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THE ROLE OF CHALLENGE AND THREAT STATES IN THE MENTAL HEALTH AND PERFORMANCE OF YOUTH ACADEMY FOOTBALL PLAYERS

JENNIFER ANNE HOBSON

A thesis submitted in partial fulfilment of the requirement of Staffordshire University for the degree of Doctor of Philosophy

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In the nearly seven years since I began this academic pursuit, I have dealt with and overcome a lot of personal and professional challenges. The support of my family, friends, colleagues, and supervisors has helped a great deal during this time and I am very grateful for them. I am thankful to the coaches and academy staff who supported my data collection, to the players and their parents for their participation. But when all is said and done, the person who deserves the biggest acknowledgement is me.

CONTENTS

ABSTRACT

Within the Theory of Challenge and Threat States in Athletes (TCTSA), on approach to motivated performance situations, demand and resource appraisals are deemed to influence sporting performance; where perceived demands outweigh perceived resources a threat state results, debilitating performance. Where perceived resources outweigh perceived demands, a challenge states results, facilitating performance. Considering the theories of stress which informed the TCTSA, it is plausible the TCTSA could be extended to explain athlete mental health. Owed to the stressful nature of football academy environments and the early age of onset of mental health problems, youth academy players represent a suitable sample within which to examine relationships between stress and mental health. Thus, the aim of this thesis was to examine longitudinal change in psychological demands, resources, and mental health in youth academy football players, to explore how changes in psychological demands and resources relate to changes in mental health, and to explore how changes in psychological demands, resources, and mental health relate to football performance. Psychometric and performance data were collected from players on six occasions over the course of 32-months, constituting three complete football seasons. Data were collected towards the start and towards the end of each season. Change analyses indicated that demand and resource appraisals and anxiety symptom frequency tended to increase during a season and over time. Perceived autonomy and competence tended to decrease during seasons and changes in perceived relatedness were mixed. PDP players experienced worsening mental health during seasons, in contrast to FP players who experienced improving mental health. Regarding the relationships between changing variables, the TCTSA model consistently explained significant proportions of variance in changes in mental health variables but failed to explain significant proportions of variance in football performance. As the longest and largest study of youth athlete mental health, this thesis makes a considerable, original contribution to the

extant literature as it evidences how psychological demands, resources and mental health are related and may change over time in youth athletes. Furthermore, applied practice recommendations are made regarding the psychological variables which could be targeted by interventions to facilitate mental health and sport performance.

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LIST OF ABBREVIATIONS

ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
AOO	Age of Onset
BPNs	Basic Psychological Needs
BPSM	Biopsychosocial Model (of Challenge and Threat)
CVR	Cardiovascular Reactivity
DRES	Demands and Resources Evaluation Scale
DSM-5	Diagnostic and Statistical Manual of Mental Disorders
EPPP	Elite Player Performance Plan
FP	Foundation Phase
GAD	Generalised Anxiety Disorder
GAD-10	Severity Measure of Generalised Anxiety Disorder
HPA	Hypothalamic-pituitary adrenal (axis)
MAp	Mastery Approach Goal Orientation
MAv	Mastery Avoidance Goal Orientation
MDD	Major Depressive Disorder
MANOVA	Multiple Analysis of Variance
MANCOVA	Multiple Analysis of Covariance
MHI-5	Mental Health Inventory-5
P1(2,3)	Performance Period 1(2,3)
PAC	Pituitary adreno cortical (system)
PAp	Performance Approach Goal Orientation
PAv	Performance Avoidance Goal Orientation
PDP	Professional Development Phase

PHQ-8	Patient Health Questionnaire-8
RCT	Randomised Controlled Trail
S1(2,3)	Season 1(2,3)
SAM	Sympathetic adrenomedullary (system)
T1(2,3,4,5,6)	Timepoint 1(2,3,4,5,6)
TCTSA	Theory of Challenge and Threat States in Athletes
TCTSA-R	Theory of Challenge and Threat States in Athletes-Revised
TTSC	Transactional Theory of Stress and Coping
YDP	Youth Development Phase

1.0 CHAPTER ONE. LITERATURE REVIEW.

1.1 Introduction

In September 2020, it was reported that approximately 14.1 million people participate in grassroots football (soccer) in England (The Football Association, 2020). Despite these high levels of participation, the large number of professional football academies, and high levels of investment made by football clubs (Union of European Football Associations, 2020) and the Football Association (2020), very few children “make it” as a professional player in the United Kingdom (UK, Calvin, 2018). Within England, children may pursue a dream of becoming a professional football player within a football academy. Despite an awareness of the low likelihood of achieving this dream, failing to do so (i.e., being released from a football academy) can lead to significant mental distress (see Blakelock et al., 2019; Sothern & O’Gorman, 2021). Given the potential risks to mental health, there is a substantial need to ensure appropriate support is provided to developing players within these environments.

Extensive research has been conducted within football academies showing them to be very physically and psychologically challenging (see Brink et al., 2010; Faude et al., 2011; Finn & McKenna, 2010; Gustafsson et al., 2017; Kristiansen et al., 2012; Reeves et al., 2009; Richardson et al., 2008; Sagar et al., 2010), potentially explaining why so few children become professional players in the UK (see Calvin, 2018). Considering these demands are experienced by developing young boys who are simultaneously experiencing significant transitions, stressors and risks to their mental health as associated with adolescence (Fraser-Thomas et al., 2008; Gerber et al., 2018; Gulliver et al., 2012; Isoard-Gautheur et al., 2012; Jensen et al., 2018; Kessler et al., 2007; Küettel et al., 2022; Maffulli & Caine, 2012; Nicholls & Polman, 2007; Schaal et al., 2011; Solmi et al., 2022; Strachan et al., 2009), there is a duty for sport and exercise psychology researchers and practitioners to have a strong and holistic understanding of stress and mental health experiences within this population, including how these change over time. Still, limited research offers such insights.

Considering that cognitive appraisals are heavily implicated in the relationship between stress and mental health outcomes (Choi et al., 2019; Gomes et al., 2017; Lazarus, 2000), the extant literature into stress within youth athletes could be extended through examining relationships between cognitive appraisals and mental health outcomes, including relationships between these variables as they change over time. Conducting such research within the context of a football academy offers several benefits. First, researchers may be able to study these variables consistently over time since players are typically signed at a single academy for at least two consecutive seasons. This could enable the completion of longitudinal research and thus a valuable understanding of how stress and mental health changes and develops over time in youth athletes. A second benefit relates to how the extant literature can be built upon. Most research into the mental health of academy football players is conducted with players as they are released from these academies (see Blakelock et al., 2019; Brown & Potrac, 2009; Sothern & O'Gorman, 2021). Thus, little is understood about the mental health of those within academy football environments (i.e., players while they are signed at an academy). Finally, the completion of such ecologically valid research could bestow valuable applied practice recommendations for sport and exercise psychologists working within these environments. For example, if mental health needs are shown to be greater in players within a certain age bracket, this may facilitate the targeted provision of support for these players. There have been numerous calls for a greater understanding and developmentally appropriate models for supporting young athletes' stress and mental health (see Harwood & Thrower, 2019; Thrower et al., 2023) but thus far, very limited insight exists.

To improve the support provision within football academies in England, the Elite Player Performance Plan (EPPP) was formulated by the Premier League in 2012 and implemented throughout the English professional game, to develop a world leading academy system (English Football League, n.d.). Within this plan, guidance and requirements were provided to football academies, and a categorisation structure was rolled out, to differentiate between academies offering differing levels of support and investment to their players; those of the highest status (providing the most support) receive category one status, with category two and three academies offering lesser and lesser support (English Football League, n.d.). An academy's status is audited to ensure the ongoing accuracy of categorisation. As reflected within the EPPP, there is a growing need and expectation for sport psychologists to work with and within football academies to aid and support youth player development, performance, and mental health (Premier League, 2012). To adequately do so, sport psychologists need a firm understanding of mental health, stress, and the development of stress appraisals, and how these factors relate to performance and mental health. Despite this need, there is a dearth of research exploring these factors in youth academy football players. These gaps are addressed by the present PhD research, conducted by a sport psychologist who was embedded within a category one football academy in the UK.

The Theory of Challenge and Threat States in Athletes (TCTSA) is a psychophysiological framework explaining sport performance in motivated performance situations (i.e., performance under stress, Jones et al., 2009). It has received good support in primarily adult samples (e.g., Moore et al., 2012; 2014; Hase et al., 2019b; Meijen et al., 2020), exploring performance in a range of ecologically valid (Cumming et al., 2017; Dixon et al., 2019; Turner et al., 2013) and laboratory (Moore et al., 2012; 2013; 2014; 2015) settings. Support for the application of this theory to youth sports performers is mixed (see

Turner et al., 2013; 2021; Dixon et al., 2019), thus more research exploring the TCTSA within youth sport samples is required.

Using the TCTSA as a framework to guide the present PhD enquiry, youth academy football players' general demand and resource appraisals, basic psychological needs and achievement goals towards football, and mental health markers were monitored over a 32-month period from September 2018 to October 2021. Analyses provided insight into how these variables changed over time (longitudinally and temporally). Furthermore, the extent to which changes in psychological demands and resources predicted changes in youth football players' mental health, and the extent to which changes in psychological demands, resources and mental health variables predicted football performance were illuminated. Research findings could better inform national governing bodies of support provision requirements within football academies, the applied practice of sport and exercise psychologists, and multi-disciplinary working practices taking place within football academies and within talent development environments generally.

The present PhD holds three main aims. The first is to examine longitudinal change in psychological demands, resources, and mental health in youth academy football players. The second is to explore how changes in psychological demands and resources relate to changes in mental health. The third is to explore how changes in psychological demands, resources, and mental health relate to football performance. In addressing these aims, this PhD comprises five chapters. Chapter one (the present chapter) provides a historical and conceptual literature review of stress and mental health. Chapter two details the method used to collect and prepare data collected from players, parents, and coaches over the course of the study period. Chapter three reports how psychological demands, resources, and mental health variables changed over time: longitudinally over three seasons, temporally during each season, and temporally during a "composite" season. Chapter four explores the change relationships between psychological demands, resources, mental health, and football performance. Finally, a general discussion of the study findings is presented in chapter five, along with implications for research and applied practice and some of the researcher's reflections. Consequently, to the best of the researcher's knowledge, the present PhD is the largest and longest survey of youth athlete stress and mental health, incorporating the youngest participants to participate in such research within sport (i.e., 8-years-old). It is also the first to provide strong indicators that the TCTSA could be extended to explain athlete mental health.

In the remainder of this chapter, the development of present-day understandings of stress and mental health will be illustrated. Beginning with a critical account of stress theories as they developed over time, contemporary research on stress in sport, and in particular youth sport will be critically discussed. The case will be made for a longitudinal examination of psychological demands and resources (including stress appraisals) in youth academy football players. Illustrating the association between stress and mental health, the origins of the concept of mental health will then be examined, culminating in the presentation of contemporary theories of mental health. The extant literature exploring mental health in sport and youth sport will then be presented and critically appraised. The case will be made for mental health to be explored longitudinally and alongside psychological demands and resources in youth academy football players.

1.2 Stress

Stress is a complex transactional process taking place between the individual and the environment (Semmer et al., 2005). Stress occurs when an individual perceives an inability to cope with anticipated demand(s), or when an individual perceives a threat to their well-being (Lazarus & Folkman, 1984). Sources of stress (stressors) may be external (i.e., physical, environmental, social) or internal (i.e., psychological, biological, Lovallo, 2005). Similarly, stress responses may manifest externally (i.e., changes in behaviour) or internally (i.e., thoughts, illness, changes to mood, the neuroendocrinal system, physiological reactivity; Semmer et al., 2005). The study of stress has been and continues to be challenging, since it can (and should) involve the investigation of stressors, appraisals, responses, coping, the interactions between these stages (Segerstrom & O'Connor, 2012) as well as physiological, dispositional, and social factors. Within this section of the literature review, the reader will be taken on a journey of stress conceptualisation through time; from the ancient Greeks to present-day theories and conceptualisations of stress in (youth) sport. Finally, the TCTSA will be presented (Jones et al., 2009) alongside a critical review of relevant extant literature.

1.3 A History of Stress

1.3.1 Ancient History (6,000 BCE-655 CE)

The ancient Greeks were fascinated by the mind-body relationship (Mommaerts & Devroey, 2012). Apart from believing the mind resides in the chest (Lucretius, 94-51 BC), ancient Greek philosophers' understanding of stress is akin to the present-day conceptualisation; considering biological, environmental, and perceptual components. For instance, when applied to stress, the theories of health philosophised by Hippocrates (460-377 BC) and later Aristotle (384-322 BC, i.e., homeostasis and humourism), implied that internal (biological) factors change or become unbalanced during illness (i.e., stress). Treatments sought to restore this internal balance (i.e., homeostasis) to prevent worsening health and death. Likewise, Democritius (460-362 BC) supposed that nothing is known for certain (resonating with individual differences in perception), save for bodily changes (i.e., physiological, measurable factors such as heart rate) caused by forces that impinge on it (i.e., environmental, physical, and social factors). Furthermore, Epictetus (60-120 AD) recognised that life's difficulties are dependent upon perception; to reduce (emotional) difficulty, he supposed that changing one's thoughts could alter the meaning of the difficult situation, thus alleviating suffering (e.g., Rational Emotive Behaviour Therapy, Ellis, 1957). From this, it is clear to see how current biopsychosocial conceptualisations of stress are rooted in ancient knowledge.

1.3.2 Early Modern History (1500-1750)

The mind-body relationship, central to ancient Greek philosophers' understanding of health, was revisited and refined in the 17th century, with Descartes (1637, trans 1960) asserting that the (non-physical) mind could influence the (physical) body and vice versa (Doublet, 2000). Furthermore, the emergence of Hooke's Law (1705), a theory to explain how man-made structures could withstand heavy loads without collapsing, led to use of the analogy that the body is machine-like and subject to wear and tear. Specifically, like a machine, the body was deemed capable of withstanding a certain amount of load before adverse effects took place. These adverse effects would occur when the energy required by the load exceeded the energy (or coping?) available or supplied to the individual. Consequently, the terms "load" (i.e., demands), "stress" (i.e., area effected by the demand) and "strain" (i.e., consequences of stress) were adopted to explain the process of stress, which guided subsequent research (Cox, 1978).

1.3.3 Late Modern History (1750-1945)

Building on Hooke's Law (1705), in the 19th century, Bernard (1859) suggested stress causes internal changes, creating homeostatic imbalance and overload of the nervous system. In turn, this leads to anxiety, fatigue, and irrational fears. According to Bernard, internal changes must be rebalanced for individuals to cope with stress (1859; Howard & Scott, 1965). Indeed, Beard put forth that the depletion of energy or coping resource came about due to nervous energy, nervous exhaustion and/or weakness of the nervous system (1881). This sense of having an internal imbalance resonates with the homeostatic principles coined by Hippocrates (460-377 BC) and Aristotle (384-322 BC), illustrating the core and common principles of stress which endured through time; external factors (stressors) change one's internal environment (physiology and psychology) and a failure to regulate (or rebalance) one's internal state and adjust to a stressor could have deleterious effects.

In the 20th century, the psychosomatic approach to stress and "fight or flight" responses became known thanks to the empirical work of Cannon (1939); the first time a conceptualisation of stress was based on such research. His theory resonated with earlier stress theory; external stressors must be met with an internal response to maintain stability and produce a positive outcome. This internal response was deemed to operate through the sympathetic pathway of the autonomic nervous system (Cannon, 1939). In addition to this response, or indeed in the absence of such a response, compensatory actions (i.e., fighting or fleeing) may be taken by the individual, developed through evolution to help ameliorate threats or avoid catastrophic resource depletion and death (Cannon, 1929). Whilst the fight response represents the enactment of anger and motivational intention to approach and resolve a threat, the flight response represents the enactment of anxiety and the intent to avoid the threat. According to Cannon (1915), both behavioural responses require similar physiological changes (i.e., increased respiration and blood flow to muscles, pupil dilation), suggesting a consistent, physiological response to stressors. Thus, the theory was limited since it failed to acknowledge those factors which dictate whether a fight or flight response is enacted in response to a stressor.

1.3.4 Contemporary History (1945-Present Day)

Behaviourist Movement. Later in the 20th century, Hans Selye contributed his theory of General Adaptation Syndrome which helped to progress the understanding of stress. Whilst the term stress was not used in his early work (due to conceptual confusion whereby both stimuli and responses were considered to be stress), eventually he defined stress as the effect of stressors on physiological (chemical) responses; a condition within an organism held in response to stressors (Selye, 1976). Selye added that stress is the demonstration of physical and behavioural responses, including a verbal expression of being stressed, appearing anxious, stuttering, being defensive, running away/fleeing, increased heart rate and blood pressure, and increased stress hormones in the blood stream (Selye, 1956). This conceptualisation of stress is reflective of the behaviourist movement and stimulus-response approach to explaining behaviour, which predominated the psychology discipline at this time; stress was conceived as a response, triggered by a stimulus (i.e., a stressor).

Selye's model was criticised for purporting stress as a purely physiological response to a stressor (see Mason, 1975). Indeed, even though stress responses occurred in situations where stressors were physically harmless (e.g., job interviews), Selye maintained that stress was a non-specific chemical response, triggered to protect the organism in response to a demand or threat (1979). Nevertheless, over time, the General Adaptation Syndrome was revised to incorporate two distinct stress responses: eustress (healthy stress which enhances functioning) and distress (unhealthy stress which restricts functioning, Selye, 1976). Whilst eustress was deemed to be associated with positive emotions, distress was associated with negative emotions, emerging when demands exceeded an individual's ability to maintain internal homeostasis. Despite the conceptualisation of these differing responses to stress, Selye maintained they were non-specific; the body could not distinguish between distress and eustress. Thus, harm to the individual could be bestowed by either response. Clearly, whilst Selye's model furthered those principles of homeostasis originating from the ancient Greeks and built upon by Cannon, the role of psychology and perception in the stress process remained absent.

In contrast to Selye's work, Harold Wolff recognised the role of psychology in the stress process (i.e., perception of the situation), viewing stress as an interaction between external and internal environments, in response to a demand (1953). Wolff challenged the view that stress was a product of evolution (cf. Cannon, 1929), suggesting such an explanation was inappropriate and potentially harmful to survival (Wolff, 1953, see also Carruthers, 1981). Instead, it is the perception of an event as threatening which produces protective physiological and behavioural stress responses, with the scale of the response dependent upon the event's significance to the individual (Wolff, 1950; 1953). Still, the interactions between external and internal environments were not elucidated by Wolff, meaning there was little understanding of why individuals responded to non-physical/non-threatening stressors (e.g., job interviews) in the same way they would a physical stressor. It was not until the end of the behaviourist movement and the start of the cognitive revolution within psychology that such explanations were incorporated into theories of stress.

Cognitive Revolution. The rise of the cognitive revolution saw theories of stress align with Wolff's work (1950; 1953), incorporating a mediating factor between stimulus and response; cognitive appraisal, or as Epictetus (60-120 AD) first suggested, the perception of the stimulus. The behaviourist "stimulus-response" models of stress failed to account for individual differences in stress responses; that a given stressor does not always invoke the same response in the same person at every encounter. Consequently, psychology's study of stress moved away from viewing stimulus and response aspects of stress as separate; the two were studied in unison since they are inextricably linked (Lazarus & Folkman, 1986) and the transactional theory of stress and coping (TTSC, Lazarus & Folkman, 1984) was proposed.

A cognitive-motivational-relational model, the TTSC (Lazarus & Folkman, 1984) postulates adaptive and maladaptive responses to stress as a function of appraisal processes made in response to a stressful event (Lazarus & Folkman, 1984). These appraisals involve assessments of the extent to which an event is relevant to one's own well-being and goals, and what is at stake during and because of the event (Lazarus & Folkman, 1984; Folkman et al., 1986). Accordingly, Lazarus and Folkman described stress as "a relationship with the environment that the person appraises as significant for his or her well-being and in which the demands tax or exceed available coping resources" (1986, p.63). Thus, unlike in previous theories (see Selye, 1975; Cannon, 1929; Wolff, 1950) the TTSC included reasoning as to why individuals could respond to the same stimulus in different (adaptive or maladaptive) ways; as a function of cognitive appraisals regarding the event and the self. As a result, the issue of circularity within stimulus-response models of stress was resolved.

Within the TTSC, interactions between aspects of the individual and their environment/the stressful event occur (Lazarus & Folkman, 1984). Initially, a primary appraisal of the event takes place, considering the perceived significance/importance of the event to the individual (ego involvement). The outcome of this appraisal dictates whether the event is perceived as stressful or not, and thus whether a stress response takes place. Criteria for judging whether an event is stressful include the extent to which the outcome of the event might pose a threat to one's own well-being or the attainment of an important goal (goal relevance and congruence, Lazarus & Folkman, 1984). Thus, the primary appraisal is influenced by the individual's motivational disposition, goals, values, self-esteem, ego-identity, expectations and the predictability, controllability, and imminence of the situation. If the event is not perceived as stressful, there is no stress response (Lazarus & Folkman, 1984). Clearly, the TTSC incorporates a great deal more complexity within the stress process than earlier stimulus-response models; differences between and within individuals, and the environmental context influence the stress process.

If an event is perceived as stressful following primary appraisal, a secondary appraisal takes place. Despite implication in the terminology, primary and secondary appraisals are not deemed to occur in a linear fashion. Instead, there are transactions between the two stages which influence the outcome of each judgement, and there is the possibility for re-appraisal, which can change the outcome of the stress encounter (Lazarus & Folkman, 1984). The secondary appraisal involves making judgements about coping resources and includes considering who is responsible for an event (blame/credit), assessing the quality of one's own resources (behaviour and cognitive operations) that will be useful for managing the stressful event (coping potential), future expectations regarding the potential outcome of the event, and the extent to which this interferes with one's own goals (Lazarus & Folkman, 1984).

Depending on the outcome of the primary and secondary appraisals, different kinds of stress responses may emerge; harm/loss, threat, or challenge (Lazarus & Folkman, 1984). The harm/loss stress response refers to psychological damage that has already taken place. For example, an individual may have experienced physical harm or loss to their self-esteem or social standing. In contrast, threat and challenge responses are anticipatory judgements referring to future events. Threat is experienced when coping resources are deemed insufficient for meeting the demands of the stressful event; an individual anticipates imminent harm to their well-being, or the future attainment of their goals is threatened (Lazarus & Folkman, 1984). Challenge is experienced when coping resources are deemed sufficient for meeting the demands of the stressful event; an individual does not anticipate harm to their well-being, and goal attainment is not threatened (Lazarus & Folkman, 1984). Indeed, an individual in a challenge state may anticipate an opportunity for growth and facilitative conditions for goal attainment.

Within the TTSC, there are unique behavioural and motivational implications for the individual depending on the stress response. For instance, a threat response is likely to result in feelings of fear and worry, the individual is more likely to take a prevention focus and make efforts to avoid anticipated negative outcomes of the stressful event (Lazarus & Folkman, 1984). This is akin to the "flight" component of Cannon's fight or flight responses (1939) and Selye's concept of distress (1975). In comparison, a challenge response likely results in feelings of joy, excitement, or cheerfulness. Correspondingly, individuals are more likely to take a promotion focus, making efforts to approach the situation and achieve the anticipated positive outcomes of the stressful event (Lazarus & Folkman, 1984). Such a response resonates with Cannon's "fight" response (1939), and Selye's concept of eustress (1975). Whilst some have questioned whether a situation invoking a challenge response can truly be considered a stressful situation since positive emotions are produced (Dienstbier, 1992), the TTSC enhanced the understanding of stress through the presentation of appraisal processes and associated behavioural and emotional responses. Nevertheless, the TTSC omits mention of physiological changes occurring during the stress response, thereby overlooking part of the picture.

Psychophysiological Approaches. The cognitive revolution saw a rise in research investigating cognitive appraisal processes surrounding stress. At the same time, neurological researchers furthered the understanding of physiological interactions and systems activated in the stress response, including the sympathetic adrenomedullary (SAM) and pituitary adreno cortical (PAC) systems. Thus, the roles of both psychological (i.e., cognitive appraisals) and physiological factors in producing differential outcomes in the stress process were incorporated into psychophysiological theories of stress. For example, Dienstbier distinguished between challenge and threat stress responses based on differences in cognitive appraisals, neuroendocrine activity, and the physiological system activated within the stress response (i.e., SAM and PAC, 1989, 1992). Challenge responses were deemed to be associated with activation of the SAM system and the resulting release of catecholamine, positive secondary appraisals, and positive emotions. Conversely, threat responses were deemed to be associated with activation of the SAM and PAC systems, with the PAC system resulting in the release of cortisol, negative secondary appraisals, and negative emotions (Dienstbier, 1989, 1992). Activation of the PAC system was also deemed to temper the positive effects of the SAM system, hence the more detrimental impact of a threat state relative to a challenge state (Dienstbier, 1989, 1992). Notwithstanding this, Baum and colleagues (1993) suggested that stress is a construct consisting of both the duration of the threatening event/stressor, and the duration of the psychological and physiological response to the stressor.

The biopsychosocial model (BPSM) of challenge and threat was put forth by Blascovich and Tomaka (1996), which neatly tied both Lazarus and Folkman's TTSC and Dienstbier's (1989) physiological theory of the stress response. In the BPSM of challenge and threat (Blascovich, 2008; Blascovich & Tomaka, 1996), psychological processes (i.e., appraisals) lead to physiological changes within the individual. This process happens very quickly and impacts the cardiovascular system. Only when motivated performance situations result in task engagement can challenge and threat psychological (and thus physiological) states be observed. Task engagement takes place if successful completion of the task is considered important for the achievement of one's self-relevant and important goals (Blascovich, 2008; Blascovich & Tomaka, 1996). Following task engagement, the processes of primary and secondary appraisal take place, as described in Lazarus and Folkman's TTSC (1984). Many factors during task completion could influence appraisal, such as subliminal messages beyond conscious awareness (Weisbuch-Remington et al., 2005), social comparison (Mendes et al., 2001), perceived social-evaluation (Feinberg & Aiello, 2010), interaction with stigmatised others (Blascovich et al., 2001), social facilitation (Blascovich et al., 1999), stereotype threat (Alter et al., 2010; Derks et al., 2011; Steele & Aronson, 1995; Vick et al., 2008), relationship threat (Murray et al., 2012), social rejection (Jamieson et al., 2013), and task engagement.

If perceived resources are considered to meet or exceed the demands of the situation, a challenge state results. This leads to specific physiological changes including activation of the SAM system, increased secretion of adrenaline, increased heart rate and cardiac output, decreased total peripheral resistance, and arterial dilation (Blascovich, 2008; Blascovich & Tomaka, 1996). In contrast, if perceived situational demands exceed perceived resources, the physiological pattern of a threat state is activated; SAM and PAC systems (more specifically, the hypothalamic–pituitary–adrenal [HPA] axis) are activated. Consequently, heart rate, the secretion of cortisol and total peripheral resistance increases, cardiac output decreases, and arteries constrict (Blascovich, 2008; Blascovich & Tomaka, 1996). A plethora of research has examined the BPSM and its suitability for predicting performance across sporting (e.g., e.g., Blascovich et al., 2004), academic (e.g., Chalabaev et al., 2009), gaming (e.g., Scheepers & Keller, 2022), medical (e.g., Vine et al., 2013), and "every day" settings (i.e., car parking, e.g., Derks et al., 2011). Within these studies, the assertion that a challenge state is related to superior performance relative to a threat state is supported (see also Hase et al., 2019b).

In the BPSM, the states of challenge and threat are deemed to be at opposite ends of a bipolar continuum, and so an individual could demonstrate greater versus lesser challenge, in response to different situations, or indeed the same situation at different points in time. This is since evaluations of challenge and threat are thought to be continually updated (Quigley et al., 2002). The theory does not aim to label individuals as categorically either in a challenge or a threat state. Instead, it promotes the importance of the relative differences in scores on the continuum since challenge and threat states are based on the outcome of general appraisals (i.e., demand and resource appraisals) rather than distinct and independent appraisals (i.e., threat, harm/loss, and challenge appraisals) as originally proposed by Lazarus and Folkman (1984, see Uphill et al., 2019). These differences in scores on the continuum could relate to changes in perceived resources or perceived demands or both. Thus, it is recommended that scores be studied at a deeper level, moving beyond a mere representation of whether perceived resources are below, equal to, or greater than perceived task demands.

However, when measuring challenge and threat appraisals according to the BPSM of challenge and threat, typically Likert-scale response questions are used to formulate subscale measures of perceived demands and perceived resources. From these subscales, ratio (demands/resources, see Quigley et al., 2002) or discrepancy (resource-demands, see Turner et al., 2012) scores are calculated. These scores are limited in their explanatory power since the same score could be calculated from a variety of demand and resource scores (see Table 1). Furthermore, with different researchers using different calculations of challenge and threat states (i.e., ratio or discrepancy), conclusions drawn from the same data could be inconsistent (see individuals C, E and F in Table 1). Thus, the extant literature is limited for often failing to explore detailed changes in demand and resource appraisals, and for the inconsistent calculation of challenge and threat states from questionnaire data.

Table 1

Table to illustrate the limited explanatory power and inconsistencies in ratio and discrepacy challenge and threat scores.

Individual	Perceived Demands	Perceived Resources	Ratio Score	Discrepancy Score
A	5	5	1	0
B	1	1	1	0
C	2	4	0.5	2
D	3	6	0.5	3
E	1	3	0.33	2
F	5	7	0.71	2

Furthermore, since demand and resource appraisals and thus challenge and threat states can fluctuate during the completion of a task, the concept becomes challenging to measure and thus study. Moreover, the BPSM of challenge and threat's bipolar conceptualisation of challenge and threat has been critiqued for failing to contend for the potential for an individual to hold both challenge and threat appraisals simultaneously, or indeed neither (see Folkman & Lazarus, 1985; Skinner & Brewer, 2004; Uphill et al., 2019). Nevertheless, the BPSM of challenge and threat and other psychophysiological theories have framed a great deal of the contemporary stress research, which will be explored in the following section.

1.4 Contemporary Stress Research

Even though cognitive (i.e., TTSC, Lazarus & Folkman, 1984) and psychophysiological (i.e., BPSM of challenge and threat, Blascovich & Tomaka, 1996) theories of stress contend for both positive/adaptive and negative/maladaptive responses to stress, contemporary research tends to focus more so on the latter than the former (Semmer et al., 2005). Nevertheless, a growing body of research exploring positive outcomes following stressful/challenging events (and the conditions under which positive outcomes can occur) shows stress-related, post-traumatic, and adversarial-growth related outcomes (Joseph & Linley, 2005; Mangelsdorf et al., 2019; Shakespeare-Finch & Lurie-Beck, 2014).

Contemporary stress research distinguishes between acute stressors (intense, short-term responses to events such as a job interview) and chronic stressors (enduring problems, or stressors present for longer periods, such as caring for a terminally ill family member, Slavich, 2016), and short and long-term consequences of stress. Methods such as the trier social stress test (Kirschbaum et al., 1993), cold pressor test (Hines & Brown, 1932), and socially evaluated cold pressor test (Schwabe et al., 2008) amongst others, are used to induce acute stress. Correspondingly, to measure acute stress responses, self-report questionnaire measures of perceived stress and various physiological indicators such as cardiovascular reactivity, HPA-axis responses, and cortisol levels are used (see Dickerson & Kemeny, 2004). A recent meta-analysis of 47 studies concluded that acute stress reactivity predicts physical and mental health and disease outcomes over time (Turner et al., 2020). Specifically, exaggerated reactivity increased the risk for cardiovascular disease, whilst blunted reactivity and HPA-axis at baseline predicted mental health problems such as depression, anxiety, and post-traumatic stress disorder symptoms (Turner et al., 2020).

Self-report and physiological methods are also used to explore the impact of chronic stress (e.g., Ferguson et al., 1999; see Coffman, 2020). Of course, acute stress experiences could lead to chronic stress experiences and vice versa, so an individual's "lifetime stress exposure" is sometimes considered, referring to the total sum of acute and chronic stressors experienced over the lifespan (see Burani et al., 2022; Lam et al., 2019). Self-report life event checklists (see Dohrenwend, 2006), life stress interviews, and automated systems such as the Stress and Adversity Inventory are used to give an indication of an adolescent's (Slavich et al., 2019) and adult's (Slavich & Shields, 2018) lifetime stress exposure. Whilst such research is limited by participants' abilities to accurately recall every stress experience encountered, greater lifetime stress exposure has been associated with poorer health outcomes including mental health problems and cardiovascular disease amongst others (Bangasser & Valentino, 2014; Juster et al., 2010; Miller et al., 2011; Slavich & Irwin, 2014). Furthermore, impaired cognitive functioning, degraded quality of life and earlier mortality were associated with greater lifetime stressor exposure (Diamond, 2013; Shields et al., 2016a, 2016b). Strangely though, this line of contemporary research has failed to consider the impact of cognitive appraisals on health outcomes. This is clearly flawed since, for example, challenge and threat appraisals and the associated psychophysiological system activated, lead to different health outcomes (Blascovich, 2008; Turner et al., 2020). Indeed, not all individuals are at equal risk for negative outcomes following stress (i.e., individual differences) and the importance of assessing stress reactivity alongside stress exposure is well known (Boyce & Ellis, 2005). These factors answer the question "why is subjective stress severity a stronger predictor of health than stressor exposure?", the title of a recent paper (Shields et al., 2022). Appraisals ought to be considered in all stress research including when exploring lifetime stressor exposure (Shields & Slavich, 2017; Smith & Pollak, 2020). A total count of stressors experienced, and even stressor "severity" appraisals fail to distinguish between those stressors appraised as challenge versus threat and thus, the differential long-term health outcomes associated with these appraisals.

Broadening the study of stress to across the lifetime, contemporary researchers contend that humans have sensitive periods, such as during early childhood (Lupien et al., 2009) and adolescence, where stress is particularly impactful (Andersen & Teicher, 2008). In adolescence, this is likely due to the psychosocial and physiological changes taking place (Romero, 2013), the increased sensitivity to social evaluation (Somerville, 2013), and the timing of transitional and other stressors (e.g., Sirsch, 2016). Indeed, experiences of stress (Ge et al., 1994) and emotional reactivity and sensitivity to stress (Diener et al., 1985; Lupien et al.,2009; Tottenham & Galvan, 2016; Yap et al., 2007) increase during adolescence, making it a salient life period for conducting research into stress. This is emphasised further by the fact that life events and stressors during adolescence can change the structure of the brain (e.g., decreased hippocampal volume, Piccolo et al., 2017) and have been linked to later mental health and behavioural problems (Zimmer-Gembeck & Skinner 2008). Since adolescents are vulnerable to both short- and long-term consequences of stress which can be traced through to adulthood (Lupien et al., 2016), they represent a suitable population within which to further study stress.

1.5 Stress Research in Sport

High-performing athletes experience high levels of physiological and psychosocial stress (Gustafsson et al., 2011; Quignon-Fleuret, 2016) and are under a great deal of societal pressure to compete and win (Souter et al., 2018). Because performing well under pressure essentially depends on an athlete's ability to enact an adaptive response to stress, it is an important and growing area of research.

Early research into stress within sport was simplistic and reflected the stimulus-response theories of stress presented by Cannon (1939) and developed by Selye (1956, 1976) and Obrist (1981). For instance, the stressors typically experienced by athletes and resulting physiological responses were explored. Hanson (1967) and Lowe and McGrath (1971) investigated sources of stress within little league baseball players aged 9 to 12-years. Measures of physiological arousal (heart rate and/or respiration) were taken at three intervals during a match: whilst at the dugout, on deck, and at bat. Peak heart rate (arousal) was observed when at bat, the most important moment in the game. The degree of importance of the game itself was deemed another determinant of arousal (Lowe & McGrath, 1971), the more important the game within the context of the season, the greater the amount of arousal or stress. Here, rather than deeming perceived importance as a cognitive appraisal, it was considered an aspect of the stressor and thus labelled a source of stress (e.g., Dohrenwend & Dohrenwend, 1974). Again, this stimulus-response conceptualisation of stress was flawed not only due to the lack of consideration of appraisals (meaning individual differences in stress responses could not be explained), but also, because it over-simplifies the stress process by conflating measures of “responses” and “stress”.

Furthermore, just like in the general stress literature, early research on stress within sport focused on physiological indicators of stress, was limited by poorly defined terms and a lack conceptual clarity; the terms arousal, anxiety, and stress were used interchangeably (Raglin, 1992). This meant researchers used a variety of methods to measure stress which lacked validity. For instance, Duffy’s (1962) concept of global arousal (a unidimensional state of physiological arousal) was measured using several physiological indicators (including heart rate), which failed to correlate with each other or explain interindividual differences in stress responses (Lacey, 1967). Furthermore, despite being entirely different concepts, anxiety was measured in the same way as arousal (i.e., via heart rate and respiration) and still, neither concept truly is “stress”.

With arousal and anxiety deemed as measures of stress, sport psychology research exploring the relationship between stress and performance really explored the relationship between anxiety and performance. The popularity of drive theory (Hull, 1943) was superseded by inverted-U theory (Yerkes & Dodson, 1908), yet neither explained how anxiety influenced performance, nor did they receive substantial support (Martens, 1971, 1974; Neiss, 1988; 1990). Both theories overlooked social and cognitive processes, and they were eventually abandoned by researchers. It was not until the work of Spielberger (1966, 1989) and McGrath (1970) that the body of literature on stress within sport started to account for individual processes (i.e., cognitive appraisals, Gill, 1995). Specifically, McGrath (1970) described stress as "a substantial imbalance between demand and response capability, under conditions where failure to meet demand has important (perceived) consequences" (p.20). McGrath referred to four stages in the stress process: situational demand, cognitive appraisal, stress response, and behavioural results (1970). Similarly, Spielberger described the anxiety response as starting with a stressor, followed by perceptions and appraisals of the stressor which led to the anxiety response (1989). Consequently, Spielberger and McGrath significantly impacted the study of stress within sport (Gill, 1995).

Sport psychology researchers began to move away from simplified, behaviourist, and purely physiological theories of stress and anxiety towards more complex theories with distinct definitions, incorporating stressors, psychological, and physiological components of the stress process (e.g., multi-dimensional anxiety theory, Martens et al., 1990; cusp catastrophe model of anxiety and performance, Fazey & Hardy, 1988; BPSM of challenge and threat, Blascovich & Tomaka, 1996). Indeed, stress research in sport post-1990 explored the different stressors experienced by athletes (Fletcher & Hanton, 2003; Giacobbi et al., 2004; Gould et al., 1993; Mellalieu et al.,2009; Noblet & Gifford, 2002; Scanlan, et al., 1991; Thelwell et al., 2007a; Weston et al., 2009; Woodman & Hardy, 2001), the effects of stress on performance (e.g., Edwards & Hardy, 1996; Hanton, & Connaughton, 2002; Jones et al., 1993; Lazarus, 2000; Parfitt et al., 1990) and facilitative coping strategies (e.g., Campen, & Roberts, 2001; Giacobbi & Weinberg, 2000; Gould et al., 1993; Nicholls et al., 2005a; Nicholls et al., 2009). Thus, it was clear that competing in sport is stressful (Harrison et al., 2001; Salvador, 2005) and for sports competitors, stress intensifies when success and failure have career implications (Jordet, 2009).

More recently, research exploring stressors within sport has extended to those experienced by coaches (e.g., Thelwell et al., 2007b; Olusoga et al., 2010) and parents of young athletes (e.g., Harwood & Knight, 2009; Lienhart et al., 2020). Whilst the importance of cognitive appraisals is emphasised in numerous theories of stress (e.g., Blascovich & Tomaka, 1996; Lazarus & Folkman, 1984; McGrath, 1970), and the need to study stress stimuli, appraisals, and responses in a unified manner is known, much research on stress within sport prior to 2010 focused on the nature of the stimuli (i.e., stressors) and/or responses to stressors (i.e., physiological changes and coping), meaning a big part of the stress picture (i.e., appraisals) was somewhat overlooked. However, in 2009 a sport specific, psychophysiological theory of stress, namely the theory of challenge and threat states in athletes (TCTSA; Jones et al., 2009) was put forth and helped to guide subsequent stress research in sport to consider personality factors, appraisals, physiological indicators, and emotional responses. This theory was adopted as the framework underpinning the present PhD and is explained in the next section.

1.5.1 Theory of Challenge and Threat States in Athletes

In the TCTSA (Jones et al., 2009), sport performance under pressure (or, in motivated performance situations) is explained as a function of cognitive, physiological, emotional, and behavioural responses to stress, having amalgamated the TTSC (Lazarus & Folkman, 1984), the BPSM of challenge and threat (Blascovich & Mendes, 2000), self-efficacy theory

(Bandura, 1986), achievement goal theory (Elliot & McGregor, 2001), the debilitative and facilitative competitive state anxiety model (Jones, 1995), and the model of adaptive approaches to competition (Skinner & Brewer, 2004). Thus, for an event to be deemed stressful, it must first hold motivational relevance to the performer, be perceived as important, pressured, and relevant to the individual. If true, cognitive appraisals involved in a stress response are activated (Jones et al., 2009). The early cognitive appraisal processes described in the TCTSA differ from those proposed by Lazarus (1999); Lazarus' primary appraisal process considering goal relevance was not incorporated into the TCTSA (Jones et al., 2009). Within the TCTSA, should an event or the possible outcome of an event be perceived as unimportant (irrelevant to personal desires), the event would not be perceived as stressful, and the subsequent cognitive appraisal processes which indicate challenge and threat states would not be initiated (Jones et al., 2009).

Demand and Resource Appraisals. Once the task is recognised as important (motivational relevance), the athlete cognitively appraises the situational demands expected. Demand appraisals in the TCTSA comprise three judgements; the perceptions of danger, uncertainty, and required effort (Jones et al., 2009). Perceptions of danger in a sporting context might relate to physical dangers such as risk of injury, or social evaluative dangers such as humiliation from making a fool of oneself or letting people down due to making mistakes or performing poorly (Jones et al., 2009). Perceptions of uncertainty might relate to whether the performer believes they know how likely they are to perform well in the upcoming event, or how much is known about the opposition. Ultimately the outcome of a competitive performance situation is also unknown, but regularly competing against the same opponent would bestow less uncertainty when compared with competing against a new opponent for the first time (Jones et al., 2009; Meijen et al., 2020). Required effort relates to how difficult, demanding and challenging the upcoming event is expected to be. This might be based on factors such as the perceived standard of the opposition, or internal factors such as the performer's own level of fitness and preparedness going into the event. These three judgements reflect situational demand appraisals; the second appraisal process in the TCTSA (Jones et al., 2009).

Dispositional factors such as optimism and perfectionism are recognised within the TCTSA to influence demand appraisals. However, how or why such dispositional factors might influence demand appraisals and thus the likelihood of challenge and threat states emerging were not reported (Jones et al., 2009). This is likely because appraisals are dynamic and likely to fluctuate, akin to the premise within the TTSC that stress appraisals and responses are the outcome of ongoing interactions and transactions between the individual and the environment (Lazarus & Folkman, 1984).

Following appraisal of situational demands, the performer appraises their own personal resources relating to their ability to cope with the perceived demands. Resource appraisals in the TCTSA amalgamate and extend those factors outlined in the BPSM of challenge and threat (Blascovich & Tomaka, 1996), the model of adaptive approaches to competition (Skinner & Brewer, 2004), and the control model of debilitative and facilitative competitive state anxiety (Jones, 1995). Consequently, resource appraisals relate to three judgements; self-efficacy, perceived control, and achievement goal focus (Jones et al., 2009). These factors ultimately reflect appraisals of one's own skills, knowledge, abilities, and dispositional factors which typically constitute theoretical conceptualisations of perceived resources (see Blascovich et al., 2003).

Self-efficacy relates to an individual's belief in their ability and skills needed to achieve a desired goal (Bandura, 1986). Within the TCTSA this desired goal relates specifically to overcoming and coping with the perceived situational demands of the important task at hand (Jones et al., 2009; Lazarus, 1999). Self-efficacy beliefs are influenced by previous performance achievements, vicarious experiences, verbal persuasion, and physiological states (Bandura, 1986) as well as imaginal experiences (Bandura, 1997; Maddux, 1995) and emotional states (Schunk, 1995; Treasure et al., 1996). Self-efficacy is a factor represented in each of the theories amalgamated into the TCTSA (i.e., Blascovich & Mendes, 2000; Jones, 1995; Skinner & Brewer, 2004) and can reasonably reflect the commitments and beliefs components of resource appraisals in the TTSC (Lazarus, 1991). One's perceived ability to cope with situational demands weighs heavily on the appraisal of one's skills and knowledge required to manage these demands, hence its inclusion in resource appraisals in the TCTSA.

Control relates to self-efficacy since only when athletes perceive they are in control of their sporting performance can they successfully execute their actions and skills, to ultimately develop self-efficacy (Bandura, 1977; 1997). If an athlete perceives little control over how well they will perform, performance successes may be attributed to external factors, stifling self-efficacy (see Biddle, 1999). Indeed, performers might not take ownership or credit for performance successes or recognise their strengths. Furthermore, low perceptions of control may lead to feelings of helplessness in the pursuit of performance excellence, leading to lower motivation, perseverance, and effort, and negative emotions which again may stifle the development of self-efficacy (Biddle, 1999; Skinner, 1996). Perceived control is also central to the debilitative and facilitative competitive state anxiety model; individuals who perceive control over the environment, themselves, and their ability to cope with demands and achieve their goals are more likely to interpret anxiety symptoms positively (Jones, 1995).

Perceived control was also included as a dispositional factor influencing challenge and threat states within the BPSM of challenge and threat (Blascovich & Mendes, 2000). Still, control in the TCTSA may refer to objective control (i.e., how much control an individual actually has within a given situation), perceived control (i.e., how much control an individual thinks they have within a given situation), and experiences of control (Skinner, 1996). Experiences of control incorporate the feelings of the individual within a given situation, influenced by external conditions, subjective interpretations, and individual actions. Perceived control predicts functioning and features in various theories of behaviour and motivation (see self-determination theory, Deci & Ryan, 2000), thus representing an important determinant of resource appraisals. As put forth in the TCTSA, the extent to which performers fixate on factors beyond versus within their control will influence whether they experience a threat versus challenge state respectively (Jones et al., 2009).

As previously described, for an event to be considered stressful and trigger demand and resource appraisal processes, the event must hold significant motivational relevance for the individual (Jones et al., 2009; Lazarus & Folkman, 1984). Goals within the resource appraisal reflect a performer's direction and motivational intent behind their actions and behaviours. According to achievement goal theory, goals influence sport performers' responses to competitive situations and the behaviours they adopt within competition. Specifically, performers may adopt ego-focused performance goals, with the motivational intent being to demonstrate competence relative to others. Mastery goals on the other hand reflect a motivational intent to master tasks and develop task involvement (Dweck, 1986). This dichotomous model of goal orientation was incorporated with approach versus avoidance directions in Elliot and McGregor's (2001) 2x2 achievement goal framework. Goals with an approach focus reflect a desire to successfully accomplish a desired outcome, whilst goals with an avoidance focus reflect a desire to avoid an undesired outcome. Thus, sport performers may define success and adopt goals reflecting a mastery-approach, mastery-avoidance, performance-approach and/or performance-avoidance motivation orientation.

Within a sport setting, mastery-approach goals might manifest as a focus on successfully executing and developing competency with a specific technique, whilst mastery-avoidance goals might manifest as a focus on avoiding the unsuccessful execution of a specific technique, making a mistake, or losing competency in a particular skill. A performance-approach goal might manifest as a desire to demonstrate competence in comparison to a teammate, whilst a performance-avoidance goal might manifest as a desire to avoid performing worse than a teammate (Elliot & McGregor, 2001). Control comes into play with regards to goals here because there is greater control over the achievement of mastery compared to performance goals. To define success as relative to the performance of others (as with performance goals) removes a degree of control over the definition and achievement of success, since one cannot control the performance of the subject of comparison. Regarding the TCTSA and challenge and threat states, avoidance goals are more indicative of a threat state whilst approach goals (in particular, mastery-approach) indicate a challenge state (Adie et al., 2008; Jones et al., 2009; Meijen et al., 2013).

In summary of the appraisal processes outlined in the TCTSA, individuals firstly appraise a performance situation as personally important and motivationally relevant (Jones et al., 2009). This prompts an appraisal of the demands of the situation followed by one's personal psychological resources required to meet the demands of the situation. The outcome of the demand appraisal relative to the resource appraisal dictates whether an individual approaches the performance situation in a challenge or threat state. Specifically, when personal resources are perceived as sufficient/enough to exceed the perceived demands of the situation, a challenge state will follow. Conversely, when personal resources are perceived as insufficient to meet the perceived demands, a threat state will follow (Jones et al., 2009). These processes are akin to those in the TTSC; the primary appraisal incorporates perceived demands and resources. However, a key difference is that for the TCTSA, this is the end of the appraisal process; challenge and threat states are the outcome of the cognitive appraisals of demands and resources. In contrast, the TTSC describes a secondary appraisal process, which considers one's own perceived coping appraisal (Lazarus, 1999). This difference is due to the emotional and physiological components that follow in the TCTSA which do not feature within the TTSC; cognitive challenge and threat states are met with specific challenge and threat physiological responses (see Jones & Turner, 2014) which influence performance (Jones et al., 2009). These implications are informed by Skinner and Brewer's (2002; 2004) adaptive approaches to competition and Blascovich and Mendes' (2000; Blascovich & Tomaka, 1996) BPSM of challenge and threat. The physiological responses indicative of challenge and threat states will now be described, followed by the emotional consequences.

Physiological Processes. In the TCTSA, physiological changes to neuroendocrine and cardiovascular systems occur as a function of the outcome of cognitive appraisals indicating a challenge or threat state (Jones et al., 2009). These outcomes are akin to those described by Obrist (1981), Deinstbier (1989) and within the BPSM of challenge and threat (Blascovich & Mendes, 2000; Blascovich & Tomaka, 1996). Specifically, a challenge state is characterised by increases in SAM activity, adrenaline, noradrenaline, and heart rate and a decrease in peripheral vascular resistance. The increase in SAM activity is proposed to result from the increase in heart rate and left-ventricular contractility, which increases stroke volume/cardiac output. SAM activation then prompts the release of adrenaline and nor adrenaline which causes vasodilation and an increase in systematic vascular resistance (Blascovich & Mendes, 2000; Blascovich & Tomaka, 1996). These patterns of cardiovascular reactivity (CVR) mean an individual in a challenge state has more efficient mobilisation of energy, which can allow immediate action and coping (Blascovich et al., 1999). The increased blood flow to the brain and muscles, higher blood glucose levels and free fatty acids provide this efficiency (Jones et al., 2009).

Conversely, a threat state is characterised by increases in SAM and PAC activity, cortisol, and heart rate (although compared to a challenge state, the increase in heart rate is smaller), and either no change or an increase in peripheral vascular resistance. Increased PAC activity stimulates the release of cortisol into the blood stream. Whilst heart rate increases slightly, there is no decrease in systemic vascular resistance; it may even increase (Dienstbier, 1989). This increases blood pressure (Blascovich & Mendes, 2000; Blascovich & Tomaka, 1996) which, together with the increased cardiac activity and increased/stable systemic vascular resistance reduces the efficiency of blood flow to the brain and muscles. Stored fat and proteins are converted into energy and used over a prolonged period. These patterns of CVR are ultimately less efficient compared to those described in a challenge state (Dienstbier, 1989). Whilst CVR indicating challenge might be considered akin to a fight or flight response, those indicating threat are akin to a distress response associated with perceptions of harm (Blascovich & Tomaka, 1996). As such, there are emotional responses reflective of challenge and threat states, which will be elucidated in the following section.

Emotions. Emotions are a "complex set of interrelated sub-events concerned with a specific object" (Russell & Barrett, 1999, p. 806) which might be an event or a person, from the past, in the present or anticipated future. Emotion differs from mood in that a mood tends to persist for a longer period, might not be due to a single specific cause, and refers to a more global feeling (e.g., feeling down). Emotions are specific (e.g., feeling sad or angry), experienced in response to a specific event and persist over a short period (see Ekkekakis, 2012; Frijda, 2009; Morris, 1992). Two aspects of emotional experience are important within the TCTSA; first, whether emotions are positive or negative and second, whether the emotions experienced are perceived as helpful or unhelpful for performance (Jones et al., 2009). Without predicting the exact emotions that will be experienced prior to a motivated performance situation, an individual in a challenge state is likely to experience positive emotions and interpret them as helpful for performance. Conversely an individual in a threat state is likely to experience negative emotions (such as anxiety) and interpret these as unhelpful for performance (Blascovich & Mendes, 2000; Hanton et al., 2008; Jones, 1995; Jones et al., 2009; Skinner & Brewer, 2004; Williams et al., 2010). These predictions also align with the cognitive-motivational-relational theory outlined by Lazarus (1999).

The TCTSA does contend for the possibility of negative emotions being experienced in a challenge state; competitive situations by nature are important to the individual, the outcome is uncertain, and conditions are demanding. These factors predict anxiety and thus it is conceivable that anxiety may be experienced within a challenge state. When appraised as helpful for performance, the experience of anxiety is likely to result in more positive (e.g., excited, relaxed) and less negative (e.g., tense, anger) outcomes relative to when anxiety is appraised as unhelpful for performance (Jones & Hanton, 2001; Mellalieu et al., 2003). Similarly, intense anger (negative emotion) may be experienced within a challenge state and interpreted as helpful for performance (Mendes, et al., 2008). Helpful interpretations of anxiety and anger may relate to the motivational benefits these emotions could bestow the individual, their behaviour and performance in a competitive situation. Appraisals of other emotions experienced prior to and during sporting performance and their relationship with challenge and threat states and performance may differ to those patterns observed with anxiety (Lazarus, 2000; Skinner & Brewer, 2004).

Competitive anxiety has received a great deal of research interest within the sport and exercise psychology literature, alongside the study of self-confidence (Jones, 1995). Indeed, multiple theories have been tested to explore if and how competitive anxiety relates to sporting performance, with distinctions made between somatic and cognitive anxiety, trait, and state anxiety (Burton, 1998; Smith et al., 1998) as well as debilitative and facilitative perceptions of anxiety (see Hanton et al., 2008). Relationships between intensity (how strongly the anxiety is felt), frequency (how often the anxiety is felt) and direction (whether the intensity is helpful or unhelpful for sporting performance) of cognitive and somatic anxiety and self-confidence have been explored (see Thomas et al., 2002). Research has indicated that mood may play an important role in the interpretation of anxiety; high positive/low negative affect was related to facilitative perceptions of anxiety whilst low positive/high negative affect was related to debilitative perceptions of anxiety (Jones et al., 1995). Furthermore, anxiety intensity itself may influence the interpretation of anxiety; when experienced at a low intensity, anxiety symptoms were interpreted as facilitative in a sample of youth athletes (Lundqvist et al., 2011, see also Skinner & Brewer, 2002).

Similarly, cognitive appraisals influence emotions; a challenge state was associated with pleasant emotions whilst a threat state was associated with unpleasant emotions (Nicholls et al., 2011; Nicholls et al., 2012). Furthermore, cognitive appraisal was found to be an important variable in explaining anxiety and burnout in young athletes (Gomes et al., 2017). Positive expectancies regarding one's ability to cope with performance challenges and attain performance goals have been associated with facilitative perceptions of anxiety (Jones & Hanton, 1996). Equally, positive expectations of goal attainment and perceptions of control over goal generation were associated with greater self-confidence and facilitative interpretations of cognitive anxiety symptoms (O'Brien et al., 2005). Each of these findings resonate with the predictions made within the TCTSA; whilst challenge states are more likely to be associated with positive and facilitative emotions, threat states are likely to be associated with negative and debilitative emotions.

Summary of the TCTSA. An athlete is expected to perform well when in a challenge state (Jones et al., 2009); they feel confident, focus on controllable aspects of their performance, and approach the task positively, holding positive performance expectations. Adaptive physiological processes are activated, and positive emotions are likely to be experienced prior to and during sporting performance, whilst any anxiety experienced is perceived as helpful for performance. These characteristics improve performance through more efficient delivery of oxygen to the muscles, quicker reaction times (McMorris et al., 1999), improved concentration (Bray et al., 2008;) and decision making (Turner et al., 2012), increased anaerobic power (Wood et al., 2018) and task engagement (Howle & Eklund, 2013), and reduced likelihood of reinvestment (Masters & Maxwell, 2008; Sammy et al., 2017) and loss of resource due to self-regulation (Behnke & Kaczmarek, 2018; Blascovich et al., 2008; Jones et al., 2009; Hase et al., 2019b; Moore et al., 2013). In contrast, performance suffers when the performer approaches the task in a threat state; perceived demands outweigh perceived resources, self-efficacy is low and there is little focus on the controllable aspects of performance. The performer focuses on avoiding failure, maladaptive physiological processes are activated, negative emotions are experienced, and anxiety is appraised as unhelpful for performance (Jones et al., 2009).

When proposing the TCTSA in 2009, Jones and colleagues made several recommendations regarding areas for future research. These included exploring the neuroendocrine changes taking place alongside challenge and threat CVR, the emotional and behavioural correlates of challenge and threat states, and the mechanisms through which challenge and threat states influence performance. Since 2009, a plethora of research has tested the TCTSA hypotheses, in sport and other performance settings. This research was reviewed in 2020 and consequently, a revised version of the TCTSA (TCTSA-R) was published (Meijen et al., 2020). The most significant updates to the theory are described in the next section.

1.5.2 Theory of Challenge and Threat States-Revised

A 2×2 bifurcation theory of challenge and threat, the theory of challenge and threat states-revised (TCTSA-R) extends the TCTSA; additional dispositional factors which influence sporting performance were described and social support was added as a fourth personal resource (Meijen et al., 2020). For instance, trait cognitive appraisal style is considered to influence state cognitive appraisal style (see Cumming et al., 2017; Moore et al., 2019; Power & Hill, 2010; Rumbold et al., 2020); an individual with a predisposition to generally perceive situations as a challenge (trait) is likely to report a cognitive appraisal of challenge on approach to specific motivated performance situations (state). Likewise, an individual with a predisposition to generally perceive situations as a threat will likely hold acute threat appraisals (Cumming et al., 2017; Meijen et al., 2020). Furthermore, in the TCTSA-R, individuals with more irrational beliefs are deemed more likely to approach motivated performance situations in a threat state relative to those with less irrational beliefs (Chada et al., 2019; Dixon et al., 2017; Evans et al., 2018).

Unlike in the TCTSA, in the TCTSA-R, a challenge state is deemed to immediately occur following primary appraisal, when an event is considered important (high motivational relevance), and the conditions are deemed favourable for success/goal achievement (high goal congruence, Meijen et al., 2020). Conversely, a threat state results when an event is considered important (high motivational relevance) and the conditions are deemed unfavourable for goal achievement (low goal congruence, Meijen et al., 2020). Following primary appraisal, reappraisal (akin to Lazarus' 1999 secondary appraisal process) involves consideration of situational demands and personal resources and will determine whether individuals are characterised as high/low in their challenge or threat state. Specifically, when a challenge state results from the primary appraisal, an individual is characterised as "high challenge" when in the reappraisal, perceived personal resources exceed situational demands. An individual is characterised as "low challenge" when demands exceed resources (Meijen et al., 2020). Conversely, when a threat state results from the primary appraisal, an individual is characterised as "low threat" if in the reappraisal, perceived personal resources exceed situational demands and "high threat" if demands exceed resources (Meijen et al., 2020).

The TCTSA-R's 2x2 framework contends that superior performance will be observed when an individual is in the high or low challenge state, whilst accounting for observations of superior performance when in a threat state (e.g., Dixon et al., 2019; Turner et al., 2013). Performance may still be high in a threat state if self-efficacy, perceived control, and perceived social support are high and approach goals are adopted, because positive performance mechanisms are activated (Meijen et al., 2020). The framework also accounts for temporal fluctuations in challenge and threat states; the primary appraisal does not define the approach taken because individuals undergo a process of reappraisal to ameliorate the perceived threat or to fully activate action when perceiving challenge. Thus, reappraisal can explain observations of good performance and high self-efficacy in a threat state (e.g., Dixon et al., 2019; Meijen et al., 2014; Turner et al., 2013), and account for changes in challenge and threat states occurring due to contextual and cognitive changes which alter demand and resource appraisals (Cox, 1978; Lazarus, 1999). An athlete who initially perceives threat can adopt a challenge approach (i.e., low t hreat) depending on the outcome of reappraisal (Meijen et al., 2020).

Regarding the physiological indicators of challenge and threat, the TCTSA-R extends the predictions made in the TCTSA by referencing profiles of hormonal change indicative of challenge and threat. Specifically, higher levels of neuropeptide Y (NPY) and oxytocin are deemed to be associated with a challenge state (Meijen et al., 2020), since higher levels of NPY in the amygdala is associated with decreased feelings of anxiety, reduced levels of norepinephrine (stress response hormone, Nulk et al., 2011), decreased HPA activation and a more helpful stress response (cf. Antonijevic et al., 2000). Similarly, oxytocin is associated with lower levels of cortisol under acute stress (Ditzen et al., 2009; McQuaid et al., 2016) although this may only be true when the stressor elicits a strong HPA axis response (Cardoso et al., 2014).

Regarding predictions of emotions experienced within each of the four states, within the TCTSA-R, individuals in high challenge are unlikely to experience negative emotions, with any interpreted as helpful for performance, whilst individuals in low challenge are likely to experience negative emotions and interpret these emotions as unhelpful for performance (Meijen et al., 2020). In contrast, individuals in low threat are likely to experience both positive and negative emotions, with negative emotions perceived as helpful for performance. Finally, individuals in high threat are unlikely to experience positive emotions, likely to experience negative emotions which are interpreted as unhelpful for performance (Meijen et al., 2020). In the next section, prominent TCTSA research within the sport and exercise psychology literature will be described and critically appraised.

Supporting Research. Since 2009, much research has explored the predictions of the TCTSA across various sports (Blascovich et al., 2004; Moore et al., 2018; Williams et al., 2010), tasks (e.g., Blascovich et al., 1999; Di Corrado et al., 2015; Frings et al., 2014; Laborde et al., 2015; Mendes et al., 2008; Rossato et al., 2018; Tomaka et al., 1997) and performance domains (e.g., Turner & Barker, 2014; Moore et al., 2014; Vine et al., 2013; 2015), largely supporting its utility as a framework for predicting performance from psychophysiological variables (Behnke & Kaczmarek, 2018; Hase et al., 2019b). Whilst studies included within a recent systematic review differed regarding the measurement of performance outcomes, the significance and direction of results, measurement of challenge and threat states, and research designs used, generally the relationships articulated within the TCTSA were supported; challenge states precede superior performance in comparison to threat states (Hase et al., 2019b). Indeed, within a lab-based golf competition, experienced golfers' pre-task demand and resource appraisals predicted superior performance when appraisals reflected a challenge state (i.e., sufficient resources to cope with perceived demands; Moore et al., 2013). Further, when challenge and threat states were manipulated in experienced golfers prior to a putting task, those who became challenged outperformed those who became threatened (Moore et al., 2013). Similarly, physiological challenge responses prior to a motivated performance situation bestowed performance benefits when compared to physiological threat responses within the lab (Brimmell et al., 2018; Turner et al., 2012). Whilst supporting the utility of the TCTSA to predict sporting performance, the lab-based nature of this research lacks ecological validity, preventing findings from being generalised to real world sport performance.

The research discussed thus far was predominantly lab-based, conducted at a single time-point, and mapped acute pre-performance cognitive appraisals against performance in an imminent task. Whilst keeping the time between measuring state challenge and threat appraisals and performance to a minimum helps to explore causal relationships, little is known regarding the relevance of challenge and threat states in real world sporting contexts and the impact on long-term performance. One study using the BPSM of challenge and threat as a framework showed that relative to cardiovascular markers of a threat state, challenge state markers measured four to six months prior to a season start were related to superior baseball and softball performance during the subsequent season (Blascovich et al., 2004). Still, more longitudinal research is required to establish the relationship between cognitive challenge and threat states and long-term performance.

Furthermore, relatively little is known regarding how challenge and threat states fluctuate over time. Skinner and Brewer's (2002) study indicated that in the lead up to a competitive event, cognitive appraisals and emotions became more intense (see also Lazarus & Folkman, 1984). Individuals who were predisposed (trait) to perceive stressful situations as a threat showed increasing threat-related cognitive appraisals (i.e., state) as the event drew closer, while predisposed challenge state individuals reported increasing challenge-related appraisals (Skinner & Brewer, 2002). It is reasonable to expect the number and significance of stressors effecting sports performers fluctuates over time (see Michailidis, 2014; Nobari et al., 2020; Tabei et al., 2020) and upon approach to competition (see van Paridon et al., 2017). Therefore, challenge and threat states might also fluctuate, but more longitudinal research exploring this is required, ideally in an applied setting where performance is "real" and engagement in the performance/task is likely to be higher (e.g., Turner et al., 2012; Turner et al., 2013).

Nevertheless, Cumming et al's (2017) study went further than Skinner and Brewer's (2002) by exploring changes in challenge and threat appraisals longitudinally over an entire competitive rowing season. Specifically, 14 (nine male) elite rowers (*M*age=25.79 years) completed questionnaire measures of achievement goals, self-efficacy, control, appraisal of life events, and event importance at four time points; at baseline (trait measurement of pre-disposed cognitive appraisal style) and prior to three competitive rowing events of increasing magnitude (state measurements) which were dispersed throughout the season. The elite rowers were generally predisposed to high challenge and moderate threat (Cumming et al., 2017). Supporting Skinner and Brewer's findings (2002), trait challenge and threat and resource appraisals were associated with their corresponding state appraisals; trait challenge and high resource (self-efficacy, control, and approach goals) appraisals were associated with acute challenge and high resource appraisals (Cumming et al., 2017). Likewise, trait threat and loss appraisals and avoidance goals were associated with the same acute appraisals/goal orientations (Cumming et al., 2017). When looking at changes over time, the rowers' self-efficacy increased, loss appraisals decreased, and avoidance goals decreased as the season progressed, which supports Skinner and Brewer's (2002) notion that predisposed cognitive appraisal style can predict subsequent cognitive appraisal styles. Whilst the events in Cumming et al's (2017) study were perceived of equal importance by the rowers, each increased in magnitude. Since the rowers were shown to display high challenge and moderate threat at baseline, when event magnitude increased, they demonstrated more of their predominant appraisal style (i.e., challenge) and less threat. This study supports the inclusion of dispositional style when predicting acute challenge and threat states in the TCTSA and TCTSA-R (Jones et al., 2009; Meijen et al., 2020). Whilst a sample of 14 rowers represented an externally valid sample size against the elite rowing population, repeating these observations in a larger sample would improve the certainty of the relationships found in this study. Indeed, the entire sample displayed a pre-disposed high challenge appraisal, which may be reflective of their elite athlete status, given the performance benefits associated with challenge states (Cumming et al., 2017; Jones et al., 2009).

Measuring real sport performance is a considerable strength of Cumming et al's (2017) and Skinner and Brewer's (2002) studies; their research is more ecologically valid than lab experiments which often involve measuring performance on novel tasks (e.g., Hase et al., 2019a; Moore et al., 2012; 2014; Sammy et al., 2017). Three further studies have explored the TCTSA in ecologically valid settings and samples; with cricketers (Turner et al., 2013), football players (Dixon et al., 2019), and netball players (Turner et al., 2021). In the first study, 42 elite, male, national (n=30) and county (n=12) cricketers (M*age*=16.45 years) completed psychological inventories measuring self-efficacy, control, achievement goals, and emotions prior to a competitive batting task. Players' CVR was also measured; challenge CVR predicted higher performance in the batting test compared to threat CVR (Turner et al., 2013). However, a subsample of cricketers who showed threat CVR alongside greater self-efficacy performed well. This may be indicative of greater complexity when conducting ecologically valid research relative to the lab, or it may explain discrepancies observed between psychological and CVR indicators of challenge and threat states (e.g., Dixon et al., 2019; Meijen et al., 2013; Turner et al., 2012; Williams et al., 2010). Alternatively, the relationship between challenge and threat states and performance may be more complex in youths than in adults or influenced by the fact that younger athletes are more likely to be inconsistent in their performances (Cobley et al., 2014; Wren et al., 2020). Since the exact reasons are unknown, more research into stress responses in youth athletes is warranted.

In the second study, 37 male football players (*M*age=17.95 years) provided psychometric (emotions, achievement goals, self-efficacy, control) and CVR data prior to a football match (Dixon et al., 2019). Post-match performance ratings were collected from the player and their coach relating to how close to their best the player had performed. Analyses indicated that challenge CVR was associated with superior performance relative to threat or blunted CVR (Dixon et al., 2019). Once again there were discrepancies between the psychometric and physiological data; greater resource appraisals were not consistently associated with challenge CVR patterns. However, demand appraisals were not measured in this study, meaning challenge and threat states from an appraisal perspective were not known. Thus, only part of the appraisal picture was involved in this analysis which could explain the inconsistent findings. Still, self-efficacy and control were positively associated with performance (Dixon et al., 2019), supporting the predictions in the TCTSA (Jones et al., 2009). Future applied research ought to include fuller measures of the psychometric components within the TCTSA.

Finally in the netball study, 92 youth (*M*age=13.26 years), female players completed measures of emotions and challenge and threat appraisals prior to a competitive, evaluative trial (Turner et al., 2021). Analyses showed that resource appraisals based on the BPSM of challenge and threat (i.e., general self-confidence, general perspective of positive challenge and positive disposition) positively related to performance in the trial, but resource appraisals based on the TCTSA (i.e., self-efficacy, perceived control, goal orientation) did not (Turner et al., 2021), replicating previous findings (see Dixon et al., 2019; Meijen et al., 2013; Turner et al., 2012; Williams et al., 2010). Further, a greater perceived ability to cope with demands was positively related to trial performance, which was likely developed through greater experience at previous trials (Turner et al., 2021). However, given the lack of longitudinal research within sport, particularly at youth level, such conclusions cannot be drawn.

The mixed findings within these three studies, and the limited study of challenge and threat states within youth sport performers in general, indicates that more research ought to be conducted with such sport performers in applied settings. Indeed, conducting longitudinal research to understand the nature of psychological demands and resources prior to and during adolescence, and investigating the associations with performance would also be valuable, given the stressful nature and increased sensitivity to stress experienced during this transition period (Diener et al., 1985; Ge et al., 1994; Lupien et al.,2009; Tottenham & Galvan, 2016; Yap et al., 2007). Football academies represent suitable environments where such research could be conducted since they are highly pressurised (Sagar et al., 2010), and afford players numerous stressors including team and individual performance, selection, and social evaluation (Reeves et al., 2009).

1.5.3 Stress in Academy Football

That stress is inherent within youth/academy football is well known (Reeves et al., 2009; Sagar et al., 2010) and there are benefits associated with supporting young players to enable them to excel under pressure and successfully manage stress (e.g., Brink et al., 2012; Dixon et al., 2019). As well as being inherent in youth football environments, a recent longitudinal analysis indicated that perceived stress fluctuates during a season (Tabei et al., 2020). Furthermore, significant increases in stress and sleep problems were observed from early to end-season in all 26 Iranian youth players (*M*age=15.5 years) who provided daily well-being scores throughout a season (Nobari et al., 2021, see also Faude et al., 2011; Nobari et al., 2020). However, associations with performance were rarely explored in these studies (Faude et al., 2011). Having a greater understanding of stress fluctuations in youth players signed at UK football academies, and how this relates to performance would be valuable and could contribute to increased success and academy productivity, yet little research has explored such patterns of change in this sample. This insight could ensure suitable support is provided to academy players, allowing them to develop adaptive coping strategies to support their performance, development, and even mental health. Indeed, whilst the extant sport and exercise psychology literature has explored the stressors and coping strategies employed by youth football players (Finn & McKenna, 2010; Sagar et al., 2010), little is understood regarding the most advantageous approaches to managing psychological demands for acute performance and long-term development (Harwood, 2008; Harwood & Thrower, 2019; Henriksen et al., 2014). Given this dearth of research, and since elite youth football players are at a heightened risk of experiencing stress and subsequently poor mental health (Fraser-Thomas et al., 2008; Gerber et al., 2018; Isoard-Gautheur et al., 2012; Nicholls & Polman, 2007; Strachan et al., 2009), further research is warranted in this sample.

Stress Interventions with Youth Athletes. To support young athletes in their performance endeavours, and to develop their ability to manage stress (Crocker et al., 2018), intervention research with young athletes has been conducted which often involves psychological skills training (PST, see Visek et al., 2009). PST refers to the practice and development of psychological skills which enable self-regulation and ultimately facilitate sports performance (Vealey, 1988). These skills may include goal setting, imagery, self-talk, and relaxation (i.e., the "canon", Andersen, 2009), anxiety management, concentration, cognitive restructuring, routines, and arousal regulation. PST training may target a single skill (e.g., Johnson et al., 2004) or a combination of skills (e.g., Gucciardi et al., 2009; Meggs & Chen, 2019), may be delivered by coaches (e.g., Harwood & Anderson, 2015; Harwood, 2008; Smith & Smoll, 1997) or sport psychologists (e.g., Mamassis & Doganis, 2004), over short (i.e., briefly, e.g., Miller, 2003) or longer time frames (e.g., Fournier et al, 2005; Sheard

& Golby, 2006). Indeed, PST could be integrated with other physical, technical, and tactical training programmes (Sherman & Poczwardowski, 2005; Sinclair & Sinclair, 1994). The aims of these programmes are often to facilitate athletic performance, and evidence supports the achievement of this (Brown & Fletcher, 2017; Tod et al., 2011), although such conclusions may be influenced by positive publication bias (Barker et al., 2020).

When measuring the effectiveness of PST programs, changes in sporting performance and psychological skill ability are often utilised (see Brown & Fletcher, 2017). To advance the PST literature, improved methods of evaluating the impact of PST programs are required (Knight & Holt, 2012) to provide more insight into the mechanisms through which PST influences performance, which are not fully understood (Meggs & Chen, 2019). Not only this but a greater understanding of the psychological needs of athletes at different levels of development is required (Harwood & Thrower, 2019; Holland et al., 2010; Thrower et al., 2023). Related to each of these areas for advancement, rarely are PST programs targeted at (or measured against) changing stress appraisals (Rumbold et al., 2012), despite the fact that appraisals are critical within the stress process and thus sporting performance (Jones et al., 2009; Lazarus & Folkman, 1984; Meijen et al., 2020). Considering that a strong evidence base is needed to inform applied approaches and interventions (Thrower & Harwood, 2019), and since psychological skills such as imagery and self-talk have been shown to influence challenge and threat states (e.g., Hase et al., 2019; Williams et al., 2010; 2018; 2021), there is value in advancing the extant literature through providing insights into developmental differences in psychological demands and resources in youth sport performers (i.e., highlighting needs), and how these can be appropriately measured within applied youth sporting contexts (Visek et al., 2009). These findings could subsequently advance the PST literature influencing how PST programs are evaluated, potentially highlighting mechanisms through which PST influences performance, and facilitating developmentally appropriate practice (Thrower et al., 2023).

1.6 Stress Summary

The concept of stress can be traced back to times of the ancient Greeks and since then, substantial developments have led to the emergence of encompassing, transactional, psychophysiological models of stress, including some sport specific theories (see Blascovich, 2008; Blascovich & Tomaka, 1996; Jones et al., 2009; Lazarus & Folkman, 1984; Meijen et al., 2020). The elite sport environment contains numerous stressors and constraints; recreational, elite youth, and professional athletes face high demands due to the fast-changing and increasingly competitive environment (Reeves et al., 2009; Sagar et al., 2010; Soligard et al., 2016). The nature of the response to both chronic and acute stress can bestow health (e.g., Epel et al., 2018; Turner et al., 2020) and performance consequences in sport (see Hase et al., 2019b; Meijen et al., 2020; Uphill et al., 2019), but much of the extant literature is lab-based, cross-sectional, and uses adult or undergraduate samples. Therefore, more longitudinal research on stress in youth sport performers – adolescents in particular – is warranted since adolescence is a stressful life transition and stress experiences during adolescence can have long-term consequences (Andersen & Teicher, 2008; Ge et al., 1994; Lupien et al., 2009; 2016; Piccolo et al., 2017; Zimmer-Gembeck & Skinner 2008).

Whilst the relationship between stress and sport performance has been the focus of the literature review so far, there are also likely to be mental health consequences for sports performers based on how they manage their response to stressors (see Turner et al., 2020). For example, both acute and chronic stressors have been related to the onset of a depressive episode (Hammen et al., 2009; Monroe et al., 2009; Slavich et al., 2010). Furthermore, stress represents a risk factor for poor mental health; in a longitudinal study of adolescents, the experience of stressors significantly positively predicted the trajectory of depressive symptoms (Carter et al., 2015). Still, this research is limited through the measurement of stressors and not appraisal of stressors; failing to distinguish between stressors and appraisals/responses to stressors is a common limitation across the extant literature (Grant & McMahon, 2005; Monroe 2008). Nevertheless, appraisals have been shown to moderate the relationship between stressors and negative outcomes (e.g., Riepenhausen et al., 2022). Indeed, cognitive reappraisal has been shown to moderate the relationship between stressful events and depression (Kraajj et al., 2013; Troy et al., 2010). With stress deemed the main cause of athletes' mental health problems (e.g., depression, anxiety, burnout, Gerber et al., 2018; Gulliver et al., 2015; Rice et al., 2016; Sabato et al., 2016), contributing to depression and worse performance in elite athletes (Doherty et al., 2016), there is value in extending the extant literature to examine the relationships between cognitive appraisals and mental health, particularly in research with youth athletes. Such research could illuminate more predictive factors of mental health and facilitate the design of preventative interventions. Ultimately, there is clear value in examining mental health alongside stress appraisals in sports performers.

Researching mental health in adolescent sport performers is particularly worthwhile since rates of depression (Hankin et al., 1998; Kessler et al., 2003; 2005; 2007) and other mental health problems surge in adolescence, an observation observed cross-culturally (Bor et al., 2014; Collishaw, 2015; Public Health Agency of Sweden, 2019). Thus, understanding the factors which influence adolescent mental health within sport is vital, and stress appears to be an important factor. In the remainder of this literature review, the origins of the concept of mental health will be examined, culminating in the presentation of contemporary theories of mental health. The extant literature exploring mental health in sport and youth sport will then be presented and critically appraised, ultimately providing a rationale for the present research; to longitudinally examine youth academy football players' psychological demands and resources (i.e., cognitive appraisals) and mental health.

1.7 Mental Health

Mental health is not a new concept yet only in recent years has it become a priority for public health agendas (Public Health England, 2019; World Health Organisation, 2013). Like any other human, elite athletes have mental health and theories of human mental health and emotion apply to them, regardless of the sport specific context. Recent research suggests elite athletes are at an increased risk for developing mental health problems relative to the general population (Gouttebarge et al., 2019; Gucciardi et al., 2017; Roberts et al., 2016), although this has not consistently been found (Gorczynski et al., 2017; Gulliver et al., 2015; Kamm, 2008; Markser, 2011; Rice et al., 2016; Schaal et al., 2011). Still, the elite sport environment contains numerous stressors and constraints that may contribute to depression and undermine performance (Doherty et al., 2016). Moreover, the demands faced by recreational and elite level athletes are on the rise, given the increasingly competitive and dynamic nature of the sport environment (Soligard et al., 2016). As such, understanding the mental health of elite sports performers has been the focus of a great deal of contemporary sport psychology and psychiatry research (e.g., Moesch et al., 2018).

Both within and outside of sport, research on mental health has tended to use a negative conceptualisation (i.e., the presence or absence of mental illness) but more recently, positive aspects of mental health (i.e., well-being) alongside an individual's level of functioning have been considered (Keyes, 2002; Schinke et al., 2017). Still, there are inconsistencies in both the definition and measurement of mental health throughout the extant literature; well-being, subjective well-being, global health, strain, burnout and depression and anxiety symptomology are used as measures of "mental health". Research in this area requires greater conceptual and methodological clarity, including consistency in how mental health is defined and measured (Giles et al., 2020). Throughout the remainder of this literature review, the origins of our understanding of mental health are examined. Then, contemporary theories of mental health are presented before critically appraising the extant literature exploring mental health in (youth) sport.

1.8 Origins of Mental Health

1.8.1 Ancient Egyptians

The origin of mental health as a concept can be traced back as far as the ancient Egyptians. Following the translation of inscriptions and papyri, it is understood the ancient Egyptians viewed the heart and mind as one, and important for general health (Okasha & Okasha, 2000). The heart (or mind) was considered the centre of physical and emotional life, of intellect and will (Posener, 1936); responsible for physical movement, decision making, vision, hearing, and breathing (Okasha & Okasha, 2000). Translated texts show that following an injury to the skull or brain, observations were recorded by treatment providers relating to changes in the individual's behaviour and degree of control over their body (Breasted, 1934). This suggests the ancient Egyptians appreciated the importance of the brain for health and functioning and such observational learning is comparable to more recent strategies for knowledge development in psychology, such as those achieved via observations following brain injury (e.g., Harlow, 1848; 1868).

The concept of psychology in ancient Egyptian medicine is evident in the translated notes of physicians; comments on personality, character traits, and the condition of the soul illustrate the perceived importance of psychic and mental symptoms when understanding patients and assessing their overall health (Okasha & Okasha, 2000). In terms of mental health, physicians observed their patients' temperament; being happy or depressed was described as "long" or "short of heart" respectively (Posener, 1936) whilst a confident person was "he who fills the heart" and someone who hid their thoughts was "to drown the heart"

(Okasha & Okasha, 2000). Furthermore, several translated medical notes appear to describe depression including within the Ebers papyrus (855k); “he huddled up in his clothes and lay, not knowing where he was. His wife inserted her hand under his clothing… she said ‘my brother, no fever in your chest and the limbs, but sadness of the heart’” (Ghalioungui, 1963) and “as to his mind being dark (i.e., melancholic and depressed) and his tasting in his heart, this means that his mind is contracted, there being darkness in his belly and he makes the deep to consume his mind” (i.e., feelings of helplessness, social withdrawal Ebers 855w). These texts are some of the earliest recordings of mental health symptoms and indicate their perceived significance within ancient Egyptian medicine.

Given the prominence of religion, spirituality and magic in ancient Egyptian life and the belief that disease was supernatural in its origin (Okasha, 2005), it is perhaps unsurprising that suggestion (or, the placebo effect) played an important role in health treatments (Ghalioungui, 1963, 1983; Sigerist, 1951). Patients who sought treatment for ailments travelled to sanatoriums and healing centres in temples, in search of cures from physicians or the Gods (Okasha, 2005). For example, at the sanatoriums and temples, mental symptoms were treated somatically via psychotherapeutic methods of “incubation” or “temple sleep” (Okasha, 2001). In incubation, patients were immersed partially or completely in sacred water, believing this would contribute to healing (Abouelata, 2018). As the name suggests, temple sleep involved patients travelling to temples to sleep and be healed through the mechanism of dreaming; if a dreamer was told a cure for their ailment had been found within their dream, they would awaken the next day believing their problem had been resolved. Furthermore, premonitory dreams were interpreted by priests, who suggested the dreams contained orders sent by the Gods which included instructions on how to bring about healing. In addition, when asleep in the healing temples, ancient Egyptians tried to contact the Gods, seeking a cure for their ailments and knowledge of the future, threats, dangers, and evil spells following them (Okasha, 2001). Indeed, translated records document the resolution of symptoms following such treatment, with cures more likely to occur for patients who were more emotional and highly strung compared to those who were less highly strung and more emotionally stable (Meier, 2009). Since treatment success likely relied heavily on the individual believing in the efficacy of the treatment, cures that came about via these methods could be explained by the placebo effect (Abouelata, 2018), and perhaps represent the origin of the understanding of the healing power of beliefs. Interestingly though, present day treatment methods of relaxation and sleep are still recommended for alleviating mental health symptoms, whist beliefs are the target of psychotherapeutic approaches such as Rational Emotive Behaviour Therapy (Ellis, 1957). Such methods can clearly be traced back to ancient Egyptian times, further signifying this time as the origin of the concept of mental health.

1.8.2 Ancient Greeks

The ancient Greeks were so impressed by the ancient Egyptians' medical knowledge that many Greek theories were based on ideas conveyed by Egyptian physicians. Herodotus (1980), a Greek historian, studied Egyptian medicine and marvelled at how physicians specialised in a single area of medicine. Rather than treating all diseases, some physicians specialised in a particular problem such as with the stomach, the teeth, or the eyes. Herodotus referred to physicians who would "heal the head" hinting at the existence of practices which treated problems deemed to originate in the head (1980). Thanks to Herodotus' fascination with ancient Egyptian medicine, several similarities exist between ancient Greek and ancient Egyptian theory and practices. For instance, the Greeks cured disorders via sleep treatments taking place at healing temples called the Asklepieion. Here, the divine intervention of the God of healing "Asklepios" and the interpretation of dreams cured the sufferer, processes which resonate with the ancient Egyptian temple sleep treatment (Meier, 2005). The power of the placebo effect (termed autosuggestion by the ancient Greeks) or "communication to the subconscious" (Mommaerts & Devroey, 2012, p.44) occurs when one's mind has the desire to heal its body. This concept reflects present day consensus that treatments may only be successful when the individual is ready, willing, and wants to change (see Ravizza, 1990).

Furthermore, treatments for mental and physical illnesses were recorded by ancient Greek physicians and philosophers; Libanius (314-393 A.D.), a Greek philosopher, sought treatments for a series of mental and physical illnesses, including from the God of healing Akslepios (Renberg, 2017). With a history of trauma (a thunderbolt struck near him when he was young), Libanius began experiencing health troubles in his 20s; a chronic and debilitating "affliction of the head" was reported (Renberg, 2017). In 355/6 A.D. he wrote "my head is possessed by an illness on account of which I drink more wine than medicine and my kidneys have forced me to bed… I have been shut off from everything that makes life pleasurable" (Renberg, 2017), and in 362 A.D. "in my head there lives a pain which makes life burdensome and puts death in my prayers" (Renberg, 2017). Whilst there was no explicit term for "mental illness" or separate discipline for mental disorders within ancient Greek medicine (Ahonen, 2019), these accounts are reminiscent of the feelings of hopelessness and suicidal ideation associated with present-day definitions major depression (see American Psychiatric Association, 2013).

A noticeable difference between ancient Egyptian and ancient Greek contributions to the understanding of health and healing is that provided by Greek philosophers who professed to be "doctors of the soul". The philosophers sought rational and logical theories, explanations, and treatment for diseases of the soul (worry, fear, dissatisfaction) which were detrimental for human happiness (Ahonen, 2019). Indeed, critical of autosuggestion, Aristotle (384-322 BC) believed that dreams are merely residual perceptions and play no role in the healing process (Barbera 2008); sleep was deemed a healing tool through the mechanism of rest and recovery rather than through the mechanism of dreaming and divine intervention.

Once again, this resonates with present-day understanding that a lack of sleep leads to worse health outcomes such as increased risk of mortality, cardiovascular disease, and depression (Gallicchio & Kalesan, 2009; Li et al., 2014; 2020). Logically, improving sleep reduces the incidence of these symptoms, and such a logical approach resonates with the musings of ancient Greek philosophers.

1.9 Contemporary Conceptualisation of Mental Health

Over recent years, distinctions between mental health and mental illness have been made; promoting positive mental health and developing mental health literacy have become increasing priorities for public health campaigns and sport advisory bodies alike (see Gorczynski et al., 2019; Public Health England, 2019; Schinke et al., 2017; World Health Organisation, 2013). In this section, definitions and distinctions between mental health and mental disorders will be made whilst specifically describing the symptoms of two salient emotional disorders; generalised anxiety disorder (GAD) and major depressive disorder (MDD). Information on the prevalence of these disorders in the overall population as well as children and adolescents will be provided together with risk factors for the development of these disorders. Then, mental health will be discussed within the contexts of elite sport and youth sport. Finally, the case will be made to explore mental health alongside stress within young football academy players whilst using the TCTSA (Jones et al., 2009) as a framework.

1.9.1 Mental Health vs. Mental Illness

An essential component of overall health, mental health is more than the absence of disease. It is a state of well-being where one realises one’s own abilities and skills, can cope with everyday stressors and can work productively, contributing to one’s community (World Health Organisation, 2018). Mental health can also be defined as “the emotional and spiritual resilience which allows us to enjoy life and to survive pain, disappointment and sadness; it is a positive sense of well-being and an underlying belief in our own, and others’ dignity and worth" (Health Education Authority, 1997, p.7). In children, the World Health Organisation emphasises developmental indicators of mental health; having a positive sense of identity, an ability to manage thoughts and emotions, build social relationships, and the ability to learn, which will enable their full and active participation in society (World Health Organisation, 2013). Of significance in these definitions of mental health is the positively framed ability to maintain functioning and commitment to daily activities, which resonates with early definitions of stress (i.e., homeostasis) covered in the first half of this literature review.

By comparison, mental illness is a term used to describe a group of mental disorders "generally characterised by a combination of abnormal thoughts, perceptions, emotions, behaviour, and relationships with others" (World Health Organisation, 2017, para. 1). Mental disorders are diagnosed based on symptoms described in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) or the International Classification of Disorders (ICD-10). As such and in line with the medical model, a negatively valenced, problem-focused approach is taken by medical professionals during the diagnosis of mental disorders. Following a clinician's assessment of symptoms, individuals may fall short of a clinical diagnosis of a mental disorder (i.e., they show several symptoms but not enough to warrant diagnosis), thus literature exploring mental health/disorders distinguishes between clinical (i.e., diagnosis) and subclinical (i.e., no diagnosis) disorders (Schinke et al., 2017).

These definitions illustrate a distinction between mental health and mental illness; mental health is not the opposite of having mental illness or a diagnosis of a mental disorder. Keyes' (2002) two-continuum model of mental health amalgamates these two concepts; both positive (mental health) and negative (mental illness) aspects are considered along two separate but related continua. On the first continuum, mental health may be positive (high-functioning and psychological wellness; flourishing) or negative (lesser functioning and problematic cognitive, emotional, or behavioural characteristics; languishing). On the second, mental illness may be present (diagnosis) or absent (no diagnosis, Keyes, 2002; Lardon & Fitzgerald, 2013). For example, an individual with bipolar disorder (mental illness diagnosed) might feel supported and optimistic about life (flourishing), whilst many people with a poor sense of well-being (languishing) are not guaranteed to be diagnosed with a mental disorder (Keyes, 2002).

Even though everyone has mental health, and mental health has been a part of human medicine since the times of the ancient Egyptians, there is stigma surrounding openly discussing, treating, and seeking help for issues relating to mental health, especially for men and boys (Pederson & Vogel, 2007; Storch et al., 2005). Reducing this stigma has been and continues to be an important aim for mental health charities and public health in England (Mind, 2012; Mind, 2016; Public Health England, 2019). Promisingly, stigma does appear to be reducing and attitudes changing, as evidenced by the attitudes to mental illness research report (TNS BMRB, 2015, see also Rossetto et al., 2019); a six percent improvement in attitudes towards mental health was observed from 2011 to 2015. Two of the most common mental disorders and problems relating to mental health are anxiety and depression, and these will be discussed in the following sections (Kessler et al., 2007; Suvisaari et al., 2009).

Anxiety. Anxiety is “a state of anticipatory apprehension over possible deleterious happenings” and “involves anticipatory affective arousal that is cognitively labelled as a state of fright” (Bandura, 1988, p.77). According to the DSM-5 there are seven clinically distinct anxiety disorders; separation anxiety disorder, selective mutism, specific phobia, social phobia, panic disorder, agoraphobia, and GAD (American Psychiatric Association, 2013). The diagnostic criteria for GAD are as follows; excessive anxiety and worry occurring more days than not, for at least six months about several events or activities, a reported difficulty at controlling the worry and at least three of the following six symptoms; restlessness or feeling on edge, easily fatigued, difficulty concentrating/mind going blank, irritable, muscular tension, and sleep disturbance (American Psychiatric Association, 2013). The manifestation of anxiety in children and adolescents differs to that in adults; there are more behavioural (rather than cognitive) manifestations of anxiety reported in young people (i.e., somatic symptoms such as headaches or stomach pain, Garland, 2001). For a diagnosis of GAD in children, only one of the six symptoms is required. In addition, the child must show clinically significant distress and impairment in normal life functioning due to the anxiety, worry and/or physical symptoms experienced. The disturbance observed cannot be explained by any other factor such as drug abuse, medication, another health problem or indeed another type of mental health problem (e.g., worry about panic attacks in panic disorder, American Psychiatric Association, 2013).

A recent systematic review exploring the presence of anxiety disorders in adult populations suggested a prevalence ranging from 3.8-25% of the population (Remes et al., 2016). Furthermore, data from the National Comorbidity Survey-Adolescent Supplement showed anxiety disorders as the most prevalent mental health concern facing adolescents (aged 13-18 years) in the United States (US) with an estimated 31% prevalence (Merikangas, et al., 2010; Siegel & Dickstein, 2011). Prevalence increased with age, and severe anxiety disorders were present in 8.3% of the total sample of 10,123 adolescents (Merikangas et al., 2010). Whilst the median age-of-onset (AOO) of anxiety disorders was six years in this sample of US children and adolescents, Kessler and colleagues observed anxiety disorders as having an AOO between 7 and 14 years (2007) with the AOO for GAD considerably later and variable by country; 25-45 years.

Anxiety disorders in childhood and adolescence predict anxiety in young adulthood (Pine et al., 1998; Woodward & Fergusson, 2001) and are a risk factor for depression in adulthood (Pine et al., 2001; Woodward & Fergusson, 2001; Stein et al., 2001; Beesdo et al., 2007; Beesdo et al., 2010). Indeed, people with high levels of anxiety were shown to be at an increased risk for developing depression and engaging in deliberate self-harm (Frances et al., 1992; Stein & Sareen, 2015). Anxiety and depression are often comorbid in adolescents (Ollendick & Hirshfield-Becker, 2002) and in such cases there is an increased risk of suicidal behaviour (Goldston et al., 2009). With suicide the third leading cause of death in 15-19-year-olds worldwide (Kessler et al., 2007), it is important that adolescents with anxiety receive necessary intervention and support.

Depression. MDD is a state of having a negative view on the world, oneself, and the future; a lack of interest, lack of motivation (anhedonia), and reduced energy (Willner et al., 2013; Belzug et al., 2015). For a diagnosis of MDD according to the DSM-5, one or more major depressive episodes must have occurred. These episodes are characterised by the presence of five or more depressive symptoms for a period of at least 14 days (American Psychiatric Association, 2013). The symptoms include a depressed mood, diminished interest or pleasure in activities, feelings of worthlessness or excessive/inappropriate guilt, fatigue or lack of energy, difficulty concentrating, significant weight change or appetite disturbance, and recurrent thoughts of death or suicide (American Psychiatric Association, 2013). The criteria for diagnosing MDD in children are similar to the adult criteria; irritable mood may be observed instead of a depressed mood, and a failure to achieve expected weight gain rather than changes in appetite or weight represent the main differences (American Psychiatric Association, 2013).

Depressive disorders are the most prevalent mental disorder; approximately 17.7% of the population are expected to develop the condition at some point in their lifetime (Suvisaari et al., 2009), whilst MDD specifically is estimated to have affected 350 million people (World Health Organisation, 2015). Kessler and colleagues' (2007) found that mood disorders (including MDD) had an AOO ranging from 25-45 years, similar to that of GAD. More recently, approximately 7.6% of American children aged 12 years and older were found to have had moderate to severe depression symptoms over the two weeks before assessment (Pratt & Brody, 2014).

1.9.2 Risk Factors for Mental Health

Multiple socio-cultural factors have been associated with greater prevalence of mental disorders, such as non-heterosexuality, low family socioeconomic status, poor parents' mental health status, parent separation, experiences of sexual harassment, adverse life events, low social support, poor general health and/or well-being, social media use, risky behaviours and being bullied/a bully (Pratt & Brody, 2014; Sheldon et al., 2021; Vizard et al., 2018). Whilst different mental disorders are influenced by different risk factors, race is differentially associated with lifetime onset of mental disorders. Since it is beyond the scope of this literature review to report these relationships in detail, see Alvarez et al (2018) and Arango et al (2021) for recent reviews.

As previously indicated, adolescence represents a substantial risk factor for mental disorders; in their large epidemiological study spanning 28 countries, Kessler and colleagues found that 10-20% of children and adolescents experience mental disorders worldwide, with 50% of all mental illnesses beginning by age 14 and 75% by mid-20s (2007). Similarly, a large-scale meta-analysis showed that globally, in one third of cases (34.6%), an individual's first mental disorder occurred before the age of 14 (Solmi et al., 2022). By the age of 18, this had increased to almost half of cases (48.4%), and in almost two thirds of cases (32.5%) the first mental disorder occurred before age 25 (Solmi et al., 2022). Furthermore, the peak AOO (14.5 years) and median age of onset (18 years) across all mental disorders occurs during adolescence (Kessler et al., 2007; Solmi et al., 2022). Over the past decade, rates of anxiety, depression and suicidality have increased for adolescents (Twenge et al., 2018; Weinberger et al., 2018). Clearly, adolescence is a prominent life stage where a greater understanding of changes in mental health is warranted.

In the UK, cross-sectional data regarding the prevalence of mental disorders in children and young people has been collected in 1999, 2004 and 2017. In 2017, interview and questionnaire data were collected from the young person, their parent(s) and their teachers, and analysed by clinically trained raters. The data showed that 11.2% of 5-19-year-olds had at least one mental disorder (Vizard et al., 2018), an increase from 10.1% in 2004 (Green et al., 2005). Similarly, 3.9% had an emotional disorder in 2004, rising to 5.8% in 2017 (Vizard et al., 2018). In 2017, 17-19-year-olds were at the greatest risk of having an emotional disorder; 16.9% met the criteria for at least one emotional disorder (Vizard et al., 2018). Indeed, they were three times more likely to have an emotional disorder than 2-4-year-olds where the prevalence of emotional disorders was 5.5% (Vizard et al., 2018).

Adolescents are at a heightened risk of depression, loneliness, and low self-esteem following peer rejection or problems with peer relationships (Conley & Rudolph, 2009; Rubin et al., 1995) because of the increased importance placed on peer relationships during this life period (Eccles et al., 1993; Steinberg, & Morris, 2001). Many stressors and important transitions take place during adolescence (see Stroud et al., 2009), and one's vulnerability for the development of mental diseases increases due to changes in brain plasticity associated with puberty (Andersen, 2003). Furthermore, since one's sense of self and identity developed during adolescence, when adolescents feel unable to be themselves, this is associated with worse mental health and greater distress (Krane, 2015; Blodgett, & Schinke, 2015). Clearly, both stress appraisals and mental health are salient areas to explore in adolescents.

1.10 Mental Health in Sport

Even though good mental health is not a pre-requisite for high performance within sport, athletes with good mental health are likely to produce better performances more consistently and over the long-term, relative to those with poorer mental health (Henriksen et al., 2019). In a sporting context, mental health has been defined as a "dynamic state of well-being in which athletes can realise their potential, see a purpose and meaning in sport and life, experience trusting personal relationships, cope with common life stressors and the specific stressors in elite sport, and are able to act autonomously according to their values" (Küettel & Larsen, 2020, p.23). Recent position statements from European Federation of Sport Psychology (Moesch et al., 2018), The British Association of Sport and Exercise Sciences (Gorczynski et al., 2019), and the International Society of Sport Psychology (Henriksen et al., 2019) offer similarly positive conceptualisations of mental health which resonate with the World Health Organisation's focus on optimal functioning and well-being (2013).

Keyes' (2002) mental health model is endorsed as an appropriate framework around which research into mental health in sport should be based (Küettel & Larsen, 2020). Still, few studies have explored or measured mental health according to Keyes' (2002) continuum (flourishing to languishing), and those which have are predominantly qualitative in nature (e.g., Coyle et al., 2017). Furthermore, aside from some studies showing the mental health benefits of sport participation (see Jewett et al., 2014; Larun et al., 2006; Swann et al., 2018), much of the extant literature has explored negative consequences. For example, the first reviews of mental health in sport featured in the sport psychiatry literature and examined the diagnosis and treatment of mental disorders in athletes (Bär & Markser, 2013; Glick et al., 2012; Reardon & Factor, 2010).

Much current research has explored the prevalence of mental disorders within elite sports; Foskett and Longstaff (2018) found that almost half of the 143 UK based athletes in their study met the cut-off for signs of anxiety or depression (47.8%), whilst 68% of 50 Canadian swimmers met the criteria for having experienced a major depressive episode in the previous 36 months (Hammond et al., 2013). In a sample of 224 Australian elite athletes, at the time of assessment 46.4% were experiencing at least one mental health problem such as depression (27.2%), an eating disorder (22.8%), or GAD (7.1%, Gulliver et al., 2015). Furthermore, 21% of 39 elite athletes in New Zealand met the criteria for moderate symptoms of depression; those who were under the age of 25 (i.e., adolescents), participating in an individual sport and/or were contemplating retirement were more likely to experience depression (Beable et al., 2017). This cross-sectional and cross-cultural research suggests that elite athletes, and perhaps especially adolescent elite athletes, experience poor mental health, much like or even potentially to a greater extent than the general population (see also Gouttebarge et al., 2016; 2017; Nixdorf et al., 2016; Schaal et al., 2011; Wolanin et al., 2016). However, the cross-sectional nature of this research limits our understanding of how mental health symptoms develop or indeed fluctuate over time; only longitudinal research could provide such insights and so more is needed to advance the extant literature (Cobley & Till, 2017). Indeed, a recently published paper has indicated that both anxiety and depression symptoms increased over the course of a season in youth, female, grassroots netball players (Davies et al., 2023), which offers further reasoning for why phenomena such as mental health markers should be studied in a temporal and/or longitudinal fashion.

Whilst these statistics provide some useful insights into the prevalence of symptoms of mental disorders in elite sport, the absence of symptoms of mental disorders does not necessarily equate to positive mental health, since an individual can experience poor mental health without evidence of characteristics of a mental disorder (Keyes, 2002). Furthermore, using clinical measures of symptoms of mental disorders within a sporting population (e.g., Bär & Markser, 2013; Glick et al., 2012; Reardon & Factor, 2010) is problematic since symptoms of overtraining and burnout could be misconstrued as symptoms of depression; both share symptoms of fatigue, insomnia, appetite change, weight loss, lack of motivation and concentration difficulties (Gustafsson et al., 2017; Reardon & Factor, 2010; Schwenk, 2000). If self-report psychometric instruments measuring symptoms of mental disorders are to be used, they ought to be modified for the athletic population (Baron et al., 2013; Foster & Chow, 2016). Thus, in future research, both mental health should be explored using sport specific measures (Keyes, 2002; Küettel & Larsen, 2020).

1.10.1 Mental Health in Football

Prevalence. Professional football is a psychologically challenging environment; research suggests players are at an increased risk of experiencing poor mental health outcomes such as depression, relative to the general population (Boden et al., 1998; Pruda & Badhur, 2016; Sarmento et al., 2021). Indeed, of the 149 active male professional football players (from Australia, Ireland, The Netherlands, New Zealand, Scotland, and US) who were screened for symptoms of mental disorders, 26% showed signs of anxiety/depression (Gouttebarge et al., 2015a). This prevalence increased to 39% in the 104 retired players screened in the study (Gouttebarge et al., 2015a). A similar study of 540 current male professional football players (from Finland, France, Norway, Spain, and Sweden) found that 39% exhibited anxiety/depression (Gouttebarge et al., 2015c), whilst another study observed lower rates in Spain (25%) and higher rates in Norway (43%, Gouttebarge et al., 2015b). However, in a sample of 471 male and female elite football players (from Switzerland), only 7.6% indicated mild to moderate depression and 3% indicated major depression, akin to the prevalence rates in the general population (Junge & Feddermann-Demont, 2016). Indeed, measures of GAD indicated that only 1.4% had at least moderate anxiety disorder, which is significantly lower than the prevalence in the general population (Junge & Feddermann-Demont, 2016). Nevertheless, rates of depression were greater in players under the age of 21 (i.e., adolescent male players) than in the general population (Junge & Feddermann-Demont, 2016), which corresponds with the wealth of research from the general psychology literature showing the prominence of stress and mental health problems during adolescence (i.e., Andersen & Teicher, 2008; Lupien et al., 2016; Solmi et al., 2022).

Collectively, these findings indicate that both current and retired professional football players are at risk of experiencing anxiety and depression. However, the extent to which they are at an increased risk relative to the general population might be influenced by nationality. Clearly there is a need to support active and retired professional football players to develop coping strategies which help them to manage stress and support their mental health (van Ramele et al., 2017). Arguably, interventions should be targeted at youth players since at this age, high levels of stress are experienced (Ge et al., 1994), mental health problems are most likely to onset (Solmi et al., 2022), and mental disorders in adulthood are predicted by mental disorders in adolescence (Beesdo et al., 2007; Beesdo et al., 2010; Das et al., 2016; Lupien et al., 2016; Pine et al., 1998; Pine et al., 2001; Stein et al., 2001; Woodward & Fergusson, 2001; Zimmer-Gembeck & Skinner 2008). Thus, learning how to manage stress and look after one's own mental health during adolescence may improve football players' long-term mental health outlook. Still, aside from qualitative investigations (Sothern & O'Gorman, 2021), usually focusing on released academy players (e.g., Brown & Potrac, 2009), very little research on the mental health symptoms exhibited by youth academy football players in England has been conducted; more is warranted.

Seasonal Fluctuations in Mental Health Symptoms. Several studies have demonstrated that professional football players' mental health symptoms fluctuate during a season. Indeed, there appears to be a positive relationship between the intensity of training/training load and players' burnout symptoms (Bicalho et al., 2020; Fagundes et al., 2019), with the pre-season period representing a particularly troublesome time for football players' mental health (Fessi et al., 2016). Nevertheless, injury, conflicts with coaches, playing position, and periods of non-selection appear to have the most significant negative impact on football players' well-being and depressive symptoms (Abbott et al., 2019; Sarmento et al., 2021). Whilst this research is useful for highlighting some of the seasonal risk factors for football players' mental health, most of these studies adopted small sample sizes (ranging from 10-53 players) and only used professional players in their sample. Thus, the reliability of these findings is limited and could not be generalised to younger players, who are at greater risk of developing mental health problems (e.g., Kessler et al., 2007; Solmi et al., 2022). Improving the understanding of how youth football players' mental health fluctuates over the course of a season would be valuable because promotion, prevention, and early intervention provide the greatest positive impact on long-term health and well-being (Parry, 1992).

Academy Football Players. As previously mentioned, elite youth football is a highly stressful environment (Finn & McKenna, 2010; Reeves et al., 2009; Sagar et al., 2010). It is also highly competitive and physically intensive, meaning the young players are at risk of developing an injury (Armstrong & McManus, 2011a; 2011b; Hastmann-Walsh & Caine, 2015). The adolescent growth spurt (Micheli, 1983) and bodily changes due to maturation (Maffulli & Caine, 2012; Schaal et al., 2011) further increase the adolescent football player's risk of injury. Sport injury has been repeatedly associated with more symptoms of depression and anxiety (Anchuri et al., 2020; Gulliver et al., 2015; Hutchinson et al., 2009; Junge & Feddermann-Demont, 2016; Mainwaring et al., 2010). Indeed, in a sample of 48 injured youth athletes, 27% exhibited mild-to-moderate depression severity immediately post-injury, with these rates declining but still salient at three (21%), six (17%), and 12 weeks (13%) post-injury (Manuel et al., 2002). Furthermore, experiencing depression and anxiety enhances the risk of injury and reinjury following return to play (Appaneal & Habif, 2013; Bauman, 2005; Johnson & Ivarsson, 2011; Li et al., 2017; Podlog, 2016; Yang et al., 2014) potentially leading to a vicious cycle of injury and poor mental health. Relatedly, a study of 239 male and female Danish football players showed that whilst most players experienced low levels of depression and moderate levels of well-being, rates of depression, anxiety, and stress increased with age and during the junior-to-senior transition (Küettel et al., 2022). For these reasons, and since peak competitive years (Allen & Hopkins, 2015) overlap with peak AOO for mental disorders (Gulliver et al., 2012; Kessler et al., 2007; Solmi et al., 2022), adolescent youth football players are at an increased risk of experiencing poor mental health (Fraser-Thomas et al., 2008; Gerber et al., 2018; Isoard-Gautheur et al., 2012; Nicholls & Polman, 2007; Strachan et al., 2009). Indeed, in a sample of elite Danish and Swedish football players, elite junior players reported higher levels of depression than professional players (Jensen et al., 2018). Clearly, being an elite youth football player poses high levels of stress and leaves players at risk of experiencing significant levels of psychological distress, and poor mental health. This body of research, together with evidence that cognitive appraisals are implicated in the relationship between stress and depression (Choi et al., 2019), and in the relationship between anxiety and burnout in young athletes (Gomes et al., 2017; Lazarus, 2000), indicates the necessity of longitudinally and temporally exploring stress appraisals and mental health symptomology in youth academy football players. Such research could shed light on the cognitive risk and protective factors most salient within youth football players, which could be used to enhance the support provided to players in these environments. Adopting an evidence-based theory of stress in sport, such as the TCTSA (Jones et al., 2009), to guide such research would be valuable since tangible recommendations for practitioners seeking to support youth academy football players can be provided (Harwood & Thrower, 2019). In the following section, reasons why the TCTSA (and TCTSA-R) is a suitable framework for studying the relationship between stress and mental health in sport will be elucidated.

1.10.2 Using the TCTSA-R to Explain Athlete Mental Health

The theories that underpinned and preceded the TCTSA (and TCTSA-R, Jones et al., 2009; Meijen et al., 2020) sought to explain the impact of stress on both mental and physical health (i.e., Dienstbier, 1989; Lazarus & Folkman, 1984; Selye, 1956). The TCTSA(-R) extended these theories to explain performance, but in so doing, ignored the possibility of also explaining mental health. Indeed, without necessarily always referencing the TCTSA, the extant psychology and sport psychology literature illustrates associations between TCTSA(-R) components and mental health. For example, greater irrational beliefs (i.e., predisposition factor) have been associated with worse mental health outcomes in the general population (Vîslă et al., 2015) and athletes (Davis & Turner, 2020; Turner et al., 2018; 2019; Turner & Moore, 2016), and greater perceived demands over the course of a season were associated with more depression symptoms in youth, female, grassroots netball players (Davies et al., 2023). Indeed, threat appraisals were associated with greater irrational beliefs, negative affect, and less facilitative perceptions of anxiety in golfers prior to a golf competition (Chadha et al., 2019), whilst greater irrational beliefs were related to a more threatening interpretation of a recent stressor (Dixon et al., 2017). Furthermore, personality traits, such as high neuroticism and high extraversion have been associated with greater threat and challenge appraisals respectively (Gallagher, 1990; Mak et al., 2004), and greater neuroticism and lower conscientiousness and extraversion have been associated with worse mental health outcomes, anxiety, and depression (Kotov et al., 2010). The concepts of perceived demands and perceived resources are often applied in the study of stress spanning organizational, educational, and sporting domains (e.g., Demerouti et al., 2001; Karasek, 1979; Smith, 1986). Across these bodies of research, greater demands, and lower resources (i.e., threat states) were consistently associated with worse mental health outcomes (Bakker & Demerouti, 2007; Mayer et al., 2017; Raedeke & Smith, 2004; Salmelo-Aro & Upadyaya, 2014; Smith, 1986; Williams et al., 1991). These findings illustrate the suitability of exploring stress appraisals (i.e., challenge and threat) within the context of the TCTSA, alongside mental health outcomes to further the extant literature.

Looking at the relationship between each resource in the TCTSA(-R) and mental health outcomes separately, high self-efficacy has been shown to have a buffering effect against the negative outcomes of stress (Baumeister & Showers, 1986; Schönfeld et al., 2016; 2019; Thomas et al., 2011), and was associated with more positive mental health outcomes (Agans et al., 2017; Chan, 2002; Chen et al., 2020; Endler et al., 2001; Grøtan et al., 2019; Gull, 2016; Takaki et al., 2003; Watson & Watson, 2016), as suggested by Bandura in his early theoretical conceptions (1994; 1997). Furthermore, low perceptions of control have been associated with worse mental health outcomes in organisational (Rau et al., 2010), health (Gallagher & McKinley, 2009), and professional settings (Aalberg et al., 2019; Kinman et al., 2017), resonating with Skinner's original contention that perceived control predicts functioning (1996). Regarding the relationship between mental health and achievement goals, findings are mixed (Isoard-Gautheur et al., 2013; Sideridis, 2005; Zhou et al., 2019). Nevertheless, generally speaking, mastery approach goals and in some cases performance approach goals are associated with better mental health outcomes relative to avoidance goals (Daumiller et al., 2021; Kareshki et al., 2012; Senko & Freund, 2015; Sommet & Elliot, 2017; Tian et al., 2017; Tuominen-Soini et al., 2008; Zhao & Jin, 2008) and the strong adoption of both performance avoidance and performance approach goals (Luo et al., 2011). Indeed, mastery approach goals positively, and mastery avoidance goals negatively predicted within-person changes in well-being in a sample of 91 male elite youth football players (Adie et al., 2010). Finally, the mental health benefits of high levels of social support have been consistently reported (Kawachi & Berkman, 2001) including within a 2003 meta-analysis of 182 studies (Wang et al., 2009). Indeed, the positive association between perceived stress and depression (Hammen, 2005) can be reduced by social support (Licitra-Klecker & Waas, 1993; Raffaelli et al., 2012). Within the context of sport, elite athletes with good mental health reported lower levels of stress and higher support relative to elite athletes with poor mental health (Küettel et al., 2022, see also DeFreese & Smith, 2014). Collectively, these associations resonate with the TCTSA's predictions regarding athletic performance; those psychological characteristics deemed beneficial for athletic performance appear to also be beneficial for mental health. Not only this, recent studies and meta-analyses have shown that, relative to challenge CVR patterns, threat, exaggerated, or blunted CVR patterns predict disease and worse physical, and mental health outcomes (Behnke & Kaczmarek, 2018; Epel et al., 2018; Hase et al., 2020; Turner et al., 2020). Thus, the TCTSA-R could be a useful framework for understanding, explaining and guiding research into athlete mental health, and longitudinal research would help to illustrate if there is a predictive relationship between stress appraisals/challenge and threat states and athlete mental health.

1.11 Mental Health Summary

Mental health is a prominent part of the human condition; its importance recognised since ancient times and studied intensively more recently, including within elite, professional, and youth sport settings. Associated with stress and consisting of both negatively (i.e., mental illness) and positively (i.e., well-being) framed components (i.e., Keyes, 2002), mental health is particularly salient within and heavily influenced by the adolescent life period (Solmi et al., 2022). The extent to which mental health symptoms are prevalent and develop within elite youth sports performers (such as football academy players) is unknown, despite the fact such individuals face many sport-specific and life stressors and are thus at an increased risk of experiencing poor mental health, anxiety, and depression (Gerber et al., 2018; Reeves et al., 2009; Richardson et al., 2008; Sagar et al., 2010). Indeed, how mental health symptoms change over time during adolescence for youth athletes is relatively unknown, with most of the extant research cross-sectional in nature or adopting small sample sizes. When football players become professional (and certainly upon retiring), they may be at an increased risk of experiencing mental health problems relative to the general population (Gouttebarge et al., 2015a). Thus, developing a greater understanding of youth football players' mental health, how their mental health changes over time, and the relationship between mental health and stress appraisals is worthwhile, since stress is heavily implicated in athletes' mental health (Lazarus, 2000; Rice et al., 2016) and the TCTSA (Jones et al., 2009) appears to be a suitable framework for guiding such research. This knowledge of young players could drive improved intervention work which could thus protect professional and retired players of the future.

1.12 Overall Summary, Aims and Rationale

Football academies in the UK are increasingly competitive performance environments for young boys who seek to become a professional football player. But the likelihood of young players achieving this goal is extremely slim (Calvin, 2018). For this and many other reasons, football academies are highly stressful environments (Reeves et al., 2009; Richardson et al., 2008; Sagar et al., 2010). Indeed, during their developmental journey, young players must also manage the confluence of stressors and challenges to their mental health associated with adolescence (Solmi et al., 2022; Stroud et al., 2009). Thus, a young player's likelihood of success may depend on their ability to withstand and effectively manage stress. Furthermore, since stress strongly influences mental health (Doherty et al., 2016; Gerber et al., 2018; Gulliver et al., 2015; Hammen et al., 2009; Monroe et al., 2009; Rice et al., 2016; Sabato et al., 2016; Slavich et al., 2010), a young player's ability to cope with stress may also influence the quality of their current and future (i.e., adult) mental and physical health (Andersen & Teicher, 2008; Ge et al., 1994; Lupien et al., 2009; 2016; Piccolo et al., 2017; Pine et al., 1998; 2001; Turner et al., 2020; Zimmer-Gembeck & Skinner 2008). Having a firm understanding of how young academy football players' stress responses relate to their current and future performance and mental health would be worthwhile, yet the extant literature offers limited insight into such relationships (cf. Dixon et al., 2019).

Even when looking beyond the context of football academies, little is understood regarding the relationships between stress and performance, and stress and mental health in young athletes. Indeed, when the relationship between stress and performance has been explored in young athletes, the findings have been mixed (see Dixon et al., 2019; Turner et al., 2013; 2021). This may be because stress is more complex in young athletes compared to adults, as they experience many biological and hormonal changes associated with adolescence (e.g., Piccolo et al., 2017; Romero, 2013; Somerville, 2013). Furthermore, since studies exploring youth athletic performance are largely cross-sectional in nature (i.e., acute performance occasions), findings may be mixed because young athletes' performance is inconsistent, particularly during maturation (Cobley et al., 2014; Wren et al., 2020). Thus, more longitudinal research should be conducted with youth sport performers, to enhance the extant literature and our understanding of the psychological development of youth athletes (Harwood & Thrower, 2019; Mills et al., 2011). Such research would provide greater insights into factors influencing youth athletic performance (and mental health) relative to cross-sectional research, since acute measures may be unreliable indicators of their performance potential. In addition, longitudinal research can provide powerful indicators of cause-and-effect relationships and important developmental processes (Cobley & Till, 2017; Grammer et al., 2013; Maxwell & Cole, 2007), such as how and why stress, mental health, and performance might change over time in young athletes. Consequently, longitudinal research can provide valuable applied implications. In the context of football academies, this could improve young players' experiences within football academies, their football career prospects, and their long-term mental and physical health.

Any research exploring complex phenomena such as stress, mental health, and athletic performance, and the relationships between them, ought to be aligned with an encompassing theory or model. The TCTSA (Jones et al., 2009) represents a suitable theory to guide such research; a growing body of evidence supports its central tenets when explaining athletic performance (see Meijen et al., 2020) and, upon consideration of the broader psychology literature, these could also explain athlete mental health. Therefore, the purpose of the present PhD was to address the gaps in the extant literature presented here, by measuring youth football players' psychological demands and resources (including stress appraisals), mental health, and football performance over a 32-month period. The completion of this research was facilitated by the researcher's position as academy sport and exercise psychologist at the football academy. The aims of this thesis are to:

1) Examine longitudinal change in psychological demands, resources, and mental health in youth academy football players,
2) Explore how changes in psychological demands and resources relate to changes in mental health,
3) Explore how changes in psychological demands, resources, and mental health relate to football performance.

Consequently, the present PhD contributes to the extant literature in several notable ways. First, this body of research represents the largest and longest survey of athlete mental health and stress change over time. Second, considering the sample comprises young athletes performing within an ecologically valid development environment, this research responds to recent calls for a greater understanding of youth athlete development experiences, offering novel insights into relationships between changes in youth athletes' psychological demands, resources, and mental health (Harwood & Thrower, 2019; Thrower et al., 2023). Third, the present PhD contributes age-appropriate methods through which stress and mental health can be measured and monitored in youth athletes. Fourth, building on the PST literature, this research provides a theoretical foundation on which sport psychology interventions could be based, to influence both acute performance and mental health. Fifth, the contribution of longitudinal research into youth athlete stress and mental health helps to strengthen the literature base and promote evidence-based practice through illuminating important interrelationships and potentially causal relationships (Grammer et al., 2013).

2.0 CHAPTER TWO. METHOD.

2.1 Introduction

In the present PhD, the TCTSA, mental health and sport performance were studied longitudinally, through the psychometric measurement of multiple components of the TCTSA, mental health markers and football performance. Data were collected at six timepoints over a 32-month period (from September 2018 to April 2021) from young players signed at a category one football academy in the UK, supporting the achievement of the PhD aims to examine longitudinal change in psychological demands, resources and mental health, to explore how changes in psychological demands and resources relate to changes in mental health, and to explore how changes in psychological demands, resources and mental health relate to changes in football performance. Achieving these aims will add to the extant literature by extending our understanding of the TCTSA; documenting the dynamic nature of challenge and threat states and how challenge and threat states relate to mental health outcomes, within an under-researched sample (namely, male youth football players). In this chapter, the method used to collect and prepare data for analyses are described and justified. The decision to devote an entire chapter to outlining the method was made due to the complexity of the data collection process adopted throughout the course of the study period, and to avoid duplication of such extensive writing within the subsequent chapters. Detailed descriptions of the methods of analysis used to achieve the first and second PhD aims are outlined in chapter three and chapter four respectively to aid the reader's comprehension. Put another way, the information relating to method within the present chapter relates to the data used within the analyses in both chapters three and four. The information relating to method provided within chapters three and four relates specifically to the analyses within the respective chapters.

2.2 Research Context

Football is a team sport, whereby two teams of 11 players (although this number is usually lower at younger ages and within disability football) compete against each other for two periods of 45 minutes (younger ages may player fewer minutes in a different format, such as four periods of 20 minutes). The winning team is the team who has scored the most goals at the end of the allotted time. Physically, football requires constant performance within a dynamic environment; players' experiences and decisions are complex and varied. Depending on playing position, the game demands periods of anaerobic and/or aerobic performance. For instance, a goalkeeper is likely to mainly perform aerobically, whilst a striker may perform aerobically for some periods, and anaerobically at others. Technically, football requires execution of gross motor skills, strong social skills, and tactical understanding. The psychological demands of football include maintaining high levels of motivation and self-confidence for prolonged periods, managing uncertainty, and regulating levels of intensity, focus, and concentration to enable effective decision making (Taylor, 1995).

Within the UK, academies at professional football clubs aim to provide an environment where young players can learn and develop their football ability. Academies are ranked in status, with category one academies offering the highest levels of support to players, and category four academies offering basic levels of support (Premier League, 2012). In a category one academy (i.e., where the present research took place), a player can expect to receive support and training from a multi-disciplinary team comprising coaches, sport and exercise scientists, physiotherapists, strength and conditioning coaches, sport and exercise psychologists, and nutritionists (Premier League, 2012).

Football academies usually have a playing squad of approximately 20 players at every age group, from under-9s to under-16s. Some academy programmes see players attend the academy in place of school. The number of days per week players attend varies by academy; some follow a full-time model (all schooling takes place at the academy), whilst others follow a part-time model (players attend the academy for one or two days per week, when education is provided by academy teachers, in lieu of the player attending school on that day). The age groups are split into developmental phases, with the under-9 to under-12 age groups making up the "Foundation Phase" (FP), the under-13 to under-16 age groups making up the "Youth Development Phase" (YDP), and the under-18 and under-23 age groups making up the "Professional Development Phase" (PDP).

Contractually, academy players enter a renewal year every two years. Towards the end of those renewal years, players discover whether their contract will be extended for an additional two years. When players reach their under-16 year (also the year of their GCSEs at school), they may be offered a highly desirable two-year contract which would see a player's contact time at the academy and training load increase significantly as they seek to earn a professional contract. If offered a scholarship during the under-16 season, players remain registered at the academy for a further two years within the under-18 age-group. Through this time, players will train at the academy four days per week, receive education five days per week, and compete in a competitive league and several cup competitions throughout the season. Players will also receive payment throughout the two years of their scholarship and seek opportunities to play with the under-23s or first team, to improve their chances of earning a professional contract. Towards the end of these two years, players may be awarded a professional contract, at which point they play and train with the under-23s and/or first team, be considered a full-time professional and enter into a cycle of seeking to earn a contract renewal or extension.

Prior to (and indeed following) the offer of a two-year scholarship, the academy player encounters a plethora of environmental, personal, and interpersonal challenges. As well as managing the challenges of adolescence (see Andersen, 2003; Conley & Rudolpf, 2009; Kessler et al., 2005; Rubin, et al., 1995; Stroud et al., 2009), players are faced with psychological demands of high expectations (from themselves, their coaches, their parents/family), making errors, selection, the opposition, mental stress, injury, and contractual issues amongst others (Reeves et al., 2009; Richardson et al., 2008). Indeed, adolescent players, and later maturing adolescent boys in particular, are at an increased risk of injury, compared to children and earlier maturing boys, due to the maturation and biological processes occurring post-puberty (Faude et al., 2013; Pearson et al., 2006), representing a further potential stressor.

The personal and interpersonal challenges faced by academy football players can vary in frequency and significance depending on their age and level within the academy development framework. Depending on the phase and degree of importance placed on the outcome of the game, stressors can include team performance, individual performance, physical demands, playing at a higher level, family, social evaluation, lifestyle, friendships, the pitch, weather conditions (Reeves et al., 2009; Richardson et al., 2008), and the junior-to-senior transition (Cronin et al., 2020). Injury is also a potentially significant stressor that could impact players of any age, at any time throughout their sporting careers (Abbott et al., 2019; Nicholls & Polman, 2007). Given the stressful nature of competing within football academies, they represent a suitable context in which to study youth sports performers' stress and mental health. Thus, the present PhD research was conducted in a category one football academy which adopted a part time model for schoolboys; players in the under-12 to under-16 age groups attended the academy in lieu of school on one day per week. Relatedly, the researcher held a dual role at the football academy, acting as researcher whilst fulfilling a full-time applied sport psychologist role at the academy, working primarily within the FP and YDP. This presented several ethical, professional, and logistical challenges during the course of the research. Insight and reflections relating to some of these challenges are presented within chapter five.

2.3 Methodology

In this section, the research methodology is described and justified. It comprises nine subsections with the first three relating to the research design, procedure and ethics, and participant information. The fourth subsection outlines the psychometric data collected and is broken down into stress appraisal, basic psychological needs, achievement goals and mental health sections. The fifth and sixth sections relate to the demographic and performance data collected across the study period respectively. Within the seventh section, details regarding how the raw data were prepared for analysis are provided. The final two subsections include descriptive statistics of the study variables at each timepoint, and correlations between the study variables at each timepoint, using the prepared dataset.

2.4 Design

Much of the extant sport and exercise psychology research into challenge and threat states in athletes is cross-sectional, correlational (cohort), and involves laboratory experiments (e.g., Moore et al., 2015; Turner et al., 2014). Whilst cross-sectional research is useful for demonstrating patterns and associations, it cannot be used to infer cause and effect. Instead, data must be collected both before and after change occurs (i.e., over time), rather than at one static time point (i.e., cohort research) for such relationships to be established. Collecting data repeatedly over multiple timepoints (i.e., longitudinal research) allows changes over time to be demonstrated (i.e., temporality) which is a long-accepted criteria for causation (Hill, 1965; Jose, 2016). Therefore, longitudinal research is required to advance sport and exercise psychology's understanding of the relationship between challenge and threat states, sport performance and mental health (Maxwell & Cole, 2007). Such research could provide greater insight into factors which relate to individuals' challenge and threat states, how challenge and threat states change/develop over time, and provide applied practice recommendations, narrowing the research-practice gap (Keegan et al., 2017).

Figure 1

Illustration of questionnaire data collection timepoints

Furthermore, longitudinal research is necessary to develop an understanding of developmental dynamics and change (Magnusson & Cairns, 1996; Magnusson & Stattin, 2006; Morrison & Ornstein, 1996). Thus, a longitudinal design is necessary for the achievement of the study's aims to examine longitudinal change in psychological demands, resources, and mental health, to explore how changes in psychological demands and resources relate to changes in mental health, and to explore how changes in psychological demands, resources and mental health relate to changes in football performance. A longitudinal design is particularly useful for understanding factors which influence youth athletes' sport performance, because their performance can be inconsistent (Cobley et al., 2014; Wren et al., 2020); measures of performance taken on single occasions from youth sport performers (i.e., cross-sectional, acute performance studies) may be unreliable. Indeed, longitudinal research can provide insight into individual developmental trajectories and can highlight factors (which cannot be manipulated experimentally) that predict later cognitive abilities (Grammer et al., 2013). Furthermore, insight can be gleaned from interacting processes over time in longitudinal research, showing how these interactions develop which can inform an understanding of the role of context in changes in children's abilities (Grammer et al., 2013). Consequently, the present PhD research is a prospective, longitudinal observation of several cohorts of youth football players signed at a category one academy. Questionnaire data measuring stress appraisals, basic psychological needs, achievement goals, and mental health were collected from players twice per season for three seasons, meaning there were six timepoints (see Figure 1). The pre-season period involves uncharacteristically high training loads and consequently high acute stress for players (see Bicalho et al., 2020; Fagundes et al., 2019; Fessi et al., 2016), relative to the early stages of a season once the season has started. Therefore, the data collection timepoints were calculated based on the pre-season start date for each age group (see Table 2 and Table 3). The early season timepoints (i.e., T1, T3 and T5) were nine weeks after the start of pre-season to allow time for players to complete pre-season and enter into the "normal" season. Late season timepoints (i.e., T2, T4 and T6) took place six months or 24 weeks after the early season timepoint, to provide a distinctly separate later season timepoint.

Table 2

Data collection dates for timepoints 1 (T1), 2 (T2), 3 (T3) and 4 (T4).

Age Groups	Event	Timepoint T1	T2	T3	T4
Under-15 to under-18	Pre-season start date	wb.23.07.18		wb. 22.07.19	
	Timepoint start date	**wb. 17.09.18**	**wb. 04.03.19**	**wb.16.09.19**	**wb. 02.03.20**
	Performance data date ranges	S1P1: 17.09.18 - 09.12.18 S1P2: 10.12.18 - 10.03.19 S1P3: 11.03.19 - 26.05.19		S2P1: 16.09.19 - 08.12.19 S2P2: 09.12.19 - 08.03.20 S2P3: 09.03.20 - 31.05.20	
Under-9 to under-14	Pre-season start date	wb. 06.08.18		wb. 05.08.19	
	Timepoint start date	**wb. 01.10.18**	**wb. 18.03.19**	**wb. 30.09.19**	**wb. 16.03.20**
	Performance data date ranges	S1P1: 01.10.18 - 23.12.18 S1P2: 24.12.18 - 24.03.19 S1P3: 25.03.19 - 09.06.19		S2P1: 30.09.19 - 22.12.19 S2P2: 23.12.19 - 22.03.20 S2P3: 23.03.20 - 14.06.20	

Note. S1 = Season 1, S2 = Season 2, P1 = Performance period 1, P2 = Performance period 2, P3 = Performance period 3. Wb. = Week beginning.

In the sport and exercise psychology literature there is a need for more longitudinal research (Grammer et al., 2013), so that cause and effect can be better inferred, and to improve understanding of how cognition develops through childhood. Understanding how challenge and threat states develop over time, and how they influence both short- and long-term success within football, will have valuable implications for academy environments. It will enable staff to develop an environment and work in ways which best support player well-being, development, and performance. The lead researcher's dual role as practitioner and researcher at the football academy provides a unique opportunity for an in-depth investigation of football players' appraisals and mental health over time. Such research, whilst not directly generalisable to all football academies or players, will provide practitioners with valuable insight into the process of applying theory to practice (Keegan et al., 2017).

Table 3

Data collection dates for timepoints 5 (T5) and 6 (T6).

Age Groups	Event	Timepoint T5	Timepoint T6
Under-18 to under-23	Pre-season start date	wb. 27.07.20	
	Timepoint start date	**wb. 21.09.20**	**wb. 08.03.21**
	Performance data date ranges	S3P1: 21.09.20 - 13.12.20 S3P2: 14.12.20 - 07.03.21 S3P3: 08.03.21 - 30.05.21	
Under-9 to under-16	Pre-season start date	wb. 17.08.20	
	Timepoint start date	**wb. 12.10.20**	**wb. 29.03.21**
	Performance data date ranges	S3P1: 12.10.20 - 03.01.21 S3P2: 04.01.21 - 28.03.21 S3P3: 29.03.21 - 20.06.21	

Note. S3 = Season 3, P1 = Performance period 1, P2 = Performance period 2, P3 = Performance period 3. Wb. = Week beginning.

A repeated-measures design is necessary within longitudinal research and to achieve the PhD aims, since collecting the same data in the same manner on multiple occasions will enable the tracking of psychological components of the TCTSA over time (Ployhart & Vandenberg, 2010). Indeed, repeated measurement allows comparisons to be made between groups (e.g., between phases of development) and within groups (e.g., over time), and for relationships to be established (e.g., associations between demographics/events and psychological characteristics) via statistical methods such as repeated measures analysis of variance (ANOVA) and regression-based techniques (Ployhart & Vandenberg, 2010; Schober & Vetter, 2018). Detailed information regarding the analysis techniques used to address the PhD aims can be found in chapters three and four.

2.5 Participants

At each timepoint, an opportunity sampling method was adopted. Every player and coach involved in the study were male except for one female coach who provided data at T1, T2 and T3. Coaches provided data relating to player performance throughout the study, whilst players provided psychometric and demographic data. At timepoint one (T1), data were collected from nine football coaches and 153 players, spanning nine age groups. Coaches' age ranged from 26-years to 42-years (M = 34.79, SD = 5.38). Players' age ranged from 8-years to 17-years (M = 11.86, SD = 2.43) at T1. At timepoint two (T2), data were collected from nine football coaches and 141 players, spanning nine age groups. Coaches' age ranged from 27-years to 43-years (M = 35.33, SD = 5.38). Players' age ranged from 8-years to 17-years (M = 12.33, SD = 2.41) at T2. At timepoint three (T3), data were collected from nine football coaches and 162 players, spanning nine age groups. Coaches' age ranged from 19-years to 44-years (M = 34.16, SD = 7.73). Players' age ranged from 8-years to 18-years (M = 12.20, SD = 2.64) at T3. At timepoint four (T4), data were collected from eight football coaches and 129 players, spanning nine age groups. Coaches' age ranged from 19-years to 44-years (M = 34.40, SD = 8.23). Players' age ranged from 8-years to 18-years (M = 12.84, SD = 2.72) at T4. At timepoint five (T5) data were collected from 10 football coaches and 172 players, spanning 10 age groups. Coaches' age ranged from 20-years to 53-years (M = 34.98, SD = 9.93). Players' age ranged from 8-years to 19-years (M = 12.64, SD = 2.91) at T5. Finally, at timepoint six (T6), data were collected from 11 football coaches and 153 players, spanning 10 age groups. Coaches' age ranged from 20-years to 54-years (M = 37.17, SD = 11.04). Players' age ranged from 8-years to 19-years (M = 13.11, SD = 2.96) at T6.

Between timepoints, some players left the academy whilst others joined. At times within the study period, some players failed to complete the questionnaire despite still being registered at the academy. Therefore, depending on the type of analysis conducted on the data, the sample size varied. In total, 230 players provided questionnaire data within the 32-month study period; 78 of those completed every eligible questionnaire at every timepoint, and one further player completed the mental health questionnaires at every timepoint.

2.6 Psychometric Data

The researcher administered an age-appropriate (see Appendix A, Appendix B, Appendix C, Appendix D), pen-and-paper questionnaire to every player within a two-week window at each of the six timepoints, beginning at the timepoint start date (see Table 3 and Table 4). The questionnaires consisted of adapted versions of Mendes et al.'s (2007) challenge and threat measure, Tomaka et al's (1993) demands and resources evaluation scale (DRES), Tian et al., (2014) adolescent students' basic psychological needs at school scale, and Conroy et al's (2003) achievement goals questionnaire for sport. The questionnaire also included Berwick et al's (1991) mental health inventory; players in the under-12 age group and older also completed the 10-item severity measure for generalised anxiety disorder (GAD-10; Craske et al., 2013) and the eight-item patient health questionnaire (PHQ-8; Kroenke et al., 2009).

Questionnaires were completed in a variety of locations because players of different age groups had different training schedules across different locations. For example, from T1 to T3, players in the under-12 to under-16 age groups attended the academy for one full day per week, whilst players in the under-18 and under-23 age groups attended the academy on at least four occasions during a week. Therefore, from T1 to T3, players in these age groups completed questionnaires in a classroom within the main academy building. Players were sat in the classroom with their teammates and were discouraged from discussing their answers or looking at their teammate's answers when considering their own, since young people can be susceptible to peer influence (Platt, 2016). Players were assured only the researcher would see their answers, their coaches would not, that there were no right or wrong answers, and it was expected that players would provide different answers to each question. If a player was absent from the initial group data collection session (e.g., due to injury), arrangements were made for the player to complete their questionnaire at another time within the two-week window. This might have been in the gym, by the side of the training pitch or within the physiotherapy treatment room.

In contrast, the under-9 to under-11 players trained in the evening three times per week and on Saturday mornings from T1 to T3. These players completed their questionnaire either before or after a training session, mid-week or on a Saturday. The locations where these players completed their questionnaire included within academy changing rooms, a sports centre seating area, a classroom, a sports hall, and a lounge area used by parents at the academy on match days. Because negotiating privacy (Mauthner, 1997) and maintaining confidentiality (Barker & Weller, 2003) is both important and difficult to achieve when conducting research with children, the same assurances made to the older players were reiterated but with greater emphasis to the children. Indeed, given the increased likelihood of children responding in a socially desirable or biased fashion (Platt, 2016), young players were assured coaches would not see their answers, that there were no right or wrong answers, players should not copy and should only circle what they truly think (Punch, 2002).

At T4, the under-15 to under-23 age groups completed their questionnaire within the main academy building as per T1 to T3. After this and at the start of the under-9 to under-14 age groups' two-week data collection period, the UK was put into national lockdown due to the COVID-19 pandemic. Therefore, the pen and paper questionnaires were sent to players via post with a return addressed envelope and an information sheet for parents explaining why the questionnaire was being sent to them (see Appendix E). After allowing two weeks for questionnaire completion and return via mail, parents of players whose data had not been received were emailed with a reminder. Where some parents reported they had not received the questionnaire through the mail or that the questionnaire was lost, another copy was provided. If their son was in the under-13 or under-14 age groups, this copy was in the form of a link to complete online. For younger players, the original word document containing the questionnaire, in the format it would have been printed, was emailed to the parent. This was then completed on the computer by their child and returned via email. Young players were not provided with a link to complete the questionnaire online because it was not possible to implement the adaptations made for children using online software; an online questionnaire could not be made engaging, colourful, or include the use of pictures when answering questions on Likert scales.

The start of the 2020/21 season was delayed relative to previous seasons due to the pandemic; age groups returned in a staggered manner. This meant the timing of T5 and T6 differed between age groups (see Table 3). During these timepoints, players in the under-18 and under-23 age groups completed their questionnaire within the main academy building as per the previous timepoints. The remaining age groups completed their questionnaire either during their gym session (under-13s to under-16s) or before or after a football training session (under-9s to under-12s).

The number of items in the questionnaire differed depending on player age and the timepoint. Furthermore, the number of Likert-scale response options differed depending on the question and the player's age. The questionnaire completed by under-9 to under-11 players contained 33 items; five items related to each category of mental health, perceived competence, perceived autonomy, perceived relatedness, and perceived demands of academy football. F our items related to perceived resources relating to academy football, three items related to achievement goals, and one item related to perceived ability to cope with football demands.

At T1 and T2, the questionnaire completed by under-12 to under-18 age group players contained 46 items; five items related to each category of perceived competence, perceived autonomy, perceived relatedness, and perceived demands of academy football. Four items related to perceived resources relating to academy football, three items related to achievement goals, and one item related to perceived ability to cope with football demands. Finally, regarding mental health, 10 items measured anxiety symptom frequency and eight items measured depression symptom frequency.

Young players completed a different measure of mental health compared to older players, because those measures tapping into anxiety and depression symptoms were not validated or appropriate for use with younger children. At the study outset, the intention was to take the mental health data from younger and older players and formulate a shared or common mental health rating score. However, only weak associations between the different mental health scores collected at T1 and T2 were found; the different measures of mental health only moderately correlated. Therefore, from T3 onwards, under-12 to under-23 age group players completed the same five mental health questions completed by under-9 to under-11 age group players in addition to the 18 items measuring anxiety and depression symptoms. Thus, at T3, T4, T5, and T6, the questionnaire completed by under-12 to under-23 age group players contained 51 items.

2.6.1 Stress Appraisals

In psychological research, stress appraisals are commonly measured via Likert scale questionnaires. For instance, the stress appraisal measure (Peacock & Wong, 1990) uses a 5-

point Likert scale to measure primary (challenge, threat, and centrality) and secondary (controllable by self, controllable by others, uncontrollable by anyone) appraisals. The Primary-Appraisal Secondary-Appraisal Scale (Gaab et al., 2005) uses a 6-point Likert scale to measure challenge and threat (primary appraisal) and self-concept of own abilities and control expectancies (secondary appraisal). For a review of instruments measuring cognitive appraisal of stress, see Carpenter (2016). At the outset of this PhD, the only measure designed specifically to measure challenge and threat states in sport samples was the Challenge and Threat in Sport Scale (Rossato et al., 2018). This questionnaire was developed using items from existing challenge and threat questionnaires, measuring acute demand and resource appraisals prior to a motivated performance task. It was validated with an androcentric student sample of novice shooters, meaning its validity cannot be assumed within other sports, or with female, elite/non-novice, and non-student performers.

Using questionnaire measures in youth sporting samples is challenging, since few measures have been adequately validated for administration with this population. The methodology also has limitations; administering questionnaires to youth players within a performance evaluative environment, such as football academies, makes social desirability bias a significant challenge for accurate measurement. Further, reading and completing questionnaires requires multiple simultaneous cognitive processes. Since children possess more limited cognitive ability than adults (Goswami, 2002; 2015), questionnaires validated for use with adults should not simply be administered to children, with the assumption the child will interpret the items in the same way as an adult. Moreover, measuring psychological characteristics, which often use Likert-scale responses, requires a level of self-knowledge, self-awareness, and grasp of abstract concepts (i.e., metacognition). These attributes develop over time, as a function of cognitive development, and so the validity of questionnaire measures within younger ages could be questionable. Nevertheless, children may respond to items in a valid manner if the wording of the items, and the format for responding fall within their cognitive capacity. To account for these challenges and enhance developmental validity of the questionnaires used (Woolley et al., 2004), stress appraisals were measured via two adapted questionnaires which underwent the process of cognitive pre-testing; Mendes and colleagues' (2007) challenge and threat questionnaire and Tomaka and colleagues' DRES (1993).

Challenge and Threat States. To measure demand and resource appraisals, Mendes et al's (2007) 7-point Likert-scale questionnaire (see Appendix F) was modified for the academy football context (see Appendix G) and the age of the sample (see Appendix H). This scale was used because it is short, the items have shown acceptable alphas (Mendes et al., 2007), and demand and resource appraisals are indicated separately, in accordance with the TCTSA. During adaptation of the items, care was taken not to change the meaning of the item (see Heggestad et al., 2019). Two items ("this task is threatening" and "this task is a positive challenge") were removed because the language labels of "threatening" and "positive challenge" do not directly reflect to demand (i.e., the task will be difficult and require effort) and resource (i.e., I am capable) appraisals. Instead, they refer to potential outcomes of these appraisals, whether an individual is within a challenge or threat state, and this does not constitute challenge and threat states within the TCTSA (Jones et al., 2009).

To adapt the scale for the academy context, all general references to "this task" in the demand items were changed to "academy football" or "football at [name of club]". For example, "this task is demanding" was changed to "academy football is demanding", and "I am uncertain how I will perform" was changed to, "before games, I am uncertain how I will perform". The resource items were adapted to reflect perceived football ability. For example, "I have the expectations to perform well" was changed to "I think I will perform well in football matches" for younger players, and "performing well is important to me" was changed to "performing well in matches is important to me".

When modifying the items for age, appropriate recommendations were followed (Borgers et al., 2000; De Leeuw, 2011; Fargas-Malet et al., 2010). Specifically, the conditional statement was brought to the start of the item wording, and the number of Likert response options was reduced from seven to five. Furthermore, the response options were represented visually rather than numerically, and each response option was labelled to reduce ambiguity/obscurity across all age groups (see Appendix A, Borgers et al., 2000; Khanum & Trivedi, 2012).

Finally, to check the suitability of the changes made, the adapted questions underwent cognitive pre-testing with some of the youngest players at the football academy (see Appendix I, Woolley et al., 2004). Questionnaires were printed in large font, with either 3- or 5-point Likert scales for each item. Meetings were arranged with the youngest players at the academy (8- and 9-year-olds). Within these meetings, the young players were greeted, made to feel at ease and ensured of the confidentiality of the meeting (de Leeuw, 2011; Woolley et al., 2004). Then, players were asked to complete the questions on their own, either reading out loud or in their heads. Following completion of the questionnaire, the researcher interviewed the child to discover how they had interpreted the questions, and what they had thought about when choosing their answer. Example questions included "what did you think about to answer this question?", "what does "stressful" mean to you?", "how did you feel about answering this question?", "can you put this question into your own words?", and "what does "threatening" mean to you?". Notes and observations following this interview were recorded by the researcher (de Leeuw, 2011; Woolley et al., 2004).

The cognitive pre-testing interviews indicated that abstract terminology (such as football is threatening, and football is demanding) were confusing for younger children (see

Appendix I). This reinforced the decision to remove the "threatening" and "positive challenge items" and led to a change in the "football is demanding" item to read "football is hard work", emphasising difficulty and effort within demand appraisals (Jones et al., 2009; Lazarus & Folkman, 1984). Since the Likert-scale labels "strongly agree" and "strongly disagree" were also confusing for children (who interpreted the word "strongly" as meaning physical strength), these were changed to "really agree" and "really disagree". Finally, the children held a preference for a 5-point rather than 3-point Likert scale, so these were adopted within the final version of the questionnaire for children. Furthermore, rather than representing each response option as a written number, and to make the questionnaire as visually engaging as possible (to reduce the onset of boredom), response options were represented using increasing numbers of small, football-related pictures, and printed in colour (Van Hattum & De Leeuw, 1999, see Appendix A).

In summary, to measure players' challenge and threat states relating to academy football, those in the under-13s to under-23s indicated their agreement with each of the nine statements on a 7-point Likert scale (1 = really disagree, 2 = disagree, 3 = somewhat disagree, 4 = kind of agree, 5 = somewhat agree, 6 = agree, 7 = really agree) whilst players in the under-9s to under-12s indicated their agreement on a 5-point Likert scale (1 = really disagree, 2 = disagree, 3 = kind of agree, 4 = agree, and 5 = really agree). Cronbach's alphas for the demand subscale at each timepoint were T1 = .67, T2 = .58, T3 = .34, T4 = .58, T5 = .55 and T6 = .57, falling short of acceptable levels, in particular at T3 (Taber, 2018). Analysis showed that removing the negatively worded item "before games I am uncertain/don't know how I will perform" would have increased the Cronbach's alpha for the demand subscale at every timepoint. This resonates with observations of children's confusion caused by negatively worded questions (Patten, 1998); negatively worded items are difficult for young people to understand and respond to (Benson & Hocevar, 1985; Marsh, 1986). Even though guidance (“I do know / I am certain” and “I don’t know / I am uncertain”) was provided in parentheses and a smaller font below the extreme response options to aid players’ comprehension and thus the reliability of their answer to this question (see Appendix A, Appendix C, Appendix D), they may have still struggled with this question.

In contrast, the Cronbach’s alphas for the resource subscale at each timepoint were T1 = .91, T2 = .62, T3 = .66, T4 = .75, T5 = .62 and T6 = .73, reaching acceptable levels at three timepoints and approaching acceptable levels at the others (Taber, 2018). Analysis showed that removing the item “performing well in matches is important to me” would have increased the Cronbach’s alpha for the resource subscale at every timepoint. It is possible this item did not map onto the other resource items well because it taps into perceptions of importance, whilst the other resource items tap more into beliefs in one’s ability. In other words, every player is likely to say that performing well in football matches is important to them, however not every player is likely to say they have full belief in their ability to do so.

Coping Potential. Coping potential was measured using the DRES (Tomaka et al., 1993; see Appendix J). This scale was selected because it is short, it has been used widely within the challenge and threat literature (e.g., Feinberg & Aiello, 2010; Moore et al. 2012) and it complements the demand and resource scale already described. The coping item from the DRES was taken and modified for the academy football context (see Appendix K) and for age using the principles described previously (see Appendix L). The Likert-scale was also changed from 6- to 7-points to bring the question in line with the demand and resource appraisal items. Making such an adaptation to a questionnaire is not deemed concerning (Heggestad et al 2019). Indeed, it is appropriate to use an odd-number of response options when conducting research with children, so they have a mid-point option to choose (De Leeuw, 2011). Thus, the Likert-scale used for the DRES was identical to that used for the longer challenge and threat questionnaire.

To keep the questionnaire battery as short as possible, as recommended when conducting research with young people (Borgers et al., 2000; Holaday & Turner-Henson, 1989), the DRES demand item was not included. Instead, the first item from the challenge and threat questionnaire (i.e., "academy football is demanding", Mendes et al., 2007) was reused when calculating coping potential, since it was very similar to the DRES demand item ("how demanding do you expect the task to be"). This provides further rationale for why the Likert-scale was changed from 6- to 7-points on the coping item.

2.6.2 Basic Psychological Needs

At the outset of this PhD, within the sport and exercise psychology literature, there was no available measure of each individual resource within the TCTSA. Consequently, this would have precluded direct comparisons from being made between each individual resource. Certainly, there was no measure validated within children and adolescents. Thus, the decision was made to measure basic psychological needs (BPNs) satisfaction instead. There is not only a wealth of research within (and indeed beyond) sport settings, investigating BPNs in youth samples (Cece et al., 2018; Doré et al., 2019; Samuelsson, 2023) and within the context of mental health and well-being (e.g., Ng et al., 2012; Stenling et al., 2015), but there is also a plethora of validated questionnaire measures available. Thus, whilst the following constructs are distinct, given the above points and the conceptual similarities between self-efficacy and perceived competence (Hughes et al., 2011; Kremer et al., 2011), and control and perceived autonomy, measures of basic psychological need satisfaction were collected as measures of individual resources measured in the present study (Biddle, 1999). Coincidentally, whilst the TCTSA-R (Meijen et al., 2020) had not been published at the outset of this PhD, it could be argued that the included measure of perceived relatedness resonates with the TCTSA-R's third resource of social support.

Thus, to measure individual resources, the Adolescent Students' Basic Psychological Needs at School Scale (Tian et al., 2014, see Appendix M) was modified for the academy football context (see Appendix N), and for age (see Appendix O). This questionnaire was selected because it has acceptable internal consistency and meaningful test–retest reliability (Tian et al., 2014). When modifying for the academy context all references to school and teachers were changed to the academy and coaches respectively. For example, the autonomy item "I am free to arrange my studies and extracurricular activities at school" was changed to "I am free to make my own decisions in my football at [club name]". The relatedness item "teachers and classmates are pretty friendly towards me at school" was changed to "coaches and teammates are pretty friendly towards me at [club name]" and the competence item "I do not feel very capable at school sometimes" was changed to "sometimes I do not feel very good at football". When modifying for children, fewer questions were presented on each page compared to the questionnaire for older players, and the conditional statement was brought to the start of the item wording (Borgers et al., 2000; De Leeuw, 2011). Simpler terms were also used to aid children's comprehension, and the Likert-scale response options were represented visually using football-related pictures, to maximise players' engagement and concentration on the questions (Borgers et al., 2000; De Leeuw, 2011, see Appendix A).

Finally, to aid young players' comprehension on the negatively worded items (De Leeuw, 2011; Borgers et al., 2000), guidance was provided on the extreme Likert-scale responses on the relatedness (at football at [club name], I do not have many close friends) and competence (sometimes I do not feel very good at football) items. This guidance was written in parentheses and a smaller font below the extreme response options (see Appendix A, Appendix C). For example, "I do not have many close friends" was written beneath "really agree" and "I do have a few close friends" was written beneath "really disagree".

All players responded to each of the 15 items on a 6-point Likert scale (1 = really disagree, 6 = really agree). For younger players, every response option was labelled to reduce ambiguity (1 = really disagree, 2 = disagree, 3 = kind of disagree, 4 = kind of agree, 5 = agree, 6 = really agree, Borgers et al., 2000; Khanum & Trivedi, 2012). Cronbach's alphas for the autonomy subscale at each timepoint were lower than previously reported for the ASBPNSS (*a* = .85, Tian et al., 2014) but were mostly acceptable (Taber, 2018); T1 = .70, T2 = .74, T3 = .68, T4 = .70, T5 = .62 and T6 = .75. Cronbach's alphas for the competence subscale at each timepoint were lower than previously reported (*a* = .80, Tian et al., 2014), and unlike the perceived autonomy items; they did not reach acceptable levels (Taber, 208); T1 = .61, T2 = .58, T3 = .58, T4 = .54, T5 = .58 and T6 = .64. Finally, Cronbach's alphas for the relatedness subscale at each timepoint were all acceptable (Taber, 2018); T1 = .70, T2 = .79, T3 = .74, T4 = .80, T5 = .75 and T6 = .81 and replicated or exceeded alphas reported previously (*a*=.77, Tian et al., 2014).

2.6.3 Achievement Goals

To measure achievement goal orientations, three items were taken and adapted from the Achievement Goals Questionnaire for Sport (AGQ) to represent measures of mastery avoidance, performance approach, and performance avoidance (Conroy et al., 2003; see Appendix P). One question from the resource appraisals was used as a measure of mastery approach orientation ("performing well in matches is important to me") because of its similarity to a mastery approach question from the AGQ ("it is important to me to perform as well as I possibly can"). Items from the AGQ were used because they have reasonable internal consistency and differential stability (Conroy et al., 2003), and the AGQ is widely used within challenge and threat research (e.g., Turner et al., 2012, 2013, 2014, 2021).

A single question was used for each mastery goal orientation instead of two to reduce memory effects (Schwarz et al., 2020) and to keep the number of items within the questionnaire battery to a minimum, which is appropriate when conducting research with young people given the risk of satisficing due to a loss of motivation and concentration (Borgers et al., 2000; Holaday & Turner-Henson, 1989). The three items taken from the AGQ (Conroy et al., 2003) were modified for the academy context (see Appendix Q), and for age using the principles described previously (see Appendix R). When modifying for the academy context, references to the academy were added to the item wording. For example, "at football" was added to the start of the questions "I worry that I may not perform as well as I possibly can" and "it is important to me to do well compared to others" (see Appendix A, Appendix C, Appendix D).

When adapting the items for age, Likert-response options were labelled, reduced in number, and represented visually as described previously (Borgers et al., 2000; Khanum & Trivedi, 2012). Again, to aid comprehension and response accuracy, on the negatively worded avoidance items, guidance was provided in parentheses and a smaller font, on the Likert-scale responses to help players correctly indicate their beliefs. For example, for the "I worry that I may not perform as well as I possibly can" item, beneath the "really agree" response option, "I do worry" was written and beneath the "really disagree" response option, "I do not worry" was written (see Appendix A, Appendix C). As with previous measures, the Likert-scale was reduced to 5-points for younger players; players in the under-13s to under-23s indicated their agreement with the achievement goal items on a 7-point Likert scale (1 = really disagree, 2 = disagree, 3 = somewhat disagree, 4 = kind of agree, 5 = somewhat agree, 6 = agree, 7 = really agree) whilst players in the under-9s to under-12s indicated their agreements on a 5-point Likert scale (1 = really disagree, 2 = disagree, 3 = kind of agree, 4 = agree, and 5 = really agree). Cronbach's alphas for the approach subscale at each timepoint were T1 = .54, T2 = .32, T3 = .28, T4 = .28, T5 = .19 and T6 = .24. Cronbach's alphas for the avoidance subscale at each timepoint were T1 = .55, T2 = .45, T3 = .36, T4 = .47, T5 = .29

and T6 = .47. These alphas are lower than those reported in previous research where the entire AGQ is used (see Muis & Winne, 2012; Turner et al., 2014) and failed to reach acceptable levels (Taber, 2018). Cronbach's alphas for the mastery subscale at each timepoint were T1 = .37, T2 = .28, T3 = -.03, T4 = -.004, T5 = -.01 and T6 = .05. Cronbach's alphas for the performance subscale at each timepoint were T1 = .48, T2 = .24, T3 = .32, T4 = .30, T5 = .41 and T6 = .45.

2.6.4 Mental Health

Mental health was measured via three different questionnaires over the course of the study period; the 10-item severity measure for generalised anxiety disorder (GAD-10; Craske et al., 2013), the eight-item patient health questionnaire (PHQ-8; Kroenke et al., 2009), and the five-item mental health inventory (MHI-5, Berwick et al., 1991).

Anxiety Symptoms. The GAD-10 (Craske et al., 2013; see Appendix S) was used and adapted slightly (see Appendix T) to measure anxiety in under-12 to under-23 age group players. This scale was chosen because it was specifically created for use with children aged 11- to 17-years, unlike the more commonly used GAD-7 questionnaire (Spitzer et al., 2006). The GAD-10 is also short, free, and publicly available (Craske et al., 2013).

Because of the overlap between symptoms of anxiety, and the normal effects of physical exercise (i.e., having a racing heart, being sweaty, Gustafsson et al., 2017; Reardon & Factor, 2010), additional wording was added to one item on the GAD-10, to improve validity (i.e., reduce the chances of elevated scores being due to the normal effects of physical activity rather than of anxiety). Specifically, "not to do with the normal effects of physical activity" was added in parentheses to the end of item four "felt a racing heart, sweaty, trouble breathing, faint or shaky". Furthermore, additional guidance was provided to aid understanding of item nine; "for someone to make me feel better" was added in parentheses after "looked for reassurance from others due to worries".

Players indicated on a 5-point Likert scale how much they had experienced 10 anxiety symptoms over the previous seven days (Craske et al., 2013, never, occasionally, half of the time, most of the time, all of the time). Example symptoms included “felt moments of sudden terror, fear or fright” and “had thoughts of bad things happening, such as family tragedy, ill health, or accidents”. Cronbach’s alphas for anxiety at all but one timepoint (T5) were acceptable (Taber, 2018); T1 = .79, T2 = .72, T3 = .73, T4 = .72, T5 = .58 and T6 = .80. During Cronbach’s alpha analyses of the T5 items, only six of the 10 items were included due to variance being zero. This may explain why the Cronbach’s alpha score was lower at T5.

Depression Symptoms. The PHQ-8 (Kroenke et al., 2009), an adapted version of the PHQ-9 (Kroenke et al., 2001; see Appendix U) was used and adapted slightly to measure depression in under-12 to under-23 age group players (see Appendix V). The scale was selected because it is short, and the items correspond to the criteria of depression within the DSM-V (American Psychiatric Association, 2013). In the PHQ-8, the final question from the PHQ-9 (“thoughts that you would be better off dead, or of hurting yourself in some way”) is removed to make the scale suitable for completion by younger people. Thus, the PHQ-8 was selected because omitting the suicidality question is more suitable when administering the questionnaire to children. Removing the question is not considered problematic since extremely high correlations have been found between the PHQ-9 and PHQ-8 (i.e., >.997, Kroenke et al., 2010; Razykov et al., 2012). Furthermore, the measures are well-validated (Corson et al., 2004, Kroenke & Spitzer, 2002).

The questionnaire was adapted slightly to create more coherence with the GAD-10 scale and based on recommendations for research with children and adolescents (see Johnson et al., 2002); the timeframe participants were asked to consider when answering each item was shortened from “the past two weeks” to “the past seven days”. Thus, players indicated on a 4-point Likert scale how much they had experienced eight depression symptoms over the previous seven days (not at all, several days, more than half the days, nearly every day). Example symptoms included "feeling down, depressed, irritable, or hopeless" and "little interest or pleasure in doing things". Cronbach's alphas for depression at each timepoint were all acceptable (Taber, 2018); T1 = .69, T2 = .77, T3 = .68, T4 = .73, T5 = .70 and T6 = .70.

Table 4

Summary of demographic information available on the sample, including the number of participants where data is available (N), mean (M) and standard deviation (SD) scores.

Variable	N	M	SD
Number of Years Playing Football at Time of T2	169	5.91	2.86
Number of Siblings	229	2	1
Number of participants offered a scholarship or professional contract within the study period	49		
Playing Position	210		
Goalkeeper	23		
Defender	73		
Midfielder	56		
Forward	58		
Player Ethnicity	169		
White British	120		
Mixed	19		
African	4		
Black British	6		
Afro Caribbean	4		
Black	6		
White European	1		
White Welsh	1		
White	4		
Indian British	2		
White Asian	1		
British Asian	1		
Academy Status at T6	230		
At academy for three seasons	95		
At academy for 2.5 seasons	6		
At academy for 2 seasons	27		
At academy for 1.5 seasons	4		
At academy for 1 season	24		
Left the academy	18		
Released, with another club	12		
Released, no known club	44		

Mental Health. The MHI-5 (Berwick et al., 1991; see Appendix W) was used to measure mental health in under-9 to under-11 age group players at all time points, and in under-12 to under-23 age group players from T3 to T6. This scale was selected because it is brief, and a reliable and valid measure of mental health (depression and generalised anxiety, Cuijpers et al., 2009) in children and adolescents (Rivera-Riquelme, 2019).

Each of the five questions asked players to indicate on a 6-point Likert scale how much of the time during the last month they had been a happy, calm and peaceful, very nervous person, down and blue, and so down in the dumps that nothing could cheer them up (1 = none of the time, 2 = a little bit of the time, 3 = some of the time, 4 = a good bit of the time, 5 = most of the time, 6 = all of the time). For younger players (under-9s to under-12s) the Likert-response options were presented visually, whilst for older players (under-13s to under-23s), they were presented numerically (see Appendix X). Cronbach's alphas for mental health at each timepoint were acceptable at all timepoints except for T2 (Taber, 2018); T1 = .67, T2 = .59, T3 = .64, T4 = .74, T5 = .62 and T6 = .73.

2.7 Demographic Data

Player demographic data was collected from players (see Appendix Y) or players' parents (see Appendix Z) on one occasion within the 43-month period. Demographic questionnaires were completed for 169 of the 230 players (73.5%) who participated in the research, though some questions were left unanswered for some players. Where demographic data were missing, the researcher inputted information where possible, thanks to their knowledge of the players gained by nature of their dual role at the academy. For an overview of the demographic data available for the sample, see Table 4.

2.8 Performance Data

Measuring player performance involved collecting player performance ratings from coaches following each competitive game within a season. With this measure, a higher score out of 10 equated to better performance. This performance metric was routinely recorded by coaches on an online data portal called The Performance Management Application. Data was downloaded from The Performance Management Application and stored in an Excel database. Average player performance scores during three performance periods (P1, P2 and P3) within each season (S1, S2 and S3) were then calculated from the raw match performance scores (Table 5). The first performance period in each season (i.e., S1P1, S2P1 and S3P1) included performance ratings collected from matches within the 12 weeks following the early season questionnaire data collection point (i.e., within the 12 weeks following T1, T3, and T5). The second performance period in each season (i.e., S1P2, S2P2, S3P2) included performance ratings collected from matches within the 12 weeks following the first performance period (i.e., within the 12 weeks following S1P1, S2P1, and S3P1). Finally, the third performance period (S1P3, S2P3 and S3P3) included performance ratings collected from matches within the 12 weeks following the end of the season questionnaire data collection point (i.e., within the 12 weeks following T2, T4 and T6).

Table 5

Illustration of each data collection timepoint and 12-week performance period across each season, and their denotations.

Time Frame	Denotation								
Season (S)		S1			S2			S3	
Timepoint (T)	T1		T2	T3		T4	T5		T6
Performance Period (P)	S1P1	S1P2	S1P3	S2P1	S2P2	S2P3	S3P1	S3P2	S3P3

2.9 Procedure and Ethics

With endorsement from the football academy (see Appendix AA), ethical approval was firstly sought from and granted by Staffordshire University's ethics committee (see Appendix BB). Then, prior to any data collection taking place, parents of the academy's youth football players were provided with information about the proposed project. Specifically, in September 2018, the researcher delivered a 15-minute presentation at the academy's induction evening. The researcher introduced herself, explained the purpose of the study and answered follow up questions. An information sheet containing all study information and appropriate contact details was provided to every parent (see Appendix CC) and parental consent was collected for all players under the age of 16 (see Appendix DD). If a player's parent was absent from the induction evening, the information sheet and consent form were shared via email. These parents either printed and returned the consent form or replied to the email confirming their consent.

Since players over the age of 16 demonstrate Gillick competence (Gillick v. West Norfolk & Wisbech AHA, 1985), they provided their own consent to participate. After having the project explained to them by the researcher or the senior academy psychologist (depending on who was their sport psychologist at the time of recruitment), players were provided with an information sheet (see Appendix EE) and consent form (see Appendix FF), which was completed and returned to the researcher. Coaches at the football academy were also emailed about the study, advised of their involvement through providing performance insight on the players, and encouraged to contact the researcher if they were not happy to participate in the study themselves (see Appendix GG).

When new players joined the academy following the initial timepoint and consent collection, the information sheet and consent form were distributed. This occurred via email to parents of players aged under 16 (see Appendix HH), and in person to players aged over 16. Once consent was gained, over a period of 32 months (between September 2018 and April 2021), questionnaire, demographic, and performance data were collected from academy players and coaches. When players completed the questionnaire for the first time, they were also provided with a study information leaflet (see Appendix II). Where players or parents refused to consent, no data was collected. Throughout the entire academy, during the 32-month study period, three parents refused to consent for their son's participation in the research. Whilst parents were informed of their right to withdraw consent at any time during the study, no parents did so.

2.10 Data Preparation

Following players' completion of the questionnaires, data were manually inputted in a coded fashion into SPSS, producing an ordinal data set (Wu & Leung, 2017). Each player was provided a unique identifier code so their data could be stored anonymously. This code was created using their date of birth and number of siblings; a player born on the first of January 2001 with one brother and one sister would receive the code 01010102. This code remained with the player throughout the study timeframe which allowed their data at each timepoint to be matched. In two separate instances, two players with the same date of birth also had the same number of siblings, meaning their unique codes were the same. Thus, to ensure future data was correctly matched to players' previous data, a letter was added to the end of their code, and the researcher kept a note of this difference for future reference.

2.10.1 Transforming Data

Since the number of Likert response options on the challenge and threat measure, DRES, and achievement goal items were fewer for younger players, these raw data scores were linearly transformed to bring their scores into line with those of older players, who responded on a Likert-scale with greater response options (see Table 6). Younger (under-9, under-10, under-11, and under-12) players' responses were transformed as follows:

$$x_2 = \frac{(x_1 - min_1)(max_2 - min_2)}{max_1 - min_1} + 1$$

where x_2= the transformed item score on the 7-point scale; x_1= the original item score on the 5-point scale; $min_1$and max_1= lowest and highest possible scores the 5-point Likert scale (i.e., 1 and 5); and $min_2$and max_2= lowest and highest possible scores the 7-point Likert scale (i.e., 1 and 7; Card, 2011).

Table 6

Original and transformed Likert responses to illustrate how responses on U9-U12s measures of demands, resources, the DRES, and achievement goals were transformed.

Scale Version	Likert Response								
Original	1	1.5	2	2.5	3	3.5	4	4.5	5
Transformed	1	1.75	2.5	3.25	4	4.75	5.5	6.25	7

2.10.2 Missing Data

Once transformed, the missing data were addressed. In total there were 84 missing cases (0.16% of the total cases) across the six timepoints (see Table 7), with the majority of these missing at T4 (n = 72). The cause of these missing data is most likely to be accidental oversight, particularly considering the age of the sample (Borgers & Hox, 2001). Little's (1988) Missing Completely at Random (MCAR) test was conducted to establish whether the data were MCAR. Where data were MCAR, new values were computed via expectation maximation (EM) within SPSS to create a more complete data set (Dempster et al., 1977; Hox, 1999). In EM, an algorithm imputes a new value based on the variable's relationships with other variables in the dataset (expectation; Graham, 2009). Whether this value is most likely is then checked (maximation); if the value is not most likely, the value is recomputed until the most likely value is reached. Even though EM underestimates standard error because natural variation in scores is absent, it was selected because only a small number of data points were missing. Furthermore, EM preserves the new value's relationship with other variables in the dataset (Graham, 2009), which is important for regression analyses which will be used to address the second and third PhD aims to investigate the relationships between changing psychological demands and resources and mental health, and between changing psychological demands, resources, mental health, and football performance.

2.10.3 Normality and Winsorizing

Once the missing data were addressed, Shapiro-Wilk normality tests (Shapiro & Wilk, 1965) were conducted to highlight outliers for every item at each timepoint. Shaprio-Wilk was used because the sample size was below 5000 and the data was continuous (Royston, 1995). Where data were shown to be non-normally distributed, Z scores were reviewed for significant outliers (p<0.05, e.g., Mendes et al., 2003) and any data points with Z scores greater than 3.29 or smaller than -3.29 were Winsorized according to the guidelines for Winsorized according to the guidelines for small sample sizes (Smith, 2011; Tabachnick & Fidell, 2013). Winsorizing reduces the effects of outliers on the mean and variance, because the most extreme scores (i.e., those with Z scores of +/-3.29) are replaced with the next nearest score from the dataset, which is within the Z score range being applied (Blaine, 2018). Once Winsorized, the dataset was more normally distributed and better prepared for subsequent analyses. A total of 426 individual cases (0.82% of the total cases) were Winsorized (see Table 7).

2.10.4 Computing Scales

Stress Appraisals.

Challenge and Threat States. Separate demand and resource scales were computed from the corresponding items (Mendes et al., 2007). To create a demand score for each participant at each timepoint, the five demand items were summed and divided by five using the compute variable function within SPSS. Similarly, an average resource score was created by summing the four perceived resources items and dividing by four. For both of these variables, higher scores equated to greater perceived demands and resources. Where individuals' missing cases could not be imputed due to their missingness being not

Table 7

Illustration of the total number (N) and percentage (%) of missing cases, imputed cases, and Winsorized cases for common (completed by every participant) and non-common data (completed by some but not every participant) at each timepoint.

Timepoint	Variable	N total cases	N missing cases (% of total)	N imputed missing cases	N Winsorized cases (% of total)
T1	Common Raw Data	4437	1 (.02%)	1	17 (.38%)
	Common Scales / Ratios	1683	0	N/A	4 (.24%)
	GADPHQ Raw Data	1782	0	N/A	29 (1.63%)
	GADPHQ Scales	198	0	N/A	0
	MHI Raw Data	270	0	N/A	2 (.74%)
	MHI Scale	54	0	N/A	0
T2	Common Raw Data	3948	4 (.1%)	4	14 (.35%)
	Common Scales / Ratios	1551	0	N/A	1 (.06%)
	GADPHQ Raw Data	1548	1	1	29 (1.87%)
	GADPHQ Scales	172	0	N/A	1 (.58%)
	MHI Raw Data	275	0	N/A	2 (.73%)
	MHI Scale	55	0	N/A	1 (1.82%
T3	Common Raw Data	5346	1 (.02%)	1	50 (.94%)
	Common Scales / Ratios	1782	0	N/A	4 (.22%)
	GADPHQ Raw Data	1926	0	N/A	29 (1.51%)
	GADPHQ Scales	214	0	N/A	2 (.93%)
T4	Common Raw Data	4356	63 (1.45%)	6	23 (.53%)
	Common Scales / Ratios	1452	0	N/A	3 (.21%)
	GADPHQ Raw Data	1602	9 (.56%)	0	31 (1.94%)
	GADPHQ Scales	178	0	N/A	3 (1.69%)
T5	Common Raw Data	5676	1	0	48 (.85%)
	Common Scales / Ratios	1892	0	N/A	1 (.05%)
	GADPHQ Raw Data	2196	0	N/A	54 (2.46%)
	GADPHQ Scales	244	0	N/A	1 (.41%)
T6	Common Raw Data	5049	4 (.08%)	4	35 (.69%)
	Common Scales / Ratios	1683	0	N/A	4 (.24%)
	GADPHQ Raw Data	1944	0	N/A	38 (1.95%)
	T6 GADPHQ Scales	216	0	N/A	0
Total		51729	84 (.16%)	17	426 (.82%)

Note. Common data refers to data completed by all participants, namely stress appraisals, BPNs, and achievement goals.

completely at random, scales were computed from the available data. For example, where a participant answered four of the five demand items, and their missing data was not MCAR, their demand scale was calculated by summing the four data points available and dividing by four. Once the demand and resource scales were computed, Shapiro-Wilk tests were conducted to check normality, and any outliers with Z scores +/-3.29 were Winsorized via the process previously described (Blaine, 2018; Smith, 2011). Once the demand and resource scales were computed, Shapiro-Wilk tests were conducted to check normality, and any outliers with Z scores +/-3.29 were Winsorized via the process previously described (Blaine, 2018; Smith, 2011).

Following computation and Winsorization of the demand and resource scales, the challenge and threat ratio was computed within SPSS using the compute variable function using the following equation to create the challenge and threat ratio:

$$C\&T\ Ratio = \frac{Average\ Perceived\ Demands}{Average\ Perceived\ Resources}$$

With this ratio, a score between 0 and 1 indicates challenge whilst a score greater than 1 indicates threat. The ratio scores were then checked for normality via Shapiro-Wilk tests, and Winsorized via the process previously described (Blaine, 2018; Smith, 2011). The ratio scores were then checked for normality via Shapiro-Wilk tests, and Winsorized via the process previously described (Blaine, 2018; Smith, 2011).

Coping Potential. To compute coping potential, the DRES coping item was used alongside a single demand item from the challenge and threat ratio (“academy football is demanding/hard work”). Coping potential was calculated using the following equation:

$$Coping\ Potential = Coping\ Appraisal - Demand\ Appraisal$$

A negative value indicates inadequate coping potential (perceived demands > perceived coping ability), and a value of zero or more indicates adequate coping potential (perceived demands ≤ perceived coping ability). Coping potential scores were checked for normality via

Shapiro-Wilk tests and Winsorized via the process previously described (Blaine, 2018; Smith, 2011).Coping potential scores were checked for normality via Shapiro-Wilk tests and Winsorized via the process previously described (Blaine, 2018; Smith, 2011).

Basic Psychological Needs. Raw scores on the negatively framed relatedness and competence items were reversed so that higher scores equated to greater perceived autonomy, competence, and relatedness. Then, to create perceived competence, autonomy, and relatedness scores, responses to the five competence, autonomy, and relatedness items were summed respectively, and divided by five to create average scores, using the compute variable function within SPSS (Tian et al., 2014). These scores were then checked for normality via Shapiro-Wilk tests and Winsorized via the process previously described (Blaine, 2018; Smith, 2011).These scores were then checked for normality via Shapiro-Wilk tests and Winsorized via the process previously described (Blaine, 2018; Smith, 2011).

Achievement Goals. To create average approach and avoidance motivation scores, the two approach (MAp, PAp) items were summed and divided by two, and the two avoidance items (MAv, PAv) were summed and divided by two respectively, using the compute variable function within SPSS (e.g., Turner et al., 2021). Then, to create average mastery and performance motivation scores, the two mastery items (MAp, MAv) were summed and divided by two, and the two performance items (PAp, PAv) were summed and divided by two. Higher scores equate to greater motivation orientation towards each goal type. Finally, all scores were checked for normality via Shapiro-Wilk tests and Winsorized via the process previously described (Blaine, 2018; Smith, 2011).

Mental Health.

Anxiety Symptoms. Players' scores on the 10 items from the GAD-10 were summed and divided by 10 using the compute variable function within SPSS, to provide an average score for anxiety symptoms (Craske et al., 2013). A higher score on this questionnaire indicates greater frequency of anxiety symptoms. Once computed, the anxiety scores were checked for normality via Shapiro-Wilk tests and Winsorized via the process previously described (Blaine, 2018; Smith, 2011).Once computed, the anxiety scores were checked for normality via Shapiro-Wilk tests and Winsorized via the process previously described (Blaine, 2018; Smith, 2011).

Depression Symptoms. Whilst guidance suggests the PHQ-8 item scores should be summed to provide a summed score (Kroenke et al., 2009), instead the procedure followed for calculating the anxiety score was replicated to create more parity between the scales. Players' scores on the eight items from the PHQ-8 were summed and divided by eight to provide an average score for depression symptoms using the compute variable function within SPSS. A higher score indicates greater frequency of depression symptoms. Once computed, the depression scores were checked for normality via Shapiro-Wilk tests and Winsorized via the process previously described (Blaine, 2018; Smith, 2011).Once computed, the depression scores were checked for normality via Shapiro-Wilk tests and Winsorized via the process previously described (Blaine, 2018; Smith, 2011).

Mental Health. The three negatively framed items on the MHI-5 were reversed. Then, MHI-5 items were summed to create a raw mental health score. The raw mental health score was then transformed according to the MHI-5 guidance (Berwick et al., 1991):

$$Mental\ Health = \left[\frac{Raw\ score - 5}{25}\right] \times\ 100$$

Higher scores on this scale equate to better mental health. Once computed, the MHI-5 scores were checked for normality via Shapiro-Wilk tests and Winsorized via the process previously described (Blaine, 2018; Smith, 2011). Once computed, the MHI-5 scores were checked for normality via Shapiro-Wilk tests and Winsorized via the process previously described (Blaine, 2018; Smith, 2011).

Common Mental Health Scores. Since players in different age groups completed different mental health questionnaires, analyses involving mental health data would be restricted by smaller sample sizes and consequently, less statistical power (Cohen, 1988). For example, change in mental health data from T1 to T6 would involve two separate analyses; change for those who completed the MHI-5 at every timepoint (i.e., players who were in the under-9 to under-11 age groups at T1, $n = 27$) and change for those who completed the GAD-10 and PHQ-8 at every timepoint (i.e., players who were in the under-12 to under-18 age groups at T1, $n = 52$). Similarly, since some players completed additional questionnaires as they moved into older age groups (i.e., players started completing the GAD-10 and PHQ-8 after moving into the under-12 age group), these individuals' data could not be sufficiently tracked during this change. Thus, to overcome these issues, "common anxiety" and "common depression" scores were created for every player at each timepoint. The process for creating these common scores is outlined in the following subsections.

Preparing MHI-5 Data. The first step in creating common anxiety and common depression scores involved reversing the original MHI-5 raw data scores so that a higher score equated to worse mental health; akin to the GAD-10 and PHQ-8 scores. For an illustration of this, see Table 8. Then, to create parity between the 4-point PHQ-8 and 6-point MHI-5 Likert scales, the reversed MHI-5 raw data scores were transformed using the following formula:

$$x_2 = \frac{(x_1 - min_1)(max_2 - min_2)}{max_1 - min_1}$$

Here, x_2= the transformed MHI-5 score, x_1= the reversed MHI-5 score; $min_1$and max_1= the lowest and highest possible scores on the MHI-5 (i.e., 1 and 6); and min_2 and max_2= the lowest and highest possible scores the PHQ-8 (i.e., 0 and 3; Card, 2011). For an illustration of these transformations, see Table 8.

Finally, MHI-5 anxiety and MHI-5 depression scores were created using the transformed MHI-5 data. Specifically, the two questions referring to anxiety related symptoms (i.e., questions two and three) were summed and divided by two to create an average MHI-5 anxiety score (Cuijpers et al., 2009; Yamazaki et al.,2005). Similarly, the two questions referring to depressive symptoms (i.e., questions four and five) were summed and divided by two to create an average MHI-5 depression score.

Table 8

Illustration of how MHI-5 data scores were manipulated.

Version of MHI-5 data	Raw Score					
Original	6	5	4	3	2	1
Reversed	1	2	3	4	5	6
Transformed	0	0.6	1.20	1.80	2.4	3

Table 9

Illustration of how GAD-10 data scores were manipulated.

Version of GAD-10 data	Raw Score				
Original	0	1	2	3	4
Transformed	0	0.75	1.5	2.25	3

Preparing GAD-10 Data. To create parity between the 5-point GAD-10 Likert scale and 4-point Likert scales of the PHQ-8, MHI-5 anxiety and MHI-5 depression, GAD-10 raw data was transformed using the following formula:

$$x_2 = \frac{(x_1 - min_1)(max_2 - min_2)}{max_1 - min_1}$$

Here, x_2= the transformed GAD-10 score, x_1= the original GAD-10 score; $min_1$and max_1= the lowest and highest possible scores on the GAD-10 (i.e., 0 and 4); and min_2 and max_2= the lowest and highest possible scores on the PHQ-8 (i.e., 0 and 3; Card, 2011). For an illustration of these transformations, see Table 9. After the raw data were transformed, scores were summed and divided by 10 to create an average “transformed anxiety” score.

Correlations Between MHI-5 Anxiety / Depression and GAD-10 / PHQ-8. Since the MHI-5 raw data were manipulated to create anxiety and depression scores, Pearson product-moment correlations were conducted to establish how well these scores related to the transformed anxiety scores and PHQ-8 score respectively. Strong correlations would encourage the collation of mental health scores from different measures to formulate the common anxiety and common depression scores.

Mental health data from T3 was used for this analysis, since this was the first time a large number of players (i.e., all players in every age group from under-12 to under-23) completed the MHI-5, GAD-10, and PHQ-8 at the same time. There was a moderate, positive, statistically significant correlation between the MHI-5 anxiety and the transformed anxiety scores ($r = .40$, $n = 107$, $p<.001$). Similarly, there was a moderate, positive, statistically significant correlation between the MHI-5 depression and PHQ-8 scores ($r = .41$, $n = 107$, $p<.001$). These correlations indicated the moderate suitability of combining mental health scores from the different measures to create common anxiety and depression scores (Cohen, 1988).

Formulating Common Anxiety and Common Depression Scores. At each timepoint, if a player completed the GAD-10, the “transformed anxiety” score became their “common anxiety” score. If players had only completed the MHI-5, the “MHI-5 anxiety” score became their “common anxiety” score. Similarly, if a player completed the PHQ-8, this score became their “common depression” score. If players had only completed the MHI-5, the “MHI-5 depression” score became their “common depression” score. Thus, every player at every timepoint had moderately comparable anxiety and depression scores, but the questionnaires these scores came from differed between players of different age groups.

2.11 Descriptive Statistics

Regarding the mental health data, descriptive statistics are provided in Table 10, Table 11, and Table 12 based on the raw GAD-10, PHQ-8 and MHI-5 data scores respectively, and the recommended cut-offs within the extant literature (Craske et al., 2013; Kelly et al., 2008; Kroenke et al., 2009). Specifically, the un-Winsorised GAD-10 items were summed and divided by 10 for each participant at each timepoint; scores of zero indicated no anxiety symptoms, scores greater than zero and smaller than or equal to one indicated mild anxiety symptoms, scores greater than one and smaller than or equal to two indicated moderate anxiety symptoms, scores greater than two and smaller than or equal to three indicated moderately severe anxiety symptoms, and scores greater than three and smaller than or equal to four indicated severe anxiety symptoms (Craske et al., 2013). The un-Winsorised PHQ-8 items were summed for each participant at each timepoint; scores from zero to four indicated no depression symptoms, scores of five to nine indicated mild depression symptoms, scores of 10 to 14 indicated moderate depression symptoms, scores of 15 to 19 indicated moderately severe depression symptoms and scores of 20 to 24 indicated severe depression symptoms (Kroenke et al., 2009).

Regarding the MHI-5 data, the raw data were summed and then transformed using the equation described previously (Berwick et al., 1991). Cut-offs used for this item varied in the extant literature and were not provided within the original item publication (e.g., Thorsen et al., 2013). The cut-offs used here were informed by the analyses conducted by Kelly and colleagues (2008); a case of common mental disorder is defined by scores or 76 or less, but this score is lower when using alternate optimisation criteria. Thus, individuals with scores between 77-100 might be interpreted as showing no sign of a common mental disorder. Individuals with scores of 76 or less might be interpreted as showing signs of a common mental disorder. A further cut-off is offered here (scores of 59 or less) to provide the reader with greater insight into the frequency of scores at the lower end of the range.

Descriptive statistics for the questionnaire data were calculated following the processes of Winsorization described previously. For descriptive statistics of the stress appraisals variables, see Table 13. For descriptive statistics of the BPN variables, see Table 14. For descriptive statistics of the achievement goals variables, see Table 15. For descriptive statistics of the mental health variables, see Table 16.

Table 10

Frequency data relating to GAD-10 cut-offs at each timepoint; a higher GAD-10 score indicates greater anxiety symptom frequency.

GAD-10 Cut-offs	Timepoint					
	T1	T2	T3	T4	T5	T6
0	7.07%	10.47%	16.82%	16.85%	40.16%	31.48%
≤1	86.87%	83.72%	77.57%	76.40%	59.84%	64.81%
≤2	5.05%	5.81%	5.61%	6.74%	0%	3.70%
≤3	1.01%	0%	0%	0%	0%	0%
≤4	0%	0%	0%	0%	0%	0%

Table 11

Frequency data relating to PHQ-8 cut-offs at each timepoint; a higher PHQ-8 score indicates greater depression symptom frequency.

PHQ-8 Cut-offs	Timepoint					
	T1	T2	T3	T4	T5	T6
0-4	75.76%	79.07%	84.11%	84.27%	89.34%	87.04%
5-9	19.19%	15.12%	14.02%	11.24%	10.66%	11.11%
10-14	5.05%	5.81%	1.87%	4.49%	0%	1.85%
15-19	0%	0%	0%	0%	0%	0%
20-24	0%	0%	0%	0%	0%	0%
0-9	94.9%	94.2%	98.1%	95.5%	100%	98.1%
10+	5.1%	5.8%	1.9%	4.5%	0%	1.9%

Table 12

Frequency data relating to MHI-5 cut-offs at each timepoint; a higher MHI-5 score indicates better mental health.

MHI-5 Cut-offs	Timepoint					
	T1	T2	T3	T4	T5	T6
0-59	11.1%	5.5%	6.8%	6.1%	5.8%	5.2%
60-76	31.5%	49.1%	31.5%	26.5%	25.6%	22.2%
77+	57.4%	45.5%	61.7%	67.4%	68.6%	72.5%

2.12 Correlations

All data collected at each timepoint were correlated to establish relationships between variables at each timepoint. For the statistics from these analyses see Table 17 for timepoint one (T1), Table 18 for timepoint two (T2), Table 19 for timepoint three (T3), Table 20 for timepoint four (T4), Table 21 for timepoint five (T5), and Table 22 for timepoint six (T6). For a description of the significant correlations, see Appendix JJ. Subscale scores were also correlated at the early (see Table 23) and late (see Table 24) composite season timepoints, and average season subscale scores were also correlated for S1 (see Table 25), S2 (see Table 26) and S3 (see Table 27).

2.13 Chapter Summary

Within this chapter the methodology followed within the present research to address the research aims was outlined. Rationale was provided for the research design and procedure and participant information was provided. Then, details regarding the psychometric, demographic and performance data collected were outlined, together with the procedures followed to prepare the data for analysis. Finally, descriptive statistics and correlations for the psychometric and performance data were provided. In the next chapter, analyses regarding how psychological demands, resources and mental health changed over time are provided.

Table 13

Descriptive statistics for stress appraisal variables at each timepoint within the study period.

Variable	Timepoint	N	M	SD	Median	Range	Min.	Max.	Skewness	Kurtosis
Demands	T1	153	3.86	.93	3.80	4.60	2.00	6.60	.46	.08
	T2	141	4.43	.79	4.40	4.20	2.50	6.70	.36	-.13
	T3	162	4.44	.74	4.40	3.80	2.80	6.60	.29	-.39
	T4	129	4.34	.87	4.30	4.20	2.30	6.50	.20	-.25
	T5	172	4.21	.89	4.20	4.70	1.90	6.60	.04	.12
	T6	153	4.35	.86	4.30	4.35	2.05	6.40	.19	-.30
Resources	T1	153	5.61	.99	5.75	3.75	3.25	7.00	-.23	-1.25
	T2	141	6.12	.58	6.25	2.50	4.50	7.00	-.62	-.05
	T3	162	6.32	.57	6.50	2.50	4.50	7.00	-.98	.79
	T4	129	6.27	.57	6.25	2.25	4.75	7.00	-.69	-.18
	T5	172	6.35	.49	6.25	2.00	5.00	7.00	-.37	-.46
	T6	153	6.31	.57	6.25	2.00	5.00	7.00	-.37	-.82
Challenge and Threat Ratio	T1	153	.70	.15	.68	.89	.37	1.26	.48	.64
	T2	141	.73	.16	.71	.77	.45	1.22	.65	.20
	T3	162	.71	.14	.69	.81	.44	1.26	.86	1.51
	T4	129	.70	.16	.68	.84	.34	1.18	.44	.22
	T5	172	.67	.16	.65	.83	.27	1.10	.30	.30
	T6	153	.70	.16	.70	.83	.29	1.13	.26	.05
Coping Potential	T1	153	-.09	1.29	0	7.00	-4.00	3.00	.03	.84
	T2	141	-.41	1.31	0	7.00	-4.00	3.00	-.05	-.06
	T3	162	-.15	1.18	0	6.00	-3.00	3.00	.40	.63
	T4	129	-.16	1.22	0	7.00	-4.00	3.00	.18	.62
	T5	172	.08	1.50	0	8.50	-4.00	4.50	.37	1.05
	T6	153	-.16	1.09	0	6.00	-3.00	4.00	.21	1.31

Table 14

Descriptive statistics for basic psychological needs variables at each timepoint within the study period.

Variable	Timepoint	N	M	SD	Median	Range	Min.	Max.	Skewness	Kurtosis
Autonomy	T1	153	4.70	.72	4.80	3.40	2.60	6.00	-.23	-.43
	T2	141	4.58	.71	4.60	3.40	2.60	6.00	-.39	-.42
	T3	162	4.69	.67	4.80	3.40	2.60	6.00	-.41	.37
	T4	129	4.58	.67	4.60	3.40	2.60	6.00	-.37	-.02
	T5	172	4.48	.76	4.60	3.80	2.20	6.00	-.48	-.06
	T6	153	4.46	.80	4.54	3.60	2.40	6.00	-.22	-.46
Competence	T1	153	5.03	.60	5.20	2.60	3.40	6.00	-.58	-.19
	T2	141	4.98	.53	5.00	2.60	3.40	6.00	-.62	.43
	T3	162	5.08	.55	5.20	2.60	3.40	6.00	-.73	.49
	T4	129	4.90	.58	5.00	2.80	3.20	6.00	-.55	.23
	T5	172	5.07	.58	5.00	2.40	3.60	6.00	-.19	-.46
	T6	153	5.06	.57	5.00	2.60	3.40	6.00	-.19	-.33
Relatedness	T1	153	5.23	.68	5.40	3.00	3.00	6.00	-.95	.49
	T2	141	5.30	.60	5.40	2.60	3.40	6.00	-.88	.58
	T3	162	5.37	.61	5.60	2.50	3.50	6.00	-.89	-.03
	T4	129	5.31	.58	5.40	2.40	3.60	6.00	-.70	.21
	T5	172	5.37	.57	5.40	2.20	3.80	6.00	-.66	-.32
	T6	153	5.35	.59	5.40	2.30	3.70	6.00	-.75	-.18

Table 15

Descriptive statistics for achievement goal variables at each timepoint within the study period.

Variable	Timepoint	N	M	SD	Median	Range	Min.	Max.	Skewness	Kurtosis
Approach Goals	T1	153	5.61	1.08	5.50	4.00	3.00	7.00	-.16	-1.17
	T2	141	6.13	.91	6.50	3.75	3.25	7.00	-.87	-.14
	T3	162	6.34	.75	6.50	3.00	4.00	7.00	-1.13	.67
	T4	129	6.21	.84	6.25	3.00	4.00	7.00	-.94	.09
	T5	172	6.21	.88	6.50	3.00	4.00	7.00	-1.03	.17
	T6	153	6.17	.90	6.50	3.75	3.25	7.00	-.98	.30
Avoidance Goals	T1	153	3.39	1.42	3.50	6.00	1.00	7.00	.28	-.74
	T2	141	4.07	1.31	4.00	6.00	1.00	7.00	.08	-.41
	T3	162	3.65	1.42	3.50	6.00	1.00	7.00	.16	-.66
	T4	129	3.73	1.37	4.00	6.00	1.00	7.00	-.03	-.29
	T5	172	3.63	1.46	3.50	6.00	1.00	7.00	.16	-.65
	T6	153	3.56	1.45	3.50	6.00	1.00	7.00	.19	-.80
Mastery Goals	T1	153	4.86	1.04	4.75	4.50	2.50	7.00	.10	-.67
	T2	141	5.60	.85	5.50	3.75	3.25	7.00	-.35	-.28
	T3	162	5.35	.87	5.50	3.00	4.00	7.00	.13	-.92
	T4	129	5.37	.85	5.50	3.75	3.25	7.00	-.09	-.60
	T5	172	5.27	.92	5.50	3.75	3.25	7.00	.01	-.83
	T6	153	5.23	.88	5.50	3.75	3.25	7.00	.13	-.63
Performance Goals	T1	153	4.14	1.36	4.00	6.00	1.00	7.00	.16	-.50
	T2	141	4.60	1.26	4.75	6.00	1.00	7.00	-.24	-.17
	T3	162	4.64	1.27	4.50	5.50	1.50	7.00	.17	-.43
	T4	129	4.56	1.25	4.50	6.00	1.00	7.00	-.03	.27
	T5	172	4.56	1.44	4.50	6.00	1.00	7.00	-.19	-.39
	T6	153	4.50	1.43	4.00	6.00	1.00	7.00	-.08	-.37

Table 16

Descriptive statistics for mental health variables at each timepoint within the study period.

Variable	Timepoint	N	M	SD	Median	Range	Min.	Max.	Skewness	Kurtosis
Anxiety (GAD-10)	T1	99	.37	.34	.30	1.80	0	1.80	1.74	3.60
	T2	86	.38	.31	.30	1.20	0	1.20	.94	.36
	T3	107	.36	.31	.30	1.30	0	1.30	.90	.33
	T4	89	.36	.32	.30	1.30	0	1.30	.98	.44
	T5	122	.14	.16	.1	.60	0	.60	1.10	.29
	T6	108	.23	.27	.1	1.10	0	1.10	1.36	1.41
Depression (PHQ-8)	T1	99	.34	.31	.25	1.25	0	1.25	.85	.22
	T2	86	.33	.33	.25	1.38	0	1.38	1.44	2.27
	T3	107	.28	.26	.25	1.00	0	1.00	1.00	.38
	T4	89	.29	.27	.25	1.00	0	1.00	.94	.27
	T5	122	.18	.24	.13	.94	0	.94	1.56	1.93
	T6	108	.22	.23	.13	.88	0	.88	.99	.40
Mental Health (MHI-5)	T1	54	78.22	14.07	82	56	44	100	-.86	.31
	T2	55	76.51	10.44	76	44	56	100	-.15	-.45
	T3	162	79.83	11.11	84	52	48	100	-.79	.28
	T4	131	80.67	12.03	84	56	44	100	-1.11	1.30
	T5	172	81.84	10.99	84	50	50	100	-.81	.25
	T6	153	83.30	10.59	84	48	52	100	-.89	.48

Table 17

*Descriptive statistics and correlations for variables measured at T1; *p<.05, **p<.001.*

Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	153	4.70	.72	-	.290**	.127	.095	.369**	-.158	.138	.225**	.052	.172*
2. Competence	153	5.03	.60		-	.572**	-.304**	.104	-.424**	.111	-.14	-.350**	-.335**
3. Relatedness	153	5.23	.68			-	-.310**	-.09	-.251**	.067	-.163*	-.117	-.225**
4. Demands	153	3.86	.93				-	.452**	.693**	-.386**	.390**	.474**	.637**
5. Resources	153	5.61	.99					-	-.310**	.107	.663**	.122	.499**
6. Challenge and Threat Ratio	153	.70	.15						-	-.485**	-.106	.406**	.278**
7. Coping Potential	153	-.09	1.29							-	.027	-.243**	-.092
8. Approach Goals	153	5.61	1.08								-	.406**	.644**
9. Avoidance Goals	153	3.39	1.42									-	.743**
10. Mastery Goals	153	4.86	1.04										-

Table 17

Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17	18	19
1. Autonomy	153	4.70	.72	.100	-.053	-.075	-.02	-.108	-.123	-.004	.008	-.04
2. Competence	153	5.03	.60	-.219**	-.233*	-.322**	.290*	-.034	-.142	.074	.128	.08
3. Relatedness	153	5.23	.68	-.079	-.037	-.009	.119	.100	.05	-.014	-.009	.023
4. Demands	153	3.86	.93	.313**	.221*	.291**	-.292*	-.237**	.081	-.027	-.148	-.076
5. Resources	153	5.61	.99	.269**	-.275**	-.263**	.321*	-.601**	-.267**	-.043	-.04	-.09
6. Challenge and Threat Ratio	153	.70	.15	.126	.352**	.386**	-.453**	.252**	.328**	-.02	-.175	-.029
7. Coping Potential	153	-.09	1.29	-.162*	-.085	-.200*	.207	-.092	-.202*	-.033	.115	-.049
8. Approach Goals	153	5.61	1.08	.720**	-.059	.009	.164	-.464**	-.149	-.023	.03	-.069
9. Avoidance Goals	153	3.39	1.42	.793**	.320**	.366**	-.193	.024	.106	-.057	-.021	-.081
10. Mastery Goals	153	4.86	1.04	.517**	.194	.298**	-.163	-.258**	-.025	-.031	-.012	-.182*
11. Performance Goals	153	4.14	1.36	-	.182	.209*	.009	-.144	.012	-.053	.011	-.004
12. Anxiety (GAD-10)	99	.37	.34		-	.592**	-	1.000**	.592**	-.221	-.288*	-.113
13. Depression (PHQ-8)	99	.34	.31			-	-	.592**	1.000**	-.032	-.228*	-.138
14. Mental Health (MHI-5, U9-U11)	54	78.22	14.07				-	-.884**	-.695**	-.09	.142	.066
15. Common Anxiety	153	.49	.50					-	.510**	.028	.009	.004
16. Common Depression	153	.42	.43						-	-.004	-.155	-.043
17. Performance (S1P1)	124	6.34	.75							-	.511**	.493**
18. Performance (S1P2)	124	6.15	.75								-	.481**
19. Performance (S1P3)	120	6.33	.62									-

Table 17

Variable	*n*	*M*	*SD*	MAv	PAp	PAv
Mastery Approach	153	6.17	1.03	.246**	.400**	.208**
Mastery Avoidance (MAv)	153	3.54	1.58	-	.336**	.386**
Performance Approach (PAp)	153	5.04	1.52	-	-	.316**
Performance Avoidance (PAv)	153	3.24	1.82	-	-	-

Table 18

*Descriptive statistics and correlations for variables measured at T2; *p<.05, **p<.001.*

Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	141	4.58	.71	-	.537**	.324**	-.049	.408**	-.251**	.238**	.148	-.094	-.079
2. Competence	141	4.98	.53		-	.586**	-.275**	.581**	-.515**	.342**	.236**	-.263**	-.122
3. Relatedness	141	5.30	.60			-	-.230**	.373**	-.382**	.329**	.134	-.11	-.046
4. Demands	141	4.43	.79				-	-.12	.878**	-.467**	.161	.429**	.308**
5. Resources	141	6.12	.58					-	-.569**	.308**	.352**	-.197*	.036
6. Challenge and Threat Ratio	141	.73	.16						-	-.544**	-.023	.454**	.253**
7. Coping Potential	141	-.41	1.31							-	.033	-.239**	-.170*
8. Approach Goals	141	6.13	.91								-	.235**	.420**
9. Avoidance Goals	141	4.07	1.31									-	.709**
10. Mastery Goals	141	5.60	.85										-

Table 18

Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17	18	19
1. Autonomy	141	4.58	.71	.062	-.515**	-.353**	.153	-.353**	-.192*	-.025	-.061	.006
2. Competence	141	4.98	.53	-.021	-.531**	-.517**	.561**	-.325**	-.387**	.122	.022	-.006
3. Relatedness	141	5.30	.60	.013	-.498**	-.414**	.289*	-.166*	-.162	.044	-.009	-.007
4. Demands	141	4.43	.79	.352**	.367**	.316**	-.341*	.041	.211*	.048	.011	-.041
5. Resources	141	6.12	.58	.024	-.348**	-.394**	.406**	-.356**	-.378**	.088	.051	-.024
6. Challenge and Threat Ratio	141	.73	.16	.284**	.452**	.434**	-.503**	.208*	.363**	-0.01	-.024	-.025
7. Coping Potential	141	-.41	1.31	-.11	-.305**	-.425**	.325*	-.215*	-.314**	-.008	-.04	.044
8. Approach Goals	141	6.13	.91	.680**	-.108	-.069	.135	-.295**	-.121	-.159	-.123	-.11
9. Avoidance Goals	141	4.07	1.31	.728**	.283**	.301**	-.337*	.170*	.324**	-.254**	-.15	-.118
10. Mastery Goals	141	5.60	.85	.362**	.253*	.242*	-.203	.039	.142	-.145	-.136	-.12
11. Performance Goals	141	4.60	1.26	-	.067	.115	-.107	-.061	.154	-.272**	-.149	-.119
12. Anxiety (GAD-10)	86	.38	.31		-	.591**	-	1.000**	.591**	.049	-.028	.092
13. Depression (PHQ-8)	86	.33	.33			-	-	.591**	1.000**	.173	-.086	-.05
14. Mental Health (MHI-5, U9-U11)	55	76.51	10.44				-	-.793**	-.659**	.380*	.365*	.227
15. Common Anxiety	141	.55	.47					-	.445**	-.035	.049	.068
16. Common Depression	141	.45	.48						-	-.147	-.024	.002
17. Performance (S1P1)	124	6.34	.75							-	.511**	.493**
18. Performance (S1P2)	124	6.15	.75								-	.481**
19. Performance (S1P3)	120	6.33	.62									-

Table 18

Variable	*n*	*M*	*SD*	MAv	PAp	PAv
Mastery Approach	141	6.75	.57	.242**	.299**	.022
Mastery Avoidance (MAv)	141	4.47	1.48	-	.220**	.291**
Performance Approach (PAp)	141	5.53	1.56	-	-	.140
Performance Avoidance (PAv)	141	3.67	1.78	-	-	-

Table 19

*Descriptive statistics and correlations for variables measured at T3; *p<.05, **p<.001.*

Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	162	4.69	.67	-	.503**	.437**	-.13	.367**	-.307**	.275**	.192*	-.038	-.064
2. Competence	162	5.08	.55		-	.497**	-.219**	.566**	-.493**	.190*	.122	-.303**	-.322**
3. Relatedness	162	5.37	.61			-	-.323**	.259**	-.415**	.115	.096	-.123	-.119
4. Demands	162	4.44	.74				-	-.014	.853**	-.369**	.127	.216**	.245**
5. Resources	162	6.32	.57					-	-.522**	.220**	.352**	-.194*	-.145
6. Challenge and Threat Ratio	162	.71	.14						-	-.426**	-.059	.290**	.294**
7. Coping Potential	162	-.15	1.18							-	.047	-.202*	-.148
8. Approach Goals	162	6.34	.75								-	.166*	.178*
9. Avoidance Goals	162	3.65	1.42									-	.744**
10. Mastery Goals	162	5.35	.87										-

Table 19

Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17	18
1. Autonomy	162	4.69	.67	.115	-.433**	-.325**	.306**	-.318**	-.133	.072	.036
2. Competence	162	5.08	.55	-.045	-.342**	-.279**	.393**	-.250**	-.08	.03	.029
3. Relatedness	162	5.37	.61	0	-.439**	-.272**	.423**	-.196*	-.175*	.216**	.228**
4. Demands	162	4.44	.74	.148	.429**	.257**	-.252**	.079	.069	-.142	-.026
5. Resources	162	6.32	.57	.091	-.212*	-.143	.212**	-.116	.036	.04	.094
6. Challenge and Threat Ratio	162	.71	.14	.087	.463**	.303**	-.340**	.125	.065	-.15	-.068
7. Coping Potential	162	-.15	1.18	-.096	-.269**	-.179	.154	-.136	-.102	.126	.193*
8. Approach Goals	162	6.34	.75	.653**	.028	.028	-.006	-.075	.136	-.094	.042
9. Avoidance Goals	162	3.65	1.42	.704**	.397**	.279**	-.270**	.143	.199*	-.230**	-.12
10. Mastery Goals	162	5.35	.87	.248**	.420**	.328**	-.292**	.149	.202**	-.108	.003
11. Performance Goals	162	4.64	1.27	-	.17	.101	-.105	.013	.164*	-.243**	-.112
12. Anxiety (GAD-10)	107	.36	.31		-	.541**	-.415**	.996**	.541**	-.162	-.126
13. Depression (PHQ-8)	107	.28	.26			-	-.546**	.537**	1.000**	-.189	-.133
14. Mental Health (MHI-5)	162	79.83	11.11				-	-.467**	-.566**	.190*	.211*
15. Common Anxiety	162	.49	.45					-	.518**	-.1	-.102
16. Common Depression	162	.36	.40						-	-.170*	-.235**
17. Performance (S2P1)	152	6.19	.74							-	.614**
18. Performance (S2P2)	152	6.04	.90								-

Table 19

Variable	*n*	*M*	*SD*	MAv	PAp	PAv
Mastery Approach	162	6.85	.42	-.028	.287**	.077
Mastery Avoidance (MAv)	162	3.85	1.71	-	.066	.224**
Performance Approach (PAp)	162	5.83	1.33	-	-	.204**
Performance Avoidance (PAv)	162	3.44	1.92	-	-	-

Table 20

*Descriptive statistics and correlations for variables measured at T4; *p<.05, **p<.001.*

Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	129	4.58	.67	-	.543**	.531**	-.029	.329**	-.171	.012	.165	-.171	-.183*
2. Competence	129	4.90	.58		-	.584**	-.164	.349**	-.312**	.074	.101	-.181*	-.135
3. Relatedness	129	5.31	.58			-	-.192*	.235**	-.275**	.117	.024	-.243**	-.208*
4. Demands	129	4.34	.87				-	-.099	.903**	-.587**	.117	.477**	.422**
5. Resources	129	6.27	.57					-	-.507**	.255**	.468**	-.201*	.023
6. Challenge and Threat Ratio	129	.70	.16						-	-.618**	-.102	.491**	.348**
7. Coping Potential	129	-.16	1.22							-	-.012	-.295**	-.228**
8. Approach Goals	129	6.21	.84								-	.123	.227**
9. Avoidance Goals	129	3.73	1.37									-	.736**
10. Mastery Goals	129	5.37	.85										-

Table 20

Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17	18
1. Autonomy	129	4.58	.67	.049	-.403**	-.402**	.385**	-.341**	-.222*	.058	.117
2. Competence	129	4.90	.58	-.038	-.474**	-.536**	.526**	-.199*	-.357**	.039	.183*
3. Relatedness	129	5.31	.58	-.109	-.460**	-.456**	.492**	-.230**	-.293**	.085	.181*
4. Demands	129	4.34	.87	.316**	.193	.279**	-.362**	-.038	.216*	-.095	.077
5. Resources	129	6.27	.57	.08	-.156	-.166	.239**	-.219*	-.201*	.044	.089
6. Challenge and Threat Ratio	129	.70	.16	.234**	.238*	.328**	-.431**	.061	.283**	-.105	.032
7. Coping Potential	129	-.16	1.22	-.177*	-.178	-.159	.187*	-.091	-.095	.001	-.063
8. Approach Goals	129	6.21	.84	.657**	-.096	-.021	.078	-.205*	-.011	-.013	-.006
9. Avoidance Goals	129	3.73	1.37	.680**	.211*	.291**	-.375**	.204*	.298**	-.093	-.065
10. Mastery Goals	129	5.37	.85	.282**	.145	.239*	-.303**	0.04	.185*	-.085	-.011
11. Performance Goals	129	4.56	1.25	-	.083	.153	-.152	.057	.194*	-.053	-.068
12. Anxiety (GAD-10)	89	.36	.32		-	.646**	-.582**	.868**	.646**	.045	-.203
13. Depression (PHQ-8)	89	.29	.27			-	-.650**	.607**	1.000**	-.023	-.188
14. Mental Health (MHI-5)	131	80.67	12.03				-	-.462**	-.633**	.021	.098
15. Common Anxiety	131	.45	.39					-	.454**	.08	-.068
16. Common Depression	131	.30	.34						-	-.074	-.234**
17. Performance (S2P1)	152	6.19	.74							-	.614**
18. Performance (S2P2)	152	6.04	.90								-

Table 20

Variable	*n*	*M*	*SD*	MAv	PAp	PAv
Mastery Approach	129	6.74	.53	-.003	.253**	-.059
Mastery Avoidance (MAv)	129	4.00	1.61	-	.071	.309**
Performance Approach (PAp)	129	5.67	1.47	-	-	.176*
Performance Avoidance (PAv)	129	3.45	1.77	-	-	-

Table 21

*Descriptive statistics and correlations for variables measured at T5; *p<.05, **p<.001.*

Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11
1. Autonomy	172	4.48	.76	-	.387**	.325**	-.064	.302**	-.168*	.182*	.076	-.08	-.038	-.01
2. Competence	172	5.07	.58		-	.633**	-.212**	.430**	-.346**	.161*	.132	-.295**	-.218**	-.078
3. Relatedness	172	5.37	.57			-	-.206**	.326**	-.301**	.058	.102	-.234**	-.145	-.081
4. Demands	172	4.21	.89				-	-.071	.933**	-.505**	0.1	.397**	.468**	.162*
5. Resources	172	6.35	.49					-	-.415**	.254**	.426**	-.135	-.02	.134
6. Challenge and Threat Ratio	172	.67	.16						-	-.554**	-.046	.416**	.436**	.113
7. Coping Potential	172	.08	1.50							-	.088	-.239**	-.168*	-.081
8. Approach Goals	172	6.21	.88								-	.228**	.223**	.694**
9. Avoidance Goals	172	3.63	1.46									-	.698**	.701**
10. Mastery Goals	172	5.27	.92										-	.200**
11. Performance Goals	172	4.56	1.44											-

Table 21

Variable	*n*	*M*	*SD*	12	13	14	15	16	17	18	19
1. Autonomy	172	4.48	.76	-.228*	-.188*	.186*	-.094	-.148	.077	.243	.015
2. Competence	172	5.07	.58	-.370**	-.369**	.343**	-.053	-.202**	.172*	.306	.003
3. Relatedness	172	5.37	.57	-.209*	-.219*	.251**	.089	-.007	.136	.584**	.04
4. Demands	172	4.21	.89	.344**	.295**	-.388**	-.057	.247**	-.08	-.066	.071
5. Resources	172	6.35	.49	-.306**	-.270**	.211**	-.116	-.149	.085	-.363	-.118
6. Challenge and Threat Ratio	172	.67	.16	.443**	.377**	-.426**	-.01	.275**	-.101	.101	.117
7. Coping Potential	172	.08	1.50	-.285**	-.262**	.275**	-.017	-.194*	.11	.047	-.005
8. Approach Goals	172	6.21	.88	.012	.031	-.058	.012	.021	-.049	-.052	-.057
9. Avoidance Goals	172	3.63	1.46	.143	.186*	-.255**	.044	.155*	-.198*	-.175	.018
10. Mastery Goals	172	5.27	.92	.200*	.234**	-.283**	.01	.163*	-.205**	-.037	-.023
11. Performance Goals	172	4.56	1.44	.019	.05	-.112	.045	.065	-.099	-.162	.001
12. Anxiety (GAD-10)	122	.14	.16	-	.553**	-.444**	1.000**	.553**	-.242**	.247	.022
13. Depression (PHQ-8)	122	.18	.24		-	-.395**	.555**	1.000**	-.186*	.01	.156
14. Mental Health (MHI-5)	172	81.84	10.99			-	-.531**	-.614**	.161*	.307	-.002
15. Common Anxiety	172	.35	.50				-	.591**	.045	.244	.085
16. Common Depression	172	.25	.38					-	-.027	.01	.144
17. Performance (S3P1)	160	6.00	.65						-	.553**	.598**
18. Performance (S3P2)	23	6.12	.73							-	.704**
19. Performance (S3P3)	122	6.08	.77								-

Table 21

Variable	*n*	*M*	*SD*	MAv	PAp	PAv
Mastery Approach	172	6.75	.49	-.009	.185*	-.031
Mastery Avoidance (MAv)	172	3.79	1.79	-	.122	.168*
Performance Approach (PAp)	172	5.66	1.60	-	-	.265**
Performance Avoidance (PAv)	172	3.47	2.02	-	-	-

Table 22

*Descriptive statistics and correlations for variables measured at T6; *p<.05, **p<.001.*

Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	153	4.46	.80	-	.513**	.391**	-.078	.378**	-.235**	.189*	.179*	-.072	-.016
2. Competence	153	5.06	.57		-	.619**	-.249**	.449**	-.407**	.264**	.170*	-.222**	-.216**
3. Relatedness	153	5.35	.59			-	-.244**	.215**	-.302**	.170*	.026	-.250**	-.213**
4. Demands	153	4.35	.86				-	-.106	.904**	-.448**	.072	.440**	.462**
5. Resources	153	6.31	.57					-	-.509**	.380**	.323**	-.203*	-.048
6. Challenge and Threat Ratio	153	.70	.16						-	-.551**	-.067	.459**	.415**
7. Coping Potential	153	-.16	1.09							-	.024	-.313**	-.239**
8. Approach Goals	153	6.17	.90								-	.253**	.263**
9. Avoidance Goals	153	3.56	1.45									-	.747**
10. Mastery Goals	153	5.23	.88										-

Table 22

Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17	18	19
1. Autonomy	153	4.46	.80	.05	-.285**	-.293**	.193*	-.209**	-.101	.078	.408	.035
2. Competence	153	5.06	.57	.015	-.407**	-.418**	.423**	-.171*	-.232**	.143	.593**	.111
3. Relatedness	153	5.35	.59	-.106	-.294**	-.242*	.436**	-.099	-.159	.16	.669**	.255**
4. Demands	153	4.35	.86	.208**	.487**	.464**	-.458**	.088	.358**	-.161	-.276	.075
5. Resources	153	6.31	.57	.027	-.271**	-.200*	.283**	-.305**	-.238**	.01	-.047	-.108
6. Challenge and Threat Ratio	153	.70	.16	.169*	.539**	.491**	-.521**	.205*	.406**	-.141	-.191	.104
7. Coping Potential	153	-.16	1.09	-.155	-.324**	-.292**	.247**	-.212**	-.194*	.066	.272	.046
8. Approach Goals	153	6.17	.90	.727**	.126	.044	-.018	.067	.057	.02	-.103	.023
9. Avoidance Goals	153	3.56	1.45	.717**	.298**	.211*	-.346**	.13	.246**	-.180*	-.34	-.131
10. Mastery Goals	153	5.23	.88	.308**	.412**	.344**	-.385**	.165*	.310**	-.129	-.265	-.125
11. Performance Goals	153	4.50	1.43	-	.131	.034	-.125	.073	.095	-.09	-.245	-.043
12. Anxiety (GAD-10)	108	.23	.27		-	.638**	-.617**	1.000**	.638**	-.081	-.173	.021
13. Depression (PHQ-8)	108	.22	.23			-	-.429**	.637**	1.000**	-.296**	-.318	.007
14. Mental Health (MHI-5)	153	83.30	10.59				-	-.473**	-.471**	.091	.319	.025
15. Common Anxiety	153	.33	.37					-	.462**	-.001	-.171	-.051
16. Common Depression	153	.25	.30						-	-.225**	-.318	-.076
17. Performance (S3P1)	160	6.00	.65							-	.553**	.598**
18. Performance (S3P2)	23	6.12	.73								-	.704**
19. Performance (S3P3)	122	6.08	.77									-

Table 22

Variable	*n*	*M*	*SD*	MAv	PAp	PAv
Mastery Approach	153	6.76	.50	.05	.236**	.023
Mastery Avoidance (MAv)	153	3.70	1.67	-	.130	.307**
Performance Approach (PAp)	153	5.59	1.62	-	-	.294**
Performance Avoidance (PAv)	153	3.42	1.92	-	-	-

Table 23

*Descriptive statistics and correlations for composite early season variables; *p<.05, **p<.001.*

Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	487	4.62	.72	-	.384**	.277**	-.031	.264**	-.187**	.181**	.134**	-.031	.014
2. Competence	487	5.06	.58		-	.568**	-.226**	.286**	-.412**	.152**	.035	-.311**	-.274**
3. Relatedness	487	5.33	.62			-	-.240**	.133**	-.316**	.078	.025	-.147**	-.140**
4. Demands	487	4.18	.89				-	.271**	.798**	-.415**	.288**	.375**	.499**
5. Resources	487	6.11	.78					-	-.349**	.161**	.585**	.005	.269**
6. Challenge and Threat Ratio	487	.69	.15						-	-.500**	-.068	.368**	.327**
7. Coping Potential	487	-.05	1.34							-	.054	-.226**	-.130**
8. Approach Goals	487	6.06	.96								-	.284**	.426**
9. Avoidance Goals	487	3.56	1.43									-	.723**
10. Mastery Goals	487	5.17	.97										-

Table 23

Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17	18	19
1. Autonomy	487	4.62	.72	.051	-.131*	-.129*	.187**	-.140**	-.106*	.076	.04	.014
2. Competence	487	5.06	.58	-.106*	-.279**	-.326**	.341**	-.105*	-.144**	.088	.083	.022
3. Relatedness	487	5.33	.62	-.038	-.225**	-.174**	.292**	-.002	-.053	.098*	.141*	.007
4. Demands	487	4.18	.89	.239**	.281**	.258**	-.248**	-.084	.107*	-.104*	-.092	-.023
5. Resources	487	6.11	.78	.223**	-.262**	-.244**	.208**	-.328**	-.194**	-.059	-.016	-.165*
6. Challenge and Threat Ratio	487	.69	.15	.106*	.382**	.347**	-.400**	.130**	.239**	-.073	-.104	.082
7. Coping Potential	487	-.05	1.34	-.106*	-.171**	-.205**	.223**	-.082	-.176**	.057	.151*	-.04
8. Approach Goals	487	6.06	.96	.692**	.007	.023	.035	-.198**	-.052	-.093	.006	-.117
9. Avoidance Goals	487	3.56	1.43	.731**	.293**	.277**	-.226**	.062	.139**	-.176**	-.09	-.036
10. Mastery Goals	487	5.17	.97	.345**	.268**	.283**	-.196**	-.056	.075	-.143**	-.02	-.127
11. Performance Goals	487	4.46	1.38	-	.135*	.120*	-.067	-.033	.056	-.149**	-.074	-.03
12. Anxiety (GAD-10)	328	.28	.29		-	.585**	-.414**	.998**	.585**	-.109	-.179*	.006
13. Depression (PHQ-8)	328	.26	.27			-	-.481**	.582**	1.000**	-.085	-.168*	.037
14. Mental Health (MHI-5)	388	80.5	11.56				-	-.576**	-.617**	.096	.182**	-.031
15. Common Anxiety	487	.44	.49					-	.549**	.022	-.044	.072
16. Common Depression	487	.34	.41						-	-.029	-.184**	.095
17. Performance (P1)	436	6.16	.72							-	.562**	.557**
18. Performance (P2)	299	6.09	.83								-	.521**
19. Performance (P3)	242	6.2	.71									-

Table 23

Variable	*n*	*M*	*SD*	MAv	PAp	PAv
Mastery Approach	487	6.60	.75	.121**	.349**	.111*
Mastery Avoidance (MAv)	487	3.73	1.70	-	.181**	.249**
Performance Approach (PAp)	487	5.52	1.52	-	-	.266**
Performance Avoidance (PAv)	487	3.39	1.93	-	-	-

Table 24

*Descriptive statistics and correlations for composite late season stress appraisals, basic psychological needs and approach and avoidance goals; *p<.05, **p<.001.*

Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	422	4.53	.73	-	.514**	.401**	-.053	.361**	-.215**	.152**	.162**	-.096*	-.071
2. Competence	422	4.98	.56		-	.595**	-.226**	.455**	-.407**	.228**	.167**	-.223**	-.166**
3. Relatedness	422	5.32	.59			-	-.224**	.277**	-.322**	.215**	.063	-.205**	-.160**
4. Demands	422	4.37	.84				-	-.113*	.894**	-.499**	.112*	.449**	.402**
5. Resources	422	6.23	.58					-	-.535**	.324**	.375**	-.217**	-.024
6. Challenge and Threat Ratio	422	.71	.16						-	-.573**	-.064	.474**	.352**
7. Coping Potential	422	-.24	1.21							-	.022	-.289**	-.220**
8. Approach Goals	422	6.17	.88								-	.204**	.295**
9. Avoidance Goals	422	3.78	1.40									-	.739**
10. Mastery Goals	422	5.40	.87										-

Table 24

Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17	18	19
1. Autonomy	422	4.53	.73	.055	-.358**	-.320**	.252**	-.269**	-.148**	.065	.076	.038
2. Competence	422	4.98	.56	-.014	-.468**	-.482**	.483**	-.240**	-.320**	.089	.156*	.04
3. Relatedness	422	5.32	.59	-.069	-.406**	-.366**	.422**	-.165**	-.194**	.095	.147*	.122
4. Demands	422	4.37	.84	.284**	.346**	.349**	-.381**	.039	.251**	-.066	.025	.036
5. Resources	422	6.23	.58	.037	-.265**	-.268**	.311**	-.317**	-.304**	.028	.059	-.094
6. Challenge and Threat Ratio	422	.71	.16	.225**	.411**	.421**	-.477**	.177**	.357**	-.073	-.008	.065
7. Coping Potential	422	-.24	1.21	-.146**	-.277**	-.308**	.246**	-.193**	-.235**	-.001	-.047	.028
8. Approach Goals	422	6.17	.88	.691**	.015	.006	.068	-.146**	-.042	-.046	-.059	-.05
9. Avoidance Goals	422	3.78	1.40	.705**	.276**	.277**	-.370**	.192**	.307**	-.150**	-.121*	-.096
10. Mastery Goals	422	5.40	.87	.317**	.299**	.294**	-.332**	.119*	.230**	-.081	-.074	-.082
11. Performance Goals	422	4.55	1.32	-	.109	.107	-.127*	.026	.144**	-.134**	-.118	-.078
12. Anxiety (GAD-10)	283	.32	.30		-	.631**	-.607**	.947**	.631**	.041	-.125	.085
13. Depression (PHQ-8)	283	.28	.28			-	-.554**	.612**	1.000**	-.009	-.152*	-.002
14. Mental Health (MHI-5)	338	81.16	11.38				-	-.542**	-.574**	.071	.154*	-.015
15. Common Anxiety	425	.44	.42					-	.473**	.046	-.012	.041
16. Common Depression	425	.33	.39						-	-.106*	-.113	.011
17. Performance (P1)	436	6.16	.72							-	.562**	.557**
18. Performance (P2)	299	6.09	.83								-	.521**
19. Performance (P3)	242	6.20	.71									-

Table 24

Variable	*n*	*M*	*SD*	MAv	PAp	PAv
Mastery Approach	422	6.75	.53	.092	.261**	-.001
Mastery Avoidance (MAv)	422	4.04	1.62	-	.132**	.310**
Performance Approach (PAp)	422	5.59	1.55	-	-	.210**
Performance Avoidance (PAv)	422	3.51	1.83	-	-	-

Table 25

*Descriptive statistics and correlations for S1 average variables; *p<.05, **p<.001.*

Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	130	4.66	.59	-	.430**	.225*	.068	.445**	-.193*	.175*	.247**	.061	0.1
2. Competence	130	5.02	.48		-	.588**	-.302**	.329**	-.505**	.195*	.007	-.301**	-.251**
3. Relatedness	130	5.30	.55			-	-.286**	.061	-.302**	.166	-.081	-.09	-.149
4. Demands	130	4.15	.71				-	.230**	.787**	-.452**	.320**	.556**	.601**
5. Resources	130	5.85	.65					-	-.405**	.146	.598**	-.061	.314**
6. Challenge and Threat Ratio	130	.72	.13						-	-.514**	-.068	.559**	.370**
7. Coping Potential	130	-.22	1.00							-	.067	-.215*	-.122
8. Approach Goals	130	5.86	.84								-	.368**	.601**
9. Avoidance Goals	130	3.70	1.10									-	.715**
10. Mastery Goals	130	5.21	.80										-

Table 25

Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17
1. Autonomy	130	4.66	.59	.180*	-.304**	-.243*	.076	-.281**	-.221*	-.044
2. Competence	130	5.02	.48	-.115	-.409**	-.449**	.508**	-.168	-.294**	.066
3. Relatedness	130	5.30	.55	-.045	-.241*	-.226*	.251	-.008	-.061	.033
4. Demands	130	4.15	.71	.369**	.349**	.327**	-.413**	-.16	.068	-.045
5. Resources	130	5.85	.65	.171	-.400**	-.431**	.491**	-.692**	-.491**	-.077
6. Challenge and Threat Ratio	130	.72	.13	.242**	.480**	.468**	-.586**	.297**	.385**	-.011
7. Coping Potential	130	-.22	1.00	-.075	-.313**	-.396**	.317*	-.216*	-.336**	-.086
8. Approach Goals	130	5.86	.84	.708**	.003	.047	.249	-.526**	-.241**	-.109
9. Avoidance Goals	130	3.70	1.10	.773**	.418**	.376**	-.268	.083	.200*	-.114
10. Mastery Goals	130	5.21	.80	.456**	.366**	.307**	-.184	-.196*	-.041	-.168
11. Performance Goals	130	4.35	1.08	-	.205	.223*	.052	-.181*	.046	-.08
12. Anxiety (GAD-10)	80	.38	.27		-	.650**	-	1.000**	.650**	-.056
13. Depression (PHQ-8)	80	.34	.28			-	-	.650**	1.000**	.039
14. Mental Health (MHI-5)	50	76.84	10.77				-	-.866**	-.712**	.222
15. Common Anxiety	130	.54	.44					-	.569**	.041
16. Common Depression	130	.45	.38						-	-.06
17. S1 Average Performance	117	6.29	.54							-

Table 26

*Descriptive statistics and correlations for S2 average variables; *p<.05, **p<.001.*

Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	124	4.62	.58	-	.548**	.525**	-.085	.431**	-.236**	.198*	.217*	-.093	-.135
2. Competence	124	5.00	.45		-	.584**	-.331**	.523**	-.510**	.204*	.15	-.245**	-.266**
3. Relatedness	124	5.36	.50			-	-.321**	.272**	-.383**	.17	.09	-.163	-.167
4. Demands	124	4.38	.73				-	-.072	.911**	-.519**	.136	.437**	.417**
5. Resources	124	6.31	.46					-	-.465**	.288**	.503**	-.186*	-.089
6. Challenge and Threat Ratio	124	.70	.13						-	-.576**	-.082	.464**	.407**
7. Coping Potential	124	-.15	.93							-	.064	-.264**	-.161
8. Approach Goals	124	6.29	.66								-	.188*	.179*
9. Avoidance Goals	124	3.73	1.25									-	.753**
10. Mastery Goals	124	5.37	.70										-

Table 26

Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17
1. Autonomy	124	4.62	.58	.105	-.468**	-.428**	.397**	-.428**	-.266**	.142
2. Competence	124	5.00	.45	-.02	-.458**	-.521**	.579**	-.242**	-.327**	.082
3. Relatedness	124	5.36	.50	-.026	-.501**	-.488**	.512**	-.202*	-.260**	.263**
4. Demands	124	4.38	.73	.302**	.332**	.265*	-.358**	-.044	.185*	-.067
5. Resources	124	6.31	.46	.143	-.246*	-.230*	.328**	-.219*	-.182*	.078
6. Challenge and Threat Ratio	124	.70	.13	.211*	.386**	.324**	-.452**	.049	.245**	-.072
7. Coping Potential	124	-.15	.93	-.151	-.227*	-.168	.214*	-.142	-.094	.037
8. Approach Goals	124	6.29	.66	.677**	-.125	-.076	.071	-.14	.049	-.001
9. Avoidance Goals	124	3.73	1.25	.739**	.331**	.292**	-.360**	.13	.317**	-.114
10. Mastery Goals	124	5.37	.70	.319**	.327**	.284**	-.378**	.092	.300**	-.012
11. Performance Goals	124	4.65	1.16	-	.106	.114	-.123	.004	.191*	-.119
12. Anxiety (GAD-10)	84	.36	.29		-	.651**	-.561**	.951**	.651**	-.144
13. Depression (PHQ-8)	84	.28	.23			-	-.643**	.627**	1.000**	-.186
14. Mental Health (MHI-5)	126	80.48	9.41				-	-.431**	-.606**	.185*
15. Common Anxiety	126	.47	.38					-	.535**	-.085
16. Common Depression	126	.34	.29						-	-.268**
17. S2 Average Performance	148	6.14	.71							-

Table 27

*Descriptive statistics and correlations for S3 average variables; *p<.05, **p<.001.*

Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	150	4.48	.70	-	.457**	.418**	-.063	.379**	-.207*	.190*	.176*	-.057	-.055
2. Competence	150	5.08	.51		-	.692**	-.204*	.468**	-.362**	.243**	.189*	-.233**	-.237**
3. Relatedness	150	5.37	.53			-	-.219**	.269**	-.296**	.162*	.102	-.206*	-.152
4. Demands	150	4.28	.80				-	-.064	.926**	-.536**	.071	.484**	.557**
5. Resources	150	6.35	.46					-	-.426**	.328**	.418**	-.146	-.074
6. Challenge and Threat Ratio	150	.68	.14						-	-.612**	-.079	.493**	.531**
7. Coping Potential	150	0	1.13							-	.072	-.318**	-.285**
8. Approach Goals	150	6.19	.81								-	.291**	.254**
9. Avoidance Goals	150	3.56	1.28									-	.739**
10. Mastery Goals	150	5.23	.75										-

Table 27

Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17
1. Autonomy	150	4.48	.70	.084	-.349**	-.272**	.217**	-.208*	-.223**	.057
2. Competence	150	5.08	.51	.023	-.453**	-.395**	.387**	-.093	-.259**	.109
3. Relatedness	150	5.37	.53	-.052	-.344**	-.244*	.318**	.059	-.101	.163
4. Demands	150	4.28	.80	.198*	.528**	.397**	-.477**	-.039	.300**	-.004
5. Resources	150	6.35	.46	.156	-.351**	-.267**	.301**	-.209*	-.298**	-.107
6. Challenge and Threat Ratio	150	.68	.14	.13	.607**	.456**	-.540**	.041	.379**	.039
7. Coping Potential	150	0	1.13	-.103	-.361**	-.256**	.324**	-.066	-.224**	.067
8. Approach Goals	150	6.19	.81	.752**	.042	.022	0	.047	.031	-.062
9. Avoidance Goals	150	3.56	1.28	.733**	.345**	.211*	-.278**	.014	.172*	-.154
10. Mastery Goals	150	5.23	.75	.307**	.493**	.362**	-.361**	.047	.286**	-.189*
11. Performance Goals	150	4.52	1.32	-	.076	.014	-.066	.016	.024	-.076
12. Anxiety (GAD-10)	104	.17	.17		-	.647**	-.583**	1.000**	.644**	-.056
13. Depression (PHQ-8)	104	.19	.19			-	-.454**	.647**	.991**	-.058
14. Mental Health (MHI-5)	150	82.87	8.83				-	-.453**	-.581**	.05
15. Common Anxiety	150	.33	.38					-	.520**	.012
16. Common Depression	150	.23	.25						-	-.034
17. S3 Average Performance	117	6.09	.63							-

3.0 CHAPTER THREE. LONGITUDINAL AND TEMPORAL CHANGE OVER TIME.

3.1 Introduction

In chapter one, the importance of longitudinally monitoring youth academy football players' stress, mental health and performance was outlined. In chapter two the procedure followed when collecting psychometric and performance data over a 32-month period from September 2018 to April 2021, and the methods adopted when preparing the data for analyses was described. In the present chapter, analyses regarding how psychological demands, resources and mental health changed over time are reported; longitudinally over three seasons, temporally during three seasons and temporally during a composite season in youth football players at a category one academy in the UK. Thus, the present chapter addresses the first aim of this PhD; to examine longitudinal change in psychological demands, resources, and mental health in youth academy football players.

Cognitive appraisal shapes an individual's approach and reactions to motivated performance situations, eliciting particular emotional, physiological, and behavioural responses. An athlete is expected to perform well when in a challenge state (Jones et al., 2009; Meijen et al., 2020) when their perceived personal resources meet or exceed their perceived situational demands. Performers in a challenge state possess high levels of self-efficacy and perceive control over their performance. They pursue approach goals and any anxiety experienced is perceived as facilitative for performance (e.g., Chadha et al., 2019). These characteristics improve performance through efficient delivery of blood to the muscles, improved concentration and decision making, increased anaerobic power and task engagement, and reduced likelihood of reinvestment due to self-regulation (Jones et al., 2009; Meijen et al., 2020). The characteristics may also promote better mental health, since greater self-efficacy (e.g., Endler et al., 2001), perceived control (e.g., Kinman et al., 2017) and an approach coping strategy (e.g., Littleton et al., 2007) have been related to positive mental health outcomes. Furthermore, more positive mental health outcomes are observed when athletes' perceived resources outweigh perceived situational demands (i.e., challenge state, Raedeke & Smith, 2004; Williams et al., 1991). In contrast, to a challenge state, performance and mental health suffer in a threat state; when perceived situational demands exceed perceived personal resources (e.g., Dixon et al., 2019; Raedeke & Smith, 2004; Turner et al., 2013, 2020). Performers in a threat state experience low self-efficacy and there is little focus on the controllable aspects of performance. The performer focuses on avoiding failure whilst interpreting anxiety as unhelpful for performance (Jones et al., 2009; Meijen et al., 2020). That challenge is beneficial for performance and health compared to threat has been reported consistently across the extant literature (Behnke & Kaczmarek, 2018; Hase et al., 2019; Turner et al., 2020).

The challenge and threat state literature to date largely consists of cross-sectional designs, single timepoint, correlational (cohort) research, and laboratory experiments (e.g., Moore et al., 2015; Turner et al., 2014). This is problematic for advancing knowledge of stress in sport since single-timepoint research only shows part of the stress picture; athletes' lived experience of stress is complex, variable, and transient and dynamic in nature (see Chadha et al., 2023). This complexity cannot be captured by studying cohorts within single timepoint research. To illustrate, in Cumming et al.'s (2017) study, athletes' challenge and threat states were monitored over a longitudinal period; 14 (nine male, five female) elite rowers (M*age*=25.79 years) completed questionnaire measures of achievement goals, self-efficacy, perceived control, appraisal of life events and event importance at four timepoints; at baseline (trait measure) and prior to three competitive rowing events (state measures) of increasing magnitude which were dispersed throughout a rowing season. Trait challenge and high resource appraisals (self-efficacy, control, and approach goals) were associated with state challenge and high resource appraisals (Cumming et al., 2017). Likewise, trait threat, loss and avoidance goals were associated with the same state appraisals. When looking at changes over time, self-efficacy increased, and loss appraisals and avoidance goals decreased as the season progressed (Cumming et al., 2017), supporting Skinner and Brewer's (2002) proposal that predisposed cognitive appraisal style can predict subsequent cognitive appraisal styles, and the idea that cognitive appraisal intensifies as important events (such as competitions) draw closer (Lazarus & Folkman, 1984). Since Cumming et al's (2017) study involved a small number of athletes from a single sport, it is difficult to generalise findings beyond elite rowers.

Notwithstanding this, Chadha et al's (2023) temporal investigation of elite golfers' changing cognitive appraisals, irrational beliefs and challenge and threat evaluations leading up to a golf tournament further indicate the transient nature of these variables and the requirement to develop a greater understanding of how they might change over time. More longitudinal and temporal research across different sports and levels of sport is required to further the current understanding of the TCTSA and how variables change over time. Such research could provide an understanding of developmental change in challenge and threat states (Magnusson & Cairns, 1996; Morrison & Ornstein, 1996; Magnusson & Stattin, 2006), highlight factors (which cannot be manipulated experimentally) that predict later outcomes, and help highlight interacting processes over time (Grammer et al., 2013). Understanding temporal change in challenge and threat states, and the nature of that change could also uncover important periods within competitive seasons where interventions to encourage challenge states would be best placed, and where risks to poor mental health are most prominent. Athlete support staff could also be advised to interact with athletes differently depending on the stage of the season or their athletes' stress appraisals.

As well as being primarily cross-sectional, TCTSA research to date has focused on adult and undergraduate student samples (e.g., Moore et al., 2012; 2014; see Hase et al., 2019; Meijen et al., 2020), limiting the generalisability of findings to younger performers. This is problematic since youth sport performers, such as those competing in football academies, face a large number of stressors including high performance expectations (from themselves, their coaches, their parents/family), making errors, the opposition, mental stress, injury, and contractual issues amongst others (Reeves et al., 2009; Richardson et al., 2004). These peak developmental years also coincide with academic stressors, increased risk of injury and the biopsychosocial challenges associated with adolescence (see Stroud et al., 2009). It is important to establish the generalisability of the TCTSA beyond adult and into youth sport samples, since an improved understanding of youth sport stress could help improve support provision to these athletes, maximising their development, performance, and mental health.

Despite the need for a greater understanding of youth athletes' stress processes there are few studies and no systematic reviews investigating stress and cognitive appraisals in youth sport performers. Indeed, the extent to which the TCTSA applies to youth samples and explains their performance under pressure appears to be limited. Only three studies have explored the TCTSA in non-adult samples (Turner et al., 2013; Turner et al., 2021; Davies et al., 2023). In the first, 42 elite, male, national (n=30) and county (n=12) cricketers (M*age*=16.45 years), completed psychological inventories measuring self-efficacy, control, achievement goals and emotions prior to a competitive batting task. CVR was also measured. The results replicated previous findings; challenge CVR predicted higher performance in a batting test compared to threat CVR. However, a subsample of cricketers who showed threat CVR alongside greater self-efficacy performed well. This may explain discrepancies between psychological and CVR indicators of challenge and threat states (e.g., Dixon et al., 2019), or it may indicate the relationship between challenge and threat states and performance is more complex in youths than in adults. In the second study, youth, female netball players (*n*=92) completed psychometrics prior to a competitive, evaluative trial (Turner et al., 2021). Analyses showed that resource appraisals based on the BPMS of challenge and threat (i.e., general self-confidence, general perspective of positive challenge and positive disposition) positively related to performance in the trial, but resource appraisals based on the TCTSA (i.e., self-efficacy, perceived control, goal orientation) did not (Turner et al., 2021). Further, a greater perceived ability to cope with demands was positively related to trial performance, which was likely developed through greater experience at previous trials (Turner et al., 2021).

In the final study, grassroots level, adolescent, female, netball players provided measures of depression and anxiety, basic psychological needs related to netball, perceived demands and resources related to netball and sleep quality at two timepoints; once towards the start (*n*=140) and once towards the end (*n*=132) of a netball season (Davies et al., 2023). Netball performance was not measured within this study so the temporal relationships between changing psychological demands, resources and mental health and performance were not provided. Analyses showed that increases in perceived demands of netball and reductions in sleep quality were associated with elevated symptoms of depression over the season and decreases in perceptions of autonomy were associated with increases in symptoms of anxiety (Davies et al., 2023). Given the mixed findings regarding the effects of psycholgoical demands and resources on youth sport performance, and the generally limited study of challenge and threat states within youth sport performers, more research ought to be conducted within this population.

Regarding mental health, research on the impact of sport involvement in youths is also mixed. For instance, evidence shows that participating in organised (Swann et al., 2018) and school sport (especially team sport) provides a protective and promotive effect on mental health (Jewett et al., 2014; Larun et al., 2006). This may be due to the opportunities to interact with coaches and peers (Brettschneider, 2001), gain a sense of mastery (Eime et al., 2013), and engage in high intensity competition, which triggers neurological processes offering protection against poor mental health (aan het Rot et al., 2009). Nevertheless, some evidence indicates that competing in sport (especially elite level and highly competitive sport), can be detrimental to youths' mental health and well-being (e.g., Blakelock et al., 2019; Bruner et al., 2008). Certainly, elite youth sports performers (such as youth football academy players), are not immune from mental ill-health (Sarmento et al., 2021). This is unsurprising since 50% of mental health problems are established by age 14, and 75% by age 24 (Kessler et al., 2005). Furthermore, the genesis of many mental health problems, including depression and anxiety, occurs during the transition from junior to adolescent sport (Cronin et al., 2020; Küettel et al., 2021). Calls for further research into the mental health needs of these young performers, as well as strategies for supporting and protecting their mental health in this context are documented (see Hill et al., 2016; Sothern & O'Gorman, 2021). Certainly, if participating in sport can initially provide mental health benefits, and in some cases end up contributing to mental health detriments (e.g., Davies et a., 2023), longitudinal research documenting this change alongside other potentially causative variables would be extremely valuable. Further, since stress is likely to contribute to athletes' mental health problems (Rice et al., 2016; Gerber et al., 2018), measuring mental health alongside stress appraisals could illuminate important interrelationships (Grammer et al., 2013). Such insights would support talent development environments and sports organisations to take an informed and proactive approach towards facilitating youth performers' mental health and well-being, by integrating protective processes into existing coaching and operating practices.

The dearth of longitudinal research exploring mental health in sport means there is a limited understanding of how such problems develop, and the longer-term consequences. Relatedly, there has been a call for more research to explore the short and long-term consequences of mental health problems in athletes (Schinke et al., 2017), such as on performance and development. The solution is to conduct longitudinal research since, when data is collected both before and after the manifestation of a mental health problem, cause and effect relationships can be inferred (Cobley & Till, 2017; Grammer et al., 2013; Maxwell & Cole, 2007). Relatedly, longitudinally monitoring individual factors (i.e., appraisals) which might contribute to the onset of mental health symptoms would add to the extant literature, since previous research has tended to focus on environmental risk and protective factors (see Küettel & Larsen, 2020) which cannot always be controlled or changed. Relatedly, applied interventions delivered to youth athletes seeking to enhance positive mental health and/or reduce negative mental health by focusing on salient individual factors (e.g., appraisals), and illustrated through case studies, would advance the sport and exercise psychology literature (Uphill et al., 2016).

Elite youth football academies in the UK represent a highly pressurised youth sport environment (Sagar et al., 2010). Academy football players are exposed to multiple stressors, including selection, team and individual performance, and social evaluation (Reeves et al., 2009). Indeed, during a typical football season in the UK, many players experience uncertainty relating to their contract renewal; at the end of under-9, under-10, under-12, and under-14 seasons, a decision is made regarding whether a player's contract should be renewed for a further two years. During the under-16 season, a decision is made regarding whether a two-year scholarship should be offered and at the end of the scholarship, a decision is made regarding whether a professional contract should be offered to under-18 players. Once a player has a professional contract, this is reviewed dependent upon the terms outlined within the contract. Since uncertainty is highly related to anxiety (Grupe & Nitschke, 2013) and a threat state (e.g., Britton et al., 2011), the nature of academy football and its contracting procedures is psychologically challenging. Similar observations have been observed in other countries; significant increases in stress and sleep problems were observed from early to end-season in all 26 Iranian youth football players (*M*age=15.5 years, Nobari et al., 2021, see also Faude et al., 2011; Nobari et al., 2020). Similarly, perceived stress fluctuated during a football season in a sample of 138 male (*n*=98) and female Japanese collegiate players (Tabei et al., 2020). Collectively, this research demonstrates the transient nature of stress throughout a football season and the need to take a longitudinal and temporal approach to studying youth football players' stress.

In addition to this, elite youth football players experience high levels of stress and demands in other areas of their life, including schoolwork (Brink et al., 2010; Gustafsson et al., 2007; Reeves et al., 2009), their parents, and coaches (Ommundsen et al., 2006). Youth players are also at an increased risk of physical injury due to physical maturation (Micheli, 1983; Maffulli & Caine, 2012, see also the statistics from Schaal et al., 2011), their intense training programmes and busy competitive schedules (Armstrong & McManus, 2011; Hastmann-Walsh & Caine, 2015), potentially adding further stress. Notwithstanding this, players in the UK face a 0.012% likelihood of making it as a Premier League professional (Calvin, 2018). Still, stress itself in not necessarily harmful, when individuals are adequately supported, and respond to stressors in a challenge state (rather than a threat state), there can be benefits to performance (e.g., Brink et al., 2012; Dixon et al., 2019). Furthermore, the negative impact of stress on health and mental health outcomes can be reduced when appropriate coping strategies, appraisals and support are in place (e.g., Turner et al., 2020). Given that elite youth football players are exposed to high levels of stress, furthering an understanding stress within this population represents a worthy area of study. Evidence-based recommendations could be made to applied practitioners working with these young players to facilitate improvements in performance and mental health.

Whilst the extant sport and exercise psychology literature has explored both the stressors and coping strategies employed by youth football players (Finn & McKenna, 2010; Sagar et al., 2010), little is understood regarding the most advantageous psychological approaches to managing psychological demands for acute performance, long-term development, and mental health. Given this dearth of research, and since elite youth football players are at a heightened risk of experiencing stress and poor mental health (Fraser-Thomas et al., 2008; Gerber et al., 2018; Isoard-Gautheur et al., 2012; Nicholls & Polman, 2007; Strachan et al., 2009), further research is warranted in this sample. Indeed, within the context where the present research was conducted, following the 2020/21 season, the academy placed 63rd in the UK's academy productivity rankings; no academy graduate competed within the Premier League and two competed (played at least two games each) in the Championship (Schneider-Weiler, 2021). By comparison, the 1st placed academy had 11.16 academy graduates competing in the Premier League and 17.5 in the Championship (Schneider-Weiler, 2021).

Work with young people in sport should take a long-term development focus (Henriksen et al., 2014) but limited insight is available regarding how psychological variables change over the course of a youth athlete's development, meaning evidence informed approaches to supporting long-term development are scant. At present in the extant literature, a thorough understanding of elite youth football players' perceived psychological demands and resources (including stress appraisals) and mental health, including how these factors change over time, is lacking (Burgess & Naughton, 2010). Thus, to overcome this gap in the literature, quantitative (psychometric) measures of stress appraisals, basic psychological needs, achievement goals, and mental health were collected over a period of 32 months, from youth football players signed at a category one academy in the UK. Data were collected over this timeframe to enable longitudinal analysis of change over three consecutive seasons and offer developmental insights. Furthermore, by collecting data at the start and end of multiple seasons, this builds on the extant literature examining change within a single season (e.g., Chadha et al., 2023; Cumming et al., 2017; Davies et al., 2023). The present analyses could illuminate whether there are consistent patterns of in-season change, or whether in-season change varies from season to season. The data were collected via the method described in chapter two and analysed for longitudinal and temporal (in-season) change. The change analyses presented here contribute to the literature by examining elite youth football players' stress appraisals, basic psychological needs, achievement goals, and mental health, how these change over time, and the nature of this change between groups. Thus, as the largest and longest study of youth athlete stress and mental health, this study extends the literature through providing insights into the developmental experiences of youth athletes (Harwood & Thrower, 2019; Thrower et al., 2023) and their impact on mental health (Mills et al., 2011). Furthermore, the present research offers novel insight into stress and mental health experiences of some of the youngest individuals to be the subject of sport psychology research (i.e., 8-years-old).

In line with past research (e.g., Cerin et al., 2000; Mabweazara et al., 2014; Nobari et al., 2020; 2021; Skinner & Brewer, 2002; Swain & Jones, 1992; 1993), it is plausible to expect that as the season intensifies and progresses towards events of greater magnitude (e.g., cup competition finals, tournaments, and contract decisions), perceived demands and anxiety and depression symptom frequency would increase; players may become less challenged and more threatened. However, it is just as plausible that, as players gain more experience within the academy environment, they develop coping strategies which allow them to adjust to demands, meaning perceived demands could show no change or even decrease, whilst perceived resources increase over time; players could maintain their appraisal style or become more challenged, particularly if they are predisposed towards challenge (e.g., Cumming et al., 2017). Greater experience and familiarity with the academy system may reduce uncertainty, meaning anxiety could decrease over the course of the season. Further, given the mixed associations between sport participation and mental health outcomes (e.g., Swann et al., 2018; Hill et al., 2016), younger players may experience improved mental health through participation in football at the academy (when the emphasis is placed on enjoyment and development), whilst older players may experience a lack of improvement or even detriment to mental health (when greater emphasis is placed on performance).

On the other hand, the competitive nature of academy football may be too much for younger football players, reducing their enjoyment and leading to worsening mental health. Whilst older players are at greater risk of mental ill-health, their experience within the academy may help them to develop a skillset which makes them robust to the stressors of adolescence and pressure of professional football. Adolescent players may experience mental health benefits from regular intense physical activity, meaning mental health does not worsen as in the normal population (e.g., Costigan et al., 2016; Leahy et al., 2020). Clearly, it is difficult to hypothesise exactly how stress appraisals and mental health may change during the study period. Nevertheless, on balance, it is hypothesised that both perceived demands (Nobari et al., 2020; Skinner & Brewer, 2002) and perceived resources (Bandura, 1977; Eime et al., 2013) would generally increase over time as the objective demands of football increases (Verheijen, 2014), players' experience within academy football, and development of coping ability increases. Similarly, it is hypothesised that perceived demands and perceived resources will increase during a season (Cumming et al., 2017). Finally, it is hypothesised that mental health will generally improve over time thanks to players having the opportunity to participate in intense exercise and an activity they enjoy and are motivated towards (Swann et al., 2018; Jewett et al., 2014; Larun et al., 2006). Similarly, it is hypothesised that mental health would improve during a season as players participate in intense and enjoyable physical activity, and benefit from regular contact time with their peers and coaches (Jewett et al., 2014; Larun et al., 2006; Swann et al., 2018).

It is equally difficult to form hypotheses regarding changes in BPN satisfaction. For instance, whilst one would expect competence to increase during a season due to the training, support and experiences gained throughout a season (Bandura, 1977; Cumming et al., 2017), competence might instead decrease if players find themselves in an increasingly demanding and highly competitive environment where they believe they are incapable of meeting the demands (e.g., Wigfield & Eccles, 1994). One would also expect relatedness and autonomy to increase overtime; players' opportunities to socialise and interact with their teammates and coach increases over the season and coaches typically aim to develop autonomous learners capable of solving problems and driving their own learning. However, player relationships may become strained in the competitive environment of academy football, and the stressors placed on coaches may negatively impact their relationships with players and the degree to which they provide players with autonomy (Altfeld et al., 2015; Balaguer et al., 2012; Balk et al., 2019). Nevertheless, on balance it is hypothesised that perceived autonomy, competence, and relatedness would increase over time and during seasons.

Regarding anticipated change in achievement goal motivation, on the one hand it is possible that approach, mastery, and performance goal orientations would increase during a season, as players spend longer engaged with an activity they enjoy and which is important to them (e.g., Mih et al., 2015), and as events of greater magnitude grow nearer (often taking place later in a season, Adie et al., 2010). Given the close association between anxiety and avoidance (American Psychiatric Association, 2013; Dymond & Roche, 2017), and avoidance goals and worse well-being (Chen & Luo, 2015; Daumiller et al., 2021; Elliot et al., 1977; Senko & Freund, 2015), avoidance goals might decrease during a season (see also Cumming et al., 2017). Still, if the environment is highly stressful and detrimental to mental health, approach, mastery, and performance goal orientations might decrease whilst avoidance goal orientations might increase, as players seek to avoid and withdraw from their active participation (Adie et al., 2010). On balance and in line with the previous hypotheses and research, it was hypothesised that approach, mastery, and performance goal orientations would increase over time and during seasons, and avoidance goal orientation would decrease over time and during seasons (Cumming et al., 2017).

Table 28

Hypothesised (H) longitudinal ($_a$) and temporal ($_b$) change in each study variable.

Variable(s)	Hypothesised Change (H) Longitudinally $_{(a)}$ (i.e., from T1 to T6)	During Seasons $_{(b)}$
Perceived resources, basic psychological needs $_{(1)}$	Increase (H_{1a})	Increase (H_{1b})
Perceived demands $_{(2)}$	Increase (H_{2a})	Increase (H_{2b})
Achievement goals $_{(3)}$	Approach, mastery and performance increase, avoidance decrease (H_{3a})	Approach, mastery and performance increase, avoidance decrease (H_{3b})
Mental health $_{(4)}$	Improve (i.e., decrease for anxiety and depression, increase for MHI) (H_{4a})	Improve (i.e., decrease for anxiety and depression, increase for MHI) (H_{4b})

3.2 Hypotheses

In summary, within the present study, the hypotheses within Table 28 were tested. Analyses testing the H_a hypotheses can be found in the Change Longitudinally Over Three Consecutive Seasons section. Analyses testing the H_b hypotheses can be found in the Change During Three Separate Seasons for Players in Different Phases of Development and Change During a Composite Season When Timepoints Are Combined sections.

3.3 Methods, Results and Short Discussions

All analysed data were collected and prepared via the method described in chapter two. Descriptive statistics for perceived demands, resources, challenge and threat ratio (Appendix KK), coping potential (see Appendix LL), basic psychological needs (Appendix MM), approach and avoidance goals (Appendix NN), mastery and performance goals (Appendix OO), anxiety, depression and mental health (Appendix PP) can be found in the appendices. To make full use of the dataset and sample size at each timepoint, change in psychological demands, resources and mental health were analysed in three ways. To support the reader's comprehension and understanding of each analysis, the method, results, and a short discussion are provided for the first approach to analysis before moving onto the second, and then the third. Thus, this section contains three subsections. The first subsection contains the method, results, and short discussion from the longitudinal change analysis, which explored change from the first (T1) to the final (T6) timepoint (inclusive of all timepoints). The second subsection contains the method, results, and short discussion from the in-season temporal change analysis, which explored change during each of the three seasons separately. Finally, the third subsection contains the method, results, and short discussion from the in-season temporal change during a *composite* season analysis. The composite season analysis involved combining T1, T3 and T5 data to create an early-season timepoint, and combining T2, T4 and T6 data to create a late-season timepoint. This maximised the data set and strengthened the statistical power within the analysis.

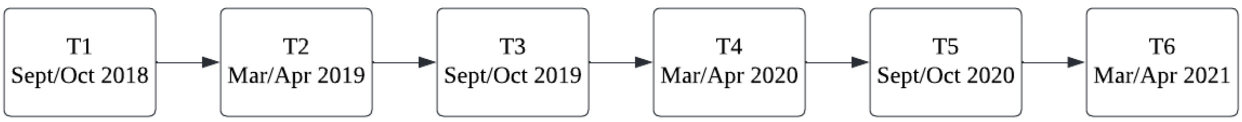
When discussing the results, instances where statistically significant changes were both statistically and *practically* significant are outlined, with practical significance referring to change equivalent to a full Likert-scale change from one timepoint to another. For example, on a Likert-scale ranging from one to five, if mean scores at T1 were 1.2 and mean scores at T2 were 2.2, this is practically significant because the change represents a change in a whole response option, a meaningful shift in perception. Indeed, if mean scores were then 3.2 at T3, this would indicate a practically meaningful change in average scores from one side of the Likert-scale's mid-point (i.e., disagree) to the other (i.e., agree). Discussion of statistical changes alone could mask this type of practically significant change, which is why it is highlighted to the reader in the short discussion sections where relevant.

3.4 Change Longitudinally Over Three Consecutive Seasons

In this section, players who provided data at all six timepoints were included in the analysis. Changes in psychological demands, resources and mental health over the course of three consecutive seasons were explored (see Figure 2), in line with hypotheses H_{1a}, H_{2a}, H_{3a}, and H_{4a}.

Figure 2

Visual illustration of the data used to test hypotheses H_{1a}, H_{2a}, H_{3a}, and H_{4a} through exploring longitudinal change over three consecutive seasons.



3.4.1 Method

Design and Participants. Longitudinal analysis over six timepoints (T1, T2, T3, T4, T5 and T6), based on a within-subjects, repeated measures design. A total of 78 youth football players (M*ageT1*=11.77, SD=2.45) completed every eligible questionnaire at every timepoint. Age at T1 ranged from 8 to 17-years, increasing to 10 to 19-years by T6. One further participant who completed the stress appraisals, basic psychological needs, and achievement goal questions at five of the six timepoints completed the mental health questionnaires at all six timepoints. Therefore, the sample size for analysing mental health change over six timepoints was 79 (M*ageT1*=11.82, SD=2.48).

Analytic Strategy. A priori power analyses conducted using G*Power (Faul et al., 2007) indicated that to detect a medium effect size using ANOVA (0.25, Cohen, 1988) when six measurements are taken from one group, a sample of 40 participants would be needed to achieve 80% power, where $\alpha=0.05$. Therefore, the sample sizes of N = 78/79 for the present analyses were sufficient. Multivariate analysis of covariance (MANCOVA) and analysis of covariance (ANCOVA) was used to examine longitudinal changes for each dependent variable over the course of six timepoints (three consecutive seasons). A total of six MANCOVA and three ANCOVA analyses were conducted; participants' age at the first timepoint was included as a covariate to control for the effects of age (see Table 29).

Table 29

Illustration of the analyses when longitudinally exploring changes over three consecutive seasons.

Scale(s) Included	Type of Analysis	Timepoints Used	Sample Size
Demands, Resources	MANCOVA	T1, T2, T3, T4, T5, T6	78
Challenge and Threat Ratio	ANCOVA	T1, T2, T3, T4, T5, T6	78
Coping Potential	ANCOVA	T1, T2, T3, T4, T5, T6	78
Autonomy, Competence, Relatedness	MANCOVA	T1, T2, T3, T4, T5, T6	78
Approach Goals, Avoidance Goals	MANCOVA	T1, T2, T3, T4, T5, T6	78
Mastery Goals, Performance Goals	MANCOVA	T1, T2, T3, T4, T5, T6	78
Anxiety, Depression	MANCOVA	T1, T2, T3, T4, T5, T6	52
Mental Health Inventory (U9-U11)	ANCOVA	T1, T2, T3, T4, T5, T6	27
Common Anxiety, Common Depression	MANCOVA	T1, T2, T3, T4, T5, T6	79

3.4.2 Results

For means and standard deviations from this analysis, see Table 30 and for inferential statistics, see Table 31.

Stress Appraisals. The MANCOVAs indicated that perceived demands significantly increased from T1 to T2, T3, T4, T5, and T6. These increases were all moderate in size (Cohen's *d* ranged from .56 to .68). Perceived resources also significantly increased from T1 to T2, T3, T4, T5, and T6. The increases from T1 to T2 (*d*=.64) and from T1 to T4 (*d*=.79) were moderate and the increases from T1 to T3 (*d*=.87), T1 to T5 (*d*=.9) and T1 to T6 (*d*=.9) were large. Perceived resources also significantly increased from T2 to T5 (small change, *d*=.36) and from T2 to T6 (small change, *d*=.37, Cohen, 1988). There were no significant changes in the challenge and threat ratio or coping potential.

Basic Psychological Needs. The MANCOVAs indicated there were no significant changes in perceived autonomy, competence, and relatedness between any of the timepoints.

Achievement Goals. The MANCOVAs indicated that approach goal orientation significantly increased from T1 to T2 (small change, *d*=.36), from T1 to T3 (moderate change, *d*=.63), and from T1 to T4 (small change, *d*=.49). Furthermore, mastery goal orientation significantly increased from T1 to T2 (moderate change, *d*=.6) and from T1 to T4 (small change, *d*=.43). Finally, mastery goal orientation significantly decreased from T2 to T5 (small change, *d*=.43, Cohen, 1988).

Mental Health. The MANCOVAs utilisting GAD-10 and common anxiety data both indicated that anxiety significantly decreased from T1, T2, T3 and T4 to T5; anxiety was significantly lower at T5 than at any preceding timepoint. The decreases in GAD-10 scores from T1, T2 and T4 to T5 were large (Cohen's *d* ranged from .98 to 1.01), and the decrease from T3 to T5 was moderate (*d*=.77). The decreases in common anxiety scores were all moderate (Cohen's *d* ranged from .68 to .77). Then, anxiety symptoms (using GAD-10 data only) significantly increased from T5 to T6 (moderate change, *d*=.51, Cohen, 1988).

Table 30

Longitudinal change across three seasons; mean (M) and standard deviation (SD) scores for all variables measured at each timepoint.

Variable	Timepoint					
	T1	T2	T3	T4	T5	T6
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Demands	3.88 (.92)	4.41 (.84)	4.46 (.78)	4.44 (0.85)	4.36 (.78)	4.42 (.83)
Resources	5.69 (0.98)	6.20 (.54)	6.37 (.52)	6.32 (0.55)	6.38 (.47)	6.40 (.53)
Challenge and Threat Ratio	.69 (.14)	.72 (.16)	.71 (.15)	.71 (0.16)	.69 (.13)	.70 (.16)
Coping Potential	-.04 (1.19)	-.21 (1.33)	-.12 (1.20)	-.22 (1.24)	.032 (1.40)	-.09 (1.09)
Autonomy	4.65 (.74)	4.57 (.70)	4.70 (.72)	4.60 (0.72)	4.54 (.68)	4.58 (.74)
Competence	5.01 (.62)	5.00 (.47)	5.11 (.54)	4.91 (0.56)	5.04 (.55)	5.04 (.59)
Relatedness	5.26 (.71)	5.34 (.61)	5.39 (.62)	5.29 (0.58)	5.28 (.58)	5.27 (.61)
Approach Goals	5.71 (1.10)	6.08 (.96)	6.30 (.74)	6.18 (0.81)	6.05 (.91)	6.04 (.86)
Avoidance Goals	3.54 (1.45)	3.83 (1.19)	3.54 (1.37)	3.58 (1.28)	3.38 (1.23)	3.39 (1.19)
Mastery Goals	4.96 (1.10)	5.56 (.89)	5.29 (.86)	5.38 (0.86)	5.19 (.82)	5.29 (.76)
Performance Goals	4.29 (1.38)	4.35 (1.29)	4.54 (1.30)	4.38 (1.19)	4.25 (1.39)	4.14 (1.30)
Anxiety (GAD-10)	.40 .38)	.35 (.29)	.31 (.32)	.37 (0.32)	.12 (.14)	.22 (.24)
Depression (PHQ-8)	.34 (.27)	.28 (.29)	.27 (.26)	.29 (0.27)	.18 (.23)	.23 (.23)
Mental Health Inventory (U9-U11 at T1)	81.78 (11.39)	79.11 (9.10)	82.37 (8.82)	84.74 (9.35)	84.44 (10.31)	85.41 (8.03)
Common Anxiety	.46 (.42)	.47 (.40)	.40 (.3)	.42 (0.36)	.19 (.32)	.25 (.34)
Common Depression	.38 (.38)	.36 (.44)	.30 (.34)	.26 (0.27)	.17 (.23)	.23 (.23)

Table 31

Longitudinal change over three seasons controlling for the effects of age; all MANCOVA statistics.

Variable	Time: Multivariate	Time: Univariate
Demands+	$F(10,67) = 6.19$, $p < 0.001$, Wilk's $\Lambda = 0.52$, $\eta=0.48$, $1\text{-}\beta=1.0$	$F(4.11,312.27) = 3.21$, $p = 0.012$, $\eta=0.04$, $1\text{-}\beta=0.83$
Resources+		$F(3.43,260.48) = 21.05$, $p < 0.001$, $\eta=0.22$, $1\text{-}\beta=1.0$
Challenge and Threat Ratio	$F(5,72) = 2.02$, $p = 0.086$, Wilk's $\Lambda = 0.88$, $\eta=0.12$, $1\text{-}\beta=0.64$	-
Coping Potential	$F(5,72) = 0.83$, $p = 0.536$, Wilk's $\Lambda = 0.95$, $\eta=0.05$, $1\text{-}\beta=0.28$	-
Autonomy+	$F(15,62) = 2.55$, $p = 0.005$, Wilk's $\Lambda = 0.62$, $\eta=0.38$, $1\text{-}\beta=0.98$	$F(4.28,325.33) = 1.89$, $p = 0.107$, $\eta=0.02$, $1\text{-}\beta=0.59$
Competence+		$F(4.05,307.81) = 4.10$, $p = 0.003$, $\eta=0.05$, $1\text{-}\beta=0.92$
Relatedness		$F(5,380) = 3.15$, $p = 0.008$, $\eta=0.04$, $1\text{-}\beta=0.88$
Approach Goals+	$F(10,67) = 3.75$, $p < 0.001$, Wilk's $\Lambda = 0.64$, $\eta=0.36$, $1\text{-}\beta=0.99$	$F(3.91,297.15) = 8.74$, $p < 0.001$, $\eta=0.10$, $1\text{-}\beta=0.99$
Avoidance Goals+		$F(4.12,313.46) = 0.68$, $p = 0.609$, $\eta=0.01$, $1\text{-}\beta=0.22$
Mastery Goals	$F(10,67) = 3.27$, $p = 0.002$, Wilk's $\Lambda = 0.67$, $\eta=0.33$, $1\text{-}\beta=0.98$	$F(5,380) = 4.98$, $p < 0.001$, $\eta=0.06$, $1\text{-}\beta=0.98$
Performance Goals+		$F(3.94,299.56) = 1.17$, $p = 0.325$, $\eta=0.02$, $1\text{-}\beta=0.36$
Anxiety (GAD-10)+	$F(10,41) = 5.59$, $p < 0.001$, Wilk's $\Lambda = 0.42$, $\eta=0.58$, $1\text{-}\beta=0.99$	$F(3.62,180.84) = 5.78$, $p < 0.001$, $\eta=0.10$, $1\text{-}\beta=0.97$
Depression (PHQ-8)+		$F(4.03,201.63) = 5.63$, $p < 0.001$, $\eta=0.10$, $1\text{-}\beta=0.98$
Mental Health Inventory	$F(5,21) = 1.59$, $p = 0.208$, Wilk's $\Lambda = 0.73$, $\eta=0.27$, $1\text{-}\beta=0.45$	-
Common Anxiety+	$F(10,68) = 3.46$, $p = 0.001$, Wilk's $\Lambda = 0.66$, $\eta=0.34$, $1\text{-}\beta=0.99$	$F(3.50,269.83) = 4.56$, $p = 0.002$, $\eta=0.06$, $1\text{-}\beta=0.92$
Common Depression+		$F(3.67,282.37) = 6.69$, $p < 0.001$, $\eta=0.08$, $1\text{-}\beta=0.99$

Note. Observed power = $1\text{-}\beta$ where $\alpha=0.05$, + assumption of sphericity violated, - univariate analyses not possible due to single variable in ANCOVA.

Anxiety symptoms (GAD-10 data only) also significantly decreased from T1, T2 and T4 to T6. The decreases from T1 to T6 (d=.57) and from T4 to T6 (d=.53) were moderate. The decrease from T2 to T6 was small (d=.49). Common anxiety scores significantly decreased from T1, T2, T3 and T4 to T6. The decreases from T1 to T6 (d=.55) and T2 to T6 (d=.59) were moderate, and the decreases from T3 to T6 (d=.47) and T4 to T6 (d=.49) were small (Cohen, 1988).

Depression symptom frequency (PHQ-8 data only) significantly decreased from T1 to T5 (moderate change, d=.64) and from T4 to T5 (small change d=.44). Depression symptom frequency (PHQ-8 and common depression) also significantly decreased from T1 to T6 (small change, d=.44, Cohen, 1988). Similarly, common depression scores significantly decreased from T1, T2 and T3 to T5. The decreases in common depression scores from T1 to T5 (d=.67) and T2 to T5 (d=.54) were moderate, and the decrease from T3 to T5 was small (d=.45).

3.4.3 Summary and Short Discussion

When testing hypotheses H_{1a}, H_{2a}, H_{3a}, and H_{4a} regarding the longitudinal change in psychological demands and resources and mental health across three consecutive seasons, perceived demands and perceived resources significantly increased after the first data collection timepoint and remained significantly higher throughout the remaining timepoints, in support of H_{1a} and H_{2a}. The increases in perceived demands were also practically significant; at T1 mean demand appraisals were weighted towards “disagree” (M=3.88; below the central, neutral point of 4 on the Likert-scale), meaning generally the players did not view academy football as demanding at T1. Yet, at every subsequent timepoint, mean demand appraisals were weighted towards “agree” (mean demands at T2, T3, T4, T5 and T6 were greater than 4); generally, the players did view academy football as demanding from T2 to T6. This may be because as players progressed into older age groups, physical and psychological demands increased; football became faster and thus more physically and technically demanding. For younger players, the pitch and ball size also became larger, and coaches tended to demand increasingly more from their players. Thus, the first timepoint (T1) represents the time when objective demands were at their lowest for every player within the study. Therefore, the increase in perceived demands from T1 could reflect an objective increase in demand.

Alternatively, the increase in perceived demands and resources from T1 may reflect the fact that T1 was the first occasion players completed the questionnaire and had to contemplate academy football's demands against their own personal resources. Thus, the changes from T1 may be due to reactive effects, which are more likely when experiencing a novel assessment technique, or when the process of assessment is motivating (Campbell & Stanley, 1996). Similarly, through completing the questionnaire itself, players' awareness of the demands of football and their personal resources may have acutely increased, leading to a reported change in appraisals following T1. Relatedly, at T1 players completed the questionnaires at their youngest. From that point onwards, players became older and potentially more self-aware, or aware of their resources and the demands placed upon them (e.g., Metcalfe & Finn, 2013). At the first completion players may not have understood the questions, but as they answered the questions more often and themselves became older, their understanding may have improved and so their scores may have changed. Whilst not testable, it is plausible that these factors could explain the observed change in perceived demands and resources from T1.

Still, regarding the questionnaire design and layout, because the demand items followed each other in sequential order, and then the resource items followed each other, the consistently higher responses from T2 to T6 could have been due to straightlining (Roßmann et al., 2017). In other words, players responded to five demand items and then four resource items in their questionnaires; players may have differentiated their answers less because similar items were grouped together and responded to one after the other (Krosnick & Alwin, 1989). Straightlining may have been particularly prevalent in those players who provided data at a greater number of timepoints (Schonlau & Toepoel, 2015). Randomising the item ordering may have counteracted this problem. However, similarly phrased items were kept together to limit the time young players took to complete the questionnaire battery and ensure the research operated within environmental time constraints. Furthermore, as was the case with the younger age group players, fewer questions could have been provided on each page for older age group players to reduce the likelihood of straightlining and increase the likelihood of players reading each question fully.

Whilst the significant increase in perceived resources from T1 supports H_{2a}, the lack of any significant change in BPNs over time fails to support H_{2a}. These different change patterns may reflect the conceptual distinctions between the perceived resources scale (reflecting the BPSM resources of general self-confidence, positive disposition, and outcome expectancies) and BPNs (i.e., perceptions of autonomy, competence, and relatedness). Alternatively, it could be that for BPNs to significantly change over time, these need to be the specific targets of intervention. For example, coaches' leadership and coaching style has been consistently related to their athletes' satisfaction of BPNs (e.g., Amorose & Anderson-Butcher, 2007; Hollembeak & Amorose, 2005; Wang et al., 2009). Coaches who do not intentionally and consistently seek to develop their players' perceptions of autonomy, competence, and relatedness through making changes to their own coaching behaviours and interactions may be unlikely to successfully do so (Reinboth et al., 2004; Reynders et al., 2019). Thus, the lack of such intervention during the study period could explain the lack of significant change in these variables.

Alternatively, considering the sample in this analysis largely comprised children, and children are less self-aware and accurate in self-appraisals than adults, owed to their limitations in self-regulation, metacognition, and the ability to be introspective (Duncan et al., 2018; Papaleontiou-Louca & Thoma, 2014), the lack of significant change in BPNs could be related to these cognitive limitations within the participant group. For instance, regarding perceptions of competence, children often judge their own skills and abilities based on external sources and via self-comparison (Schunk, 1989) rather than relying on their own internal sources. Furthermore, children struggle to incorporate task difficultly into self-judgements meaning they struggle to recognise self-improvement when task difficulty increases alongside this improvement (Bandura, 1986). Given that objective football demands increase over time within football academies, and football academies seek to improve and develop all players within an age group (i.e., increase objective competence), this could explain why perceived competence did not increase over time in the present study. Players may have struggled to recognise their increased competence because the demands of football also increased, and because their teammates also improved over time.

Related to this, the lack of an increase in perceived autonomy could indicate that this football academy was not autonomy supportive by nature, suggesting youth academy environments more broadly may not be autonomy supportive. Whilst autonomy supportive environments bestow benefits to athletes with regards to their development and well-being (Mossman et al., 2022), there are pragmatic benefits to withholding autonomy from children and young people. For instance, football academies deliver coaching programmes comprising a clear playing philosophy. The delivery of clear technical and tactical outcomes to children may thus require a considerable amount of coach directed training sessions. Of course, autonomy supportive behaviours can be incorporated into sessions, but if this is too salient within youth settings, this may stifle progress and learning through steering focus too far from a necessary curriculum.

Relatedly, considering the requirements to deliver an age-appropriate, academy wide playing philosophy (Premier League, 2012); players were often instructed by their coach how to play and how to improve (i.e., corrective instruction), potentially leading to a low autonomy supportive environment generally. But attention should also be paid to the wording of the perceived autonomy items. In general, players likely disagreed with the “I can decide for myself how to do things at football at [club]” and “I can plan my own training at [club]” items, because they objectively could not always do this. Moreover, despite the fact academy processes enabled player autonomy (such as requiring players to create their own development plan each season, devoting 15 minutes of training time per week to allow players to work on a football skill/attribute of their choosing, and coaches asked players questions and gave players choices to make within training sessions), these opportunities for the exertion of autonomy were relatively infrequent. Indeed, these opportunities for autonomy may not have been taken up by every player or factored into their thinking when responding to the items, because the items did not concretely refer to these examples of autonomy being offered. Thus, opportunities for autonomy may not have factored into players’ appraisals during questionnaire completion, which could explain the lack of an increase over time.

The lack of an increase in perceived relatedness over time could be explained on consideration of the wording of the questionnaire items (see Appendix N, Appendix O). Four of the five perceived relatedness items refer to both coaches and teammates within the item wording. Whilst one might expect perceived relatedness with teammates to increase over time because this group of individuals would largely remain consistent, it is less likely that longitudinal increases in coach relatedness would occur because players were rarely coached by the same coach for more than one season; each season new relationships needed to be established between player and their new coach. Since the question wording did not allow participants to differentiate between perceived relatedness towards their coach and perceived relatedness towards teammates, this may have contributed to the lack of any significant change in perceptions. Moreover, considering the highly competitive nature of football academies, players are challenged to perform both with and against their peers. This potentially challenging social context could give rise to competitive tensions, disagreements amongst players within the same age group which stifle relationship development. This could also explain the lack of an increase in perceived relatedness.

The approach and mastery goal orientations significantly increased from the first through to the fourth timepoint, supporting H_{3a}. The increase in approach goal orientations may relate to the increases in perceived resources; personal resources incorporate approach focus within the TCTSA (Jones et al., 2009; Meijen et al., 2020) and the items used to measure perceived resources within the present study resonate with approach and mastery themes (see Mendes et al., 2007, Appendix F). Indeed, one item measuring perceived resources doubled as the mastery approach achievement goal item. Thus, it follows that as personal resources increased, mastery and approach goal orientations increased. The increase in mastery goal orientations may also relate to the increase in perceived demands; as the demands of academy football objectively increase over time (and relatedly the anticipated required effort increases too), players might become increasingly motivated towards improving the skills needed to meet those demands (i.e., put in more effort) because they know this will be required if they are to achieve their goals of earning their next contract or becoming a professional football player (e.g., Agbuga & Xiang, 2008; Sideris & Kaplan, 2011).

Still, increases in approach and mastery goal orientations may be reflective of the motivational climate within the academy. Academy processes aimed to foster the pursuit of personal achievement (i.e., task motivation orientations). For example, at the start of each season players created a development plan, highlighting how they could improve on three key areas of their football performance of their choosing. Throughout each season players were reviewed against these areas and provided with individualised, process related feedback. Players were not compared to others; feedback related to how they had progressed since their previous review. Therefore, the longer players were within the academy, the more these processes may have influenced achievement goal orientations, towards approach and mastery (Castillo et al., 2011).

Failing to support H_{3a}, that approach goal orientations were lower at T5 (relative to T2) may be due to the impact of the COVID-19 lockdown. Since football was taken away from players entirely, players' motivations towards football may have changed from wanting to achieve and improve (i.e., higher approach goals at T2) to simply wanting to return and start playing again (i.e., lower approach goals at T5). Of course, such explanations can only be speculative given the quantitative nature of the data.

Finally, support for H_{4a} was mixed; whilst anxiety and depression symptom frequencies were significantly lower in the third season (at T5 and T6) than at any preceding timepoint (supporting H_{4a}), anxiety symptom frequency significantly increased during S3 (from T5 to T6, not supporting H_{4a}). The lower anxiety in S3 is also practically significant since from T1 to T4, players' anxiety symptom frequency (M=.31 to .4) was consistently between "occasionally" (0.25) and "half of the time" (0.5), and this decreased to less than "occasionally" and almost "not at all" at T5 (M=.12). From T5 to T6 (M=.22), anxiety symptom frequency increased towards but did not reach "occasionally".

The unpredictable and confounding variable of COVID-19, and generally varying degrees of uncertainty experienced by players during the study period may explain some of the changes in anxiety symptoms, since greater uncertainty is related to greater anxiety (Grupe & Nitschke, 2013). Specifically, the COVID-19 lockdown (taking place around T4) was a time of heightened uncertainty on a national and international level (Dettmann et al., 2022; Mertens et al., 2020). There was much speculation in the news regarding how the COVID-19 and corona virus outbreak would impact life in the UK. National News in the UK around T4 showed scenes of total lockdown in Italy and other European countries (see British Broadcasting Company News, 2020a, 2020b, 2020c). Thus, between T4 and T5, players were experiencing uncertainty regarding COVID implications for the football season and their contracts, as well as if/when football and formal education would return, amongst other things. For many of the younger players, their contracts were extended due to the extenuating circumstances of the season ending prematurely due to the lockdown. By T5 the lockdown period had ended, players had returned to school and the academy, and life was gradually starting to return to normal. Therefore, the removal of these uncertainties may explain why anxiety was lower during S3 than at any preceding timepoint (Grupe & Nitsche, 2013). Relatedly, following the first lockdown in April 2020, a second lockdown look place in the UK during the winter. For many of the age groups (under-9 to under-15), this meant that once again, their football season was paused and did not restart until just before T6. This lockdown reoccurrence may have contributed to the increase in anxiety from T5 to T6 (see Dettman et al., 2022). Finally, anxiety may have significantly increased during S3 (from T5 to T6) since those players whose contracts were extended (instead of terminated) at the time of the initial lockdown were now awaiting a renewal decision, on top of those players whose contracts were already scheduled for renewal around the time of T6.

Alternatively, it is possible that, having experienced so much uncertainty during the previous 12 months (Dettmann et al., 2022; Mertens et al., 2020), players developed coping strategies for tolerating or dealing with anxiety; players' mental health may have been protected from the stressors of academy football in S3 relative to previous seasons. With enough support throughout adversity (as well as satisfaction of basic psychological needs, resilience, and other factors), individuals can experience growth following adversity (Joseph & Linley, 2005; Maercker & Zoellner, 2004). Throughout 2020 and 2021, players received a great deal of support from the academy. For example, regular supportive communications between the club and parents/guardians and players provided clarity amidst uncertainty. Coaches regularly checked in with players, psychological support was provided to those who demonstrated a need after mental health screening, and training sessions, challenges and competitions were set to keep players connected and engaged with each other and academy staff whilst in lockdown. Thus, from having tolerated so much uncertainty throughout T4-T6, it could be that players grew through adversity and developed strategies for dealing with uncertainty, explaining why fewer symptoms of anxiety were reported at T6 than at T1, T2, T3 and T4.

The significant decreases in common depression scores and depression symptom frequency (PHQ-8) from early study timepoints to S3 (T5 and T6, supporting H_{4a}) mirrors the pattern of change observed in anxiety symptom frequency, which is unsurprising since depression and anxiety are positively related (Jansson-Fröjmark & Lindblom, 2008) and highly comorbid in adolescents (Ollendick & Hirshfield-Becker, 2002). The decreases were practically significant since at T1, players' depression symptom frequency (T1M=.34) reflected "several days" (.33), and at T2, T3 and T4, symptoms frequency reflected less than several days, with the means falling between "not at all" (0) and "several days" (M=.27 to

.29); depression symptom frequency decreased both practically and significantly from T1 to T5 (T5M=.19) and from T1 to T6 (T6M=.23).

When seeking to understand the decrease in depression symptoms, consideration of the impact of COVID-19 is again warranted. Players were unable to play football or maintain the same level of pre-lockdown participation in sport during the COVID-19 lockdown (taking place between T4-T5, e.g., Schmidt et al., 2020; Stockwell et al., 2021). Since depression symptoms are associated with burnout and fatigue (Bianchi & Schonfeld, 2018), the rest players gained between T4 and T5 when they were unable to train or play football as normal, may explain the lower levels of depression symptoms in S3. Similarly, players were unable to see friends at school between T4 and T5; declines in social interactions could have led to worsening mental health outcomes following T4 (see Orben et al., 2020). Since participants were starting to return to school, football, and socialising at T5, this may have benefitted players mental health and mood (see Badri et al., 2021), alleviated negative mental health symptoms experienced between T4 and T5, thus potentially explaining the lower levels of depression symptoms in S3. Finally, like with anxiety, lower levels of depression in S3 could be explained by adversarial growth following the pandemic (Joseph & Linley, 2005; Maercker & Zoellner, 2004).

Alternatively, since lower levels of anxiety and depression were observed alongside higher levels of resources in S3 (relative to the earlier, pre-pandemic timepoints), it is plausible that perceived resources may have protected players' mental health against the negative effects of stress (see Mayer et al., 2017; Raedeke & Smith, 2004; Salmelo-Aro & Upadyaya, 2014; Williams et al., 1991). However, further analyses are required to substantiate this explanation and will be reported within chapter four.

Overall, this analysis showed interesting longitudinal change in psychological demands and resources and mental health variables, with mixed support for three of the four relevant hypotheses. Further exploration of the data is required due to attrition, which is commonplace in longitudinal research (Schaffer, 1996) and expected in the context of academy football (Calvin, 2018); the sample size for this analysis was limited to 78 or 79. Thus, analyses on a larger dataset are required to better understand the change taking place. Furthermore, this longitudinal analysis failed to show if change was dependent upon a players' phase of development. Therefore, to maximise the sample size at each timepoint and explore differences between groups (i.e., players in different developmental phases), in-season change was explored for each season separately for players in different phases of development (i.e., FP, YDP, PDP) and is reported in the next section.

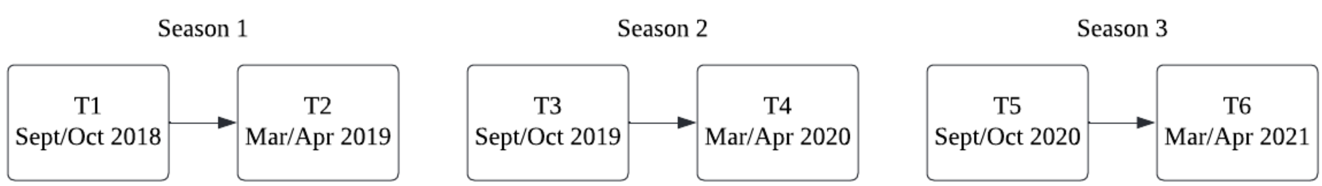
3.5 Change During Three Separate Seasons for Players in Different Phases of Development

In this section, players who provided full-season data within any of the three seasons were included in the analysis. In other words, players who provided data at the start (T1) and the end (T2) of S1 were included in the S1 change analysis. Players who provided data at the start (T3) and the end (T4) of S2 were included in the S2 change analysis. Players who provided data at the start (T5) and the end (T6) of S3 were included in the S3 change analysis. This allowed the analysis of in-season change within each season separately. Such analysis builds upon the extant temporal challenge and threat research which documented change within single competitive seasons (see Chadha et al., 2023; Cumming et al., 2017; Davies et al., 2023). The change reported in these studies may only apply to the particular season being studied; categorical patterns of in-season change cannot be deduced. Thus, the present research could illuminate whether there are consistent patterns of in-season change, or whether in-season change differs between seasons. This is important to know because there are implications for the measurement and evaluation of sport psychology interventions. For example, if a season-long intervention targets the development of BPNs, but BPNs are likely to increase naturally over the course of a season, the impact of interventions could be inflated for failing to control for "natural" increases in these variables. Analysing each season separately also maximised the sample size within the present research, again building on the extant temporal literature (Davies et al., 2023) employing smaller sample sizes (Chadha et al., 2023; Cumming et al., 2017). Consequently, any significant findings within the present research can be considered more robust owed to the stronger statistical power.

Some players provided data for only one season, such as players who provided data at both T1 and T2 but then left the academy after T2; they featured only within the S1 individual season analysis. Other players provided data for two seasons, such as players who provided data at T1, T2, T3 and T4, but left after T4; they featured within the S1 and S2 individual season analyses. Similarly, players who provided data at T3, T4, T5 and T6 featured within the S2 and S3 individual season analyses. Of course, the 78/79 players who were included within the longitudinal analyses featured within the S1, S2 and S3 individual season analyses. Changes in psychological demands, resources and mental health during each individual season were explored (see Figure 3) in line with hypotheses H_{1b}, H_{2b}, H_{3b}, and H_{4b}.

Figure 3

Visual illustration of the data used to test hypotheses H_{1b}, H_{2b}, H_{3b}, and H_{4b} through exploring temporal change during three separate seasons for players in different phases of development.



3.5.1 Method

Design and Participants. A cross-sectional analysis of change during three individual seasons, based on a within-subjects, repeated-measures design. In S1 (T1-T2), a total of 130 players completed every eligible questionnaire at T1 and T2; age at T1 ranged from 8 to 17-years (M*ageT1*=11.75, SD=2.45). 50 players completed the MHI (M*ageT1*=9.20, SD=.90) whilst 80 completed the GAD-10 and PHQ-8 at T1 and T2 (M*ageT1*=13.35, SD = 1.61). In S2 (T3-T4), 124 players completed every eligible questionnaire at T3 and T4; age at T3 ranged from 8 to 18-years (M*ageT3*=12.19, SD=2.66). Two further participants completed the mental health questionnaires T3 and T4. In total, 126 players completed the MHI (M*ageT3*=12.25, SD=2.68) and 84 completed the GAD-10 and PHQ-8 at T3 and T4 (M*ageT3*=13.77, SD=1.83). In S3 (T5-T6), 150 players completed every eligible questionnaire including the MHI at T5 and T6; age at T5 ranged from 8 to 19-years (M*ageT5*=12.55, SD=2.96). In total, 104 players completed the GAD-10 and PHQ-8 at T5 and T6 (M*ageT5*=14.08, SD=2.17).

Table 32

Illustration of the analyses when temporally exploring changes during three separate seasons.

Scale(s) Included	Type of Analysis	Timepoints Used			Sample Size		
		Season 1	Season 2	Season 3	Season 1	Season 2	Season 3
Demands, Resources	MANOVA	T1, T2	T3, T4	T5, T6	130	124	150
Challenge and Threat Ratio	ANOVA	T1, T2	T3, T4	T5, T6	130	124	150
Coping Potential	ANOVA	T1, T2	T3, T4	T5, T6	130	124	150
Autonomy, Competence, Relatedness	MANOVA	T1, T2	T3, T4	T5, T6	130	124	150
Approach Goals, Avoidance Goals	MANOVA	T1, T2	T3, T4	T5, T6	130	124	150
Mastery Goals, Performance Goals	MANOVA	T1, T2	T3, T4	T5, T6	130	124	150
Anxiety, Depression	MANOVA	T1, T2	T3, T4	T5, T6	80	84	104
Mental Health Inventory	ANOVA	T1, T2	T3, T4	T5, T6	50*	126	150

Note. *Data were available from U9, U10 and U11 players only for this ANOVA.

Analytic Strategy. Sample sizes in the present analyses were mostly sufficient since a priori power analyses conducted using G*Power (Faul et al., 2007) indicated that to detect a medium effect size (0.25) when two measurements are taken from three groups, a sample of 81 participants would be needed to achieve 80% power, where α=0.05. Multivariate mixed (within and between subjects) 2x3 analysis of variance (MANOVA) and analysis of variance (ANOVA) was used to examine temporal change for each dependent variable during three separate seasons. A total of 15 MANOVAs and nine ANOVAs were conducted (see Table 32). Participants' developmental phase at the start of each season was included as a between-subjects factors to explore whether change during a season differed between players in the FP (under-9 to under-12 age groups), YDP (under-13 to under-16 age groups) and PDP (under-18 and under-23 age groups).

3.5.2 Results

For means and standard deviations for S1, S2 and S3, see Table 33. For the inferential statistics for S1, S2 and S3, see Table 34, Table 35, and Table 36 respectively.

Stress appraisals. The MANOVAs indicated that in S1, perceived demands (*d*=.65) significantly, moderately increased from T1 to T2. For FP and YDP players, perceived demands significantly increased from T1 to T2. The increase for YDP players was small (*d*=.27, Cohen, 1988) and the increase for FP players was very large (*d*=1.44, Sawilowsky, 2009). Perceived resources also significantly, moderately increased from T1 to T2 (*d*=.72), but this was only true for FP players; their increase in perceived resources very large (*d*=1.55, Sawilowsky, 2009).

There were no significant changes in stress appraisals during S2. In S3, perceived demands significantly increased from T5 to T6; this increase was very small (*d*=.16, Sawilowsky, 2009). The ANOVAs indicated that in general, the challenge and threat ratio significantly increased from T5 to T6 (small change, *d*=.26); players became less challenged during S3. Similarly, the DRES significantly decreased from T5 to T6 (small change, *d*=.22, Cohen, 1988); players' perceived coping ability changed from a perceived ability to a

Table 33

Change during three separate seasons; mean (M) and standard deviation (SD) scores for all variables measured at each timepoint.

Variable	Group	Timepoint T1	T2	T3	T4	T5	T6
		M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Demands	Total	3.85 (.89)	4.45 (.77)*	4.41 (.75)	4.35 (.88)	4.21 (.90)	4.35 (.86)*
	PDP	4.51 (.43)	4.50 (.66)	4.89 (.79)	5.01 (.99)	4.63 (.60)	4.82 (.73)
	YDP	4.30 (.87)	4.52 (.77)*	4.47 (.79)	4.55 (.80)	4.38 (.87)	4.47 (.91)
	FP	3.35 (.63)	4.38 (.79)*	4.21 (.67)	3.96 (.75)	3.87 (.91)	4.04 (.74)
Resources	Total	5.56 (.99)	6.14 (.56)*	6.34 (.53)	6.27 (.58)	6.40 (.47)	6.30 (.57)
	PDP	5.89 (.45)	6.22 (.49)	6.38 (.60)	6.45 (.44)	6.36 (.42)	6.38 (.54)
	YDP	6.27 (.59)	6.27 (.51)	6.44 (.48)	6.33 (.57)	6.40 (.45)	6.36 (.53)
	FP	4.88 (.85)	6.01 (.58)*	6.23 (.55)	6.15 (.61)	6.41 (.52)	6.21 (.62)
Challenge and Threat Ratio	Total	.70 (.15)	.73 (.16)	.70 (.14)	.70 (.16)	.66 (.15)	.70 (.16)*
	PDP	.77 (.09)	.73 (.15)	.78 (.14)	.78 (.17)	.73 (.09)	.76 (.15)
	YDP	.69 (.17)	.73 (.15)	.70 (.15)	.73 (.16)	.69 (.15)	.71 (.16)
	FP	.70 (.13)	.74 (.17)	.68 (.13)	.65 (.16)	.61 (.15)	.66 (.15)
Coping Potential	Total	-.07 (1.21)	-.37 (1.29)	-.19 (1.16)	-.13 (1.23)	.14 (1.51)	-.15 (1.09)*
	PDP	-.78 (1.09)	-.11 (1.62)	-.13 (1.30)	-.40 (1.24)	-.15 (1.80)	-.19 (1.02)
	YDP	.35 (1.36)	-.32 (1.07)	-.03 (1.19)	-.16 (1.28)	-.05 (1.19)	-.16 (1.01)
	FP	-.07 (1.06)	-.45 (1.43)	-.36 (1.09)	-.03 (1.18)	.46 (1.51)	-.11 (1.21)

Note. This includes the significant Bonferroni pairwise differences from the preceding timepoint, * p <0.05. ** p<0.001

Table 33

Variable	Group	T1	T2	T3	T4	T5	T6
		Timepoint					
		M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Autonomy	Total	4.71 (.72)	4.61 (.69)	4.67 (.68)	4.57 (.67)*	4.49 (.77)	4.46 (.81)
	PDP	4.44 (.61)	4.78 (.43)	4.69 (.55)	4.15 (.65)	4.43 (.68)	4.22 (.75)
	YDP	5.04 (.59)	4.74 (.69)*	4.88 (.70)	4.81 (.64)	4.66 (.73)	4.83 (.71)
	FP	4.45 (.74)	4.48 (.70)	4.47 (.63)	4.43 (.63)	4.35 (.83)	4.19 (.80)
Competence	Total	5.04 (.60)	4.998 (.53)	5.12 (.52)	4.89 (.59)*	5.10 (.57)	5.06 (.57)
	PDP	4.69 (.61)	4.71 (.66)	5.04 (.62)	4.40 (.56)	4.75 (.51)	4.65 (.58)
	YDP	5.04 (.59)	5.10 (.45)	5.18 (.46)	4.96 (.63)	5.20 (.55)	5.21 (.55)
	FP	5.10 (.60)	4.94 (.56)*	5.07 (.55)	4.96 (.48)	5.13 (.58)	5.09 (.51)
Relatedness	Total	5.27 (.67)	5.32 (.59)	5.42 (.56)	5.30 (.58)*	5.39 (.55)	5.35 (.59)
	PDP	4.56 (1.11)	4.94 (.71)	4.99 (.74)	4.75 (.47)	4.90 (.54)	4.91 (.70)
	YDP	5.17 (.61)	5.35 (.61)*	5.45 (.56)	5.35 (.64)	5.43 (.54)	5.46 (.54)
	FP	5.47 (.57)	5.35 (.55)	5.52 (.45)	5.41 (.45)	5.56 (.46)	5.42 (.49)*
Approach Goals	Total	5.58 (1.10)	6.14 (.89)	6.39 (.73)	6.18 (.85)	6.21 (.88)	6.18 (.91)
	PDP	6.22 (.57)	5.78 (.91)	6.38 (.80)	6.33 (.79)	5.96 (.93)	5.88 (.86)
	YDP	6.05 (.89)	6.37 (.70)*	6.45 (.59)	6.27 (.76)	6.33 (.79)	6.30 (.77)
	FP	5.06 (1.10)	5.996 (1.00)*	6.33 (.84)	6.06 (.95)	6.20 (.95)	6.18 (1.03)
Avoidance Goals	Total	3.41 (1.40)	3.98 (1.25)	3.69 (1.43)	3.77 (1.36)	3.57 (1.47)	3.55 (1.45)
	PDP	4.39 (1.14)	3.61 (1.22)	3.83 (1.28)	4.07 (1.35)	3.63 (1.22)	3.60 (1.45)
	YDP	3.60 (1.51)	3.95 (1.20)	4.00 (1.54)	3.95 (1.36)	3.79 (1.40)	3.70 (1.43)
	FP	3.11 (1.25)	4.06 (1.30)*	3.33 (1.30)	3.50 (1.34)	3.32 (1.61)	3.38 (1.48)

Note. This includes the significant Bonferroni pairwise differences from the preceding timepoint. * $p < 0.05$. ** $p < 0.001$

Table 33

Variable	Group	T1	T2	T3	T4	T5	T6
		M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Mastery Goals	Total	4.83 (1.03)	5.58 (.85)*	5.37 (.88)	5.38 (.85)	5.24 (.93)	5.23 (.87)
	PDP	6.00 (.66)	5.56 (.53)	5.62 (.71)	5.83 (.96)	5.40 (.77)	5.50 (.84)
	YDP	5.20 (.83)	5.68 (.75)*	5.43 (.95)	5.50 (.81)	5.26 (.95)	5.24 (.80)
	FP	4.34 (.96)	5.50 (.96)*	5.24 (.85)	5.13 (.79)	5.14 (.99)	5.10 (.95)
Performance Goals	Total	4.16 (1.36)	4.54 (1.24)	4.71 (1.27)	4.58 (1.27)	4.54 (1.46)	4.50 (1.44)
	PDP	4.61 (1.17)	3.83 (1.32)	4.60 (1.20)	4.57 (1.13)	4.19 (1.40)	3.98 (1.45)
	YDP	4.45(1.53)	4.64 (1.27)	5.03 (1.36)	4.72 (1.38)	4.85 (1.43)	4.76 (1.47)
	FP	3.84 (1.16)	4.55 (1.18)*	4.43 (1.14)	4.43 (1.18)	4.37 (1.49)	4.46 (1.36)
Anxiety (GAD-10)	Total	.39 (.36)	.37 (.30)	.35 (.32)	.37 (.33)	.12 (.15)	.23 (.25)*
	PDP	.32 (.37)	.37 (.33)	.43 (.36)	.63 (.39)*	.14 (.16)	.33 (.31)
	YDP	.38 (.38)	.31 (.27)	.33 (.32)	.32 (.28)	.09 (.13)	.18 (.22)
	FP	.44 (.28)	.63 (.26)	.33 (.25)	.29 (.28)	.21 (.18)	.24 (.23)
Depression (PHQ-8)	Total	.36 (.32)	.32 (.32)	.27 (.25)	.30 (.27)	.18 (.23)	.22 (.22)
	PDP	.35 (.14)	.35 (.41)	.23 (.21)	.48 (.31)*	.18 (.18)	.29 (.25)
	YDP	.36 (.33)	.29 (.29)	.29 (.28)	.26 (.26)	.16 (.24)	.19 (.22)
	FP	.40 (.33)	.42 (.34)	.26 (.20)	.21 (.19)	.25 (.24)	.20 (.16)
Mental Health (MHI-5)	Total	-	-	80.51 (11.22)	80.35 (12.07)	82.39 (10.71)	83.36 (10.31)
	PDP	-	-	76.25 (12.26)	69.25 (13.52)*	80.15 (9.76)	75.02 (14.23)*
	YDP	-	-	82.71 (10.27)	80.79 (11.998)	84.90 (8.94)	85.42 (8.17)
	FP	77.52 (14.36)	76.16 (10.72)	79.48 (11.55)	83.19 (9.84)*	80.81 (12.25)	84.81 (8.58)*

Note. This includes the significant Bonferroni pairwise differences from the preceding timepoint. * p <0.05. ** p<0.001, - data were not collected from all phases.

Table 34

Inferential statistics for change during season one (from T1 to T2).

Variable	Time: Multivariate	Time: Univariate	Time x Phase: Multivariate	Time x Phase: Multivariate
Demands+	$F(2,126) = 19.36$, $p < 0.001$, Wilk's $\Lambda = 0.77$, $\eta = 0.24$, $1\text{-}\beta = 1.0$	$F(1,127) = 19.15$, $p < 0.001$, $\eta = 0.13$, $1\text{-}\beta = 0.99$	$F(4,252) = 20.94$, $p < 0.001$, Wilk's $\Lambda = 0.56$, $\eta = 0.25$, $1\text{-}\beta = 1.0$	$F(2,127) = 21.19$, $p < 0.001$, $\eta = 0.25$, $1\text{-}\beta = 1.0$
Resources+		$F(1,127) = 24.02$, $p < 0.001$, $\eta = 0.16$, $1\text{-}\beta = 0.998$		$F(2,127) = 32.04$, $p < 0.001$, $\eta = 0.34$, $1\text{-}\beta = 1.0$
Challenge and Threat Ratio	$F(1,127) = 0.434$, $p = 0.511$, Wilk's $\Lambda = 0.997$, $\eta = 0.003$, $1\text{-}\beta = 0.10$		$F(2,127) = 1.09$, $p = 0.341$, Wilk's $\Lambda = 0.98$, $\eta = 0.02$, $1\text{-}\beta = 0.24$	
Coping Potential	$F(1,127) = 0.01$, $p = 0.918$, Wilk's $\Lambda = 1.0$, $\eta = 0.00$, $1\text{-}\beta = 0.05$		$F(2,127) = 1.97$, $p = 0.144$, Wilk's $\Lambda = 0.97$, $\eta = 0.03$, $1\text{-}\beta = 0.40$	
Autonomy+	$F(3,125) = 1.81$, $p = 0.148$, Wilk's $\Lambda = 0.96$, $\eta = 0.04$, $1\text{-}\beta = 0.46$	$F(1,127) = 0.046$, $p = 0.830$, $\eta = 0.00$, $1\text{-}\beta = 0.06$	$F(6,250) = 4.16$, $p = 0.001$, Wilk's $\Lambda = 0.83$, $\eta = 0.09$, $1\text{-}\beta = 0.98$	$F(2,127) = 4.54$, $p = 0.012$, $\eta = 0.07$, $1\text{-}\beta = 0.76$
Competence+		$F(1,127) = 0.087$, $p = 0.768$, $\eta = 0.001$, $1\text{-}\beta = 0.06$		$F(2,127) = 2.29$, $p = 0.105$ $\eta = 0.04$, $1\text{-}\beta = 0.46$
Relatedness+		$F(1,127) = 3.76$, $p = 0.055$, $\eta = 0.03$, $1\text{-}\beta = 0.49$		$F(2,127) = 5.03$, $p = 0.008$, $\eta = 0.07$, $1\text{-}\beta = 0.81$
Approach Goals+	$F(2,126) = 2.44$, $p = 0.092$, Wilk's $\Lambda = 0.96$, $\eta = 0.04$, $1\text{-}\beta = 0.48$	$F(1,127) = 4.41$, $p = 0.038$, $\eta = 0.03$, $1\text{-}\beta = 0.55$	$F(4,252) = 7.35$, $p < 0.001$, Wilk's $\Lambda = 0.80$, $\eta = 0.10$, $1\text{-}\beta = 0.996$	$F(2,127) = 10.51$, $p < 0.001$, $\eta = 0.14$, $1\text{-}\beta = 0.99$
Avoidance Goals+		$F(1,127) = 0.95$, $p = 0.333$, $\eta = 0.01$, $1\text{-}\beta = 0.16$		$F(2,127) = 7.07$, $p = 0.001$, $\eta = 0.10$, $1\text{-}\beta = 0.92$
Mastery Goals+	$F(2,126) = 6.53$, $p = 0.002$, Wilk's $\Lambda = 0.91$, $\eta = 0.09$, $1\text{-}\beta = 0.90$	$F(1,127) = 12.64$, $p = 0.001$, $\eta = 0.09$, $1\text{-}\beta = 0.94$	$F(4,252) = 9.12$, $p < 0.001$, Wilk's $\Lambda = 0.76$, $\eta = 0.13$, $1\text{-}\beta = 0.999$	$F(2,127) = 18.05$, $p < 0.001$, $\eta = 0.22$, $1\text{-}\beta = 1.0$
Performance Goals+		$F(1,127) = 0.06$, $p = 0.807$, $\eta = 0.00$, $1\text{-}\beta = 0.06$		$F(2,127) = 5.45$, $p = 0.005$, $\eta = 0.08$, $1\text{-}\beta = 0.84$

Note. Observed power = $1\text{-}\beta$ where $\alpha = 0.05$, + assumption of sphericity violated.

Table 34

Variable	Time		Time x Phase	
	Multivariate	Univariate	Multivariate	Multivariate
Anxiety (GAD-10)+	*F*(2,76) = 0.85, *p* = 0.433, Wilk's Λ = 0.98, η=0.02, 1-β=0.19	*F*(1,77) = 0.77, *p* = 0.383, η=0.01, 1-β=0.14	*F*(4,152) = 1.33, *p* = 0.261, Wilk's Λ = 0.93, η=0.03, 1-β=0.41	*F*(2,77) = 2.69, *p* = 0.074, η=0.07, 1-β=0.52
Depression (PHQ-8)+		*F*(1,77) = 0.16, *p* = 0.690, η=0.002, 1-β=0.07		*F*(2,77) = 0.65, *p* = 0.524, η=0.02, 1-β=0.16
Mental Health (MHI-5, U9-U11)	*F*(1,49) = 0.52, *p* = 0.475, Wilk's Λ = 0.99, η=0.01, 1-β=0.11			-

Note. Observed power = 1-β where α=0.05, + assumption of sphericity violated, - no analyses were conducted because only one group (FP) completed the MHI-5 at T1-T2.

Table 35

Inferential statistics for change during season two (from T3 to T4).

Variable	Time		Time x Phase	
	Multivariate	Univariate	Multivariate	Multivariate
Demands+	$F(2,120) = 0.21, p = 0.812$, Wilk's $\Lambda = 0.997, \eta=0.004, 1\text{-}\beta=0.08$	$F(1,121) = 0.06, p = 0.808, \eta=0.00, 1\text{-}\beta=0.06$	$F(4,240) = 1.77, p = 0.135$, Wilk's $\Lambda = 0.94, \eta=0.03, 1\text{-}\beta=0.54$	$F(2,121) = 2.99, p = 0.054, \eta=0.05, 1\text{-}\beta=0.57$
Resources+		$F(1,121) = 0.34, p = 0.563, \eta=0.003, 1\text{-}\beta=0.09$		$F(2,121) = 0.56, p = 0.572, \eta=0.01, 1\text{-}\beta=0.14$
Challenge and Threat Ratio	$F(1,121) = 0.002, p = 0.966$, Wilk's $\Lambda = 1.00, \eta=0.00, 1\text{-}\beta=0.05$		$F(2,121) = 2.09, p = 0.128$, Wilk's $\Lambda = 0.97, \eta=0.03, 1\text{-}\beta=0.42$	
Coping Potential	$F(1,121) = 0.02, p = 0.895$, Wilk's $\Lambda = 1.00, \eta=0.00, 1\text{-}\beta=0.05$		$F(2,121) = 1.88, p = 0.158$, Wilk's $\Lambda = 0.97, \eta=0.03, 1\text{-}\beta=0.38$	
Autonomy+	$F(3,119) = 8.15, p < 0.001$, Wilk's $\Lambda = 0.83, \eta=0.17, 1\text{-}\beta=0.99$	$F(1,121) = 8.35, p = 0.005, \eta=0.07, 1\text{-}\beta=0.82$	$F(6,238) = 1.87, p = 0.086$, Wilk's $\Lambda = 0.91, \eta=0.05, 1\text{-}\beta=0.69$	$F(2,119) = 3.43, p = 0.036, \eta=0.05, 1\text{-}\beta=0.63$
Competence+		$F(1,121) = 23.26, p < 0.001, \eta=0.16, 1\text{-}\beta=0.998$		$F(2,119) = 4.26, p = 0.016, \eta=0.07, 1\text{-}\beta=0.74$
Relatedness+		$F(1,121) = 6.13, p = 0.015, \eta=0.05, 1\text{-}\beta=0.69$		$F(2,119) = 0.41, p = 0.665, \eta=0.01, 1\text{-}\beta=0.12$
Approach Goals+	$F(2,120) = 2.19, p = 0.117$, Wilk's $\Lambda = 0.97, \eta=0.04, 1\text{-}\beta=0.44$	$F(1,121) = 3.46, p = 0.065, \eta=0.03, 1\text{-}\beta=0.46$	$F(4,240) = 0.50, p = 0.736$, Wilk's $\Lambda = 0.98, \eta=0.01, 1\text{-}\beta=0.17$	$F(2,121) = 0.45, p = 0.639, \eta=0.01, 1\text{-}\beta=0.12$
Avoidance Goals+		$F(1,121) = 0.77, p = 0.382, \eta=0.01, 1\text{-}\beta=0.14$		$F(2,121) = 0.55, p = 0.579, \eta=0.01, 1\text{-}\beta=0.14$
Mastery Goals+	$F(2,120) = 0.70, p = 0.499$, Wilk's $\Lambda = 0.99, \eta=0.01, 1\text{-}\beta=0.17$	$F(1,121) = 0.29, p = 0.594, \eta=0.002, 1\text{-}\beta=0.08$	$F(4,240) = 1.09, p = 0.364$, Wilk's $\Lambda = 0.97, \eta=0.02, 1\text{-}\beta=0.34$	$F(2,121) = 0.77, p = 0.468, \eta=0.01, 1\text{-}\beta=0.18$
Performance Goals+		$F(1,121) = 1.01, p = 0.318, \eta=0.01, 1\text{-}\beta=0.17$		$F(2,121) = 1.31, p = 0.275, \eta=0.02, 1\text{-}\beta=0.28$

Note. Observed power = $1\text{-}\beta$ where $\alpha=0.05$, + assumption of sphericity violated.

Table 35

Variable	Time		Time x Phase	
	Multivariate	Univariate	Multivariate	Multivariate
Anxiety (GAD-10)+	*F*(2,80) = 2.05, *p* = 0.136, Wilk's Λ = 0.95, η=0.05, 1-β=0.41	*F*(1,81) = 1.74, *p* = 0.190, η=0.02, 1-β=0.26	*F*(4,160) = 5.02, *p* = 0.001, Wilk's Λ = 0.79, η=0.11, 1-β=0.96	*F*(2,81) = 4.02, *p* = 0.022, η=0.09, 1-β=0.70
Depression (PHQ-8)+		*F*(1,81) = 3.33, *p* = 0.072, η=0.04, 1-β=0.44		*F*(2,81) = 9.08, *p* < 0.001, η=0.18, 1-β=0.97
Mental Health (MHI-5 U9-U11)	*F*(1,123) = 1.67, *p* = 0.199, Wilk's Λ = 0.99, η=0.01, 1-β=0.25		*F*(2,123) = 5.22, *p* = 0.007, Wilk's Λ = 0.92, η=0.08, 1-β=0.82	

Note. Observed power = 1-β where α=0.05, + assumption of sphericity violated.

Table 36

Inferential statistics for change during season three (from T5 to T6).

Variable	Time		Time x Phase	
	Multivariate	Univariate	Multivariate	Multivariate
Demands+	$F(2,146) = 3.76$, $p = 0.026$, Wilk's $\Lambda = 0.95$, $\eta=0.05$, $1-\beta=0.68$	$F(1,147) = 5.70$, $p = 0.018$, $\eta=0.04$, $1-\beta=0.66$	$F(4,292) = 1.40$, $p = 0.235$, Wilk's $\Lambda = 0.96$, $\eta=0.02$, $1-\beta=0.43$	$F(2,147) = 0.26$, $p = 0.773$, $\eta=0.003$, $1-\beta=0.09$
Resources+		$F(1,147) = 2.31$, $p = 0.131$, $\eta=0.02$, $1-\beta=0.33$		$F(2,147) = 2.62$, $p = 0.077$, $\eta=0.03$, $1-\beta=0.51$
Challenge and Threat Ratio	$F(1,147) = 9.15$, $p = 0.003$, Wilk's $\Lambda = 0.94$, $\eta=0.06$, $1-\beta=0.85$		$F(2,147) = 1.04$, $p = 0.357$, Wilk's $\Lambda = 0.99$, $\eta=0.01$, $1-\beta=0.23$	
Coping Potential	$F(1,147) = 4.11$, $p = 0.044$, Wilk's $\Lambda = 0.97$, $\eta=0.03$, $1-\beta=0.52$		$F(2,147) = 2.36$, $p = 0.098$, Wilk's $\Lambda = 0.97$, $\eta=0.03$, $1-\beta=0.47$	
Autonomy+	$F(3,145) = 0.61$, $p = 0.609$, Wilk's $\Lambda = 0.99$, $\eta=0.01$, $1-\beta=0.18$	$F(1,147) = 1.19$, $p = 0.276$, $\eta=0.01$, $1-\beta=0.19$	$F(6,290) = 2.35$, $p = 0.031$, Wilk's $\Lambda = 0.91$, $\eta=0.05$, $1-\beta=0.83$	$F(2,147) = 4.25$, $p = 0.016$, $\eta=0.06$, $1-\beta=0.74$
Competence+		$F(1,147) = 0.96$, $p = 0.330$, $\eta=0.01$, $1-\beta=0.16$		$F(2,147) = 0.45$, $p = 0.636$, $\eta=0.01$, $1-\beta=0.12$
Relatedness+		$F(1,147) = 0.71$, $p = 0.401$, $\eta=0.01$, $1-\beta=0.13$		$F(2,147) = 2.62$, $p = 0.076$, $\eta=0.03$, $1-\beta=0.52$
Approach Goals+	$F(2,146) = 0.18$, $p = 0.838$, Wilk's $\Lambda = 0.998$, $\eta=0.002$, $1-\beta=0.08$	$F(1,147) = 0.34$, $p = 0.562$, $\eta=0.002$, $1-\beta=0.09$	$F(4,292) = 0.121$, $p = 0.975$, Wilk's $\Lambda = 0.997$, $\eta=0.002$, $1-\beta=0.08$	$F(2,147) = 0.06$, $p = 0.945$, $\eta=0.001$, $1-\beta=0.06$
Avoidance Goals+		$F(1,147) = 0.04$, $p = 0.849$, $\eta=0.00$, $1-\beta=0.05$		$F(2,147) = 0.19$, $p = 0.828$, $\eta=0.003$, $1-\beta=0.08$
Mastery Goals+	$F(2,146) = 0.24$, $p = 0.785$, Wilk's $\Lambda = 0.997$, $\eta=0.003$, $1-\beta=0.09$	$F(1,147) = 0.01$, $p = 0.919$, $\eta=0.00$, $1-\beta=0.05$	$F(4,292) = 0.47$, $p = 0.757$, Wilk's $\Lambda = 0.99$, $\eta=0.01$, $1-\beta=0.16$	$F(2,147) = 0.19$, $p = 0.829$, $\eta=0.003$, $1-\beta=0.08$
Performance Goals+		$F(1,147) =0.46$, $p = 0.499$, $\eta=0.003$, $1-\beta=0.10$		$F(2,147) =0.69$, $p = 0.501$, $\eta=0.01$, $1-\beta=0.17$

Note. Observed power = $1-\beta$ where $\alpha=0.05$, + assumption of sphericity violated.

Table 36

Variable	Time		Time x Phase	
	Multivariate	Univariate	Multivariate	Multivariate
Anxiety (GAD-10)+	*F*(2,100) = 7.09, *p* = 0.001, Wilk's Λ = 0.88, η=0.12, 1-β=0.92	*F*(1,101) = 14.30, *p* <0.001, η=0.12, 1-β=0.96	*F*(4,200) = 2.19, *p* = 0.072, Wilk's Λ = 0.92, η=0.04, 1-β=0.64	*F*(2,101) = 3.02, *p* = 0.053, η=0.06, 1-β=0.57
Depression (PHQ-8)+		*F*(1,101) = 1.73, *p* = 0.191, η=0.02, 1-β=0.26		*F*(2,101) = 3.18, *p* = 0.046, η=0.06, 1-β=0.60
Mental Health (MHI-5, All)	*F*(1,147) = 0.05, *p* = 0.832, Wilk's Λ = 1.00, η=0.00, 1-β=0.06		*F*(2,147) = 6.42, *p* = 0.002, Wilk's Λ = 0.92, η=0.08, 1-β=0.90	

Note. Observed power = 1-β where α=0.05, + assumption of sphericity violated.

perceived inability to cope with the demands of football during S3. This change was likely skewed by FP players' DRES scores; they were the only group to change from perceiving an ability to an inability to cope with football demands during S3, their score at T5 was considerably higher than both YDP and PDP players' scores at T5, and the DRES scores for FP players at every preceding timepoint (see Table 33).

Basic Psychological Needs. The MANOVAs indicated that in S1 (from T1 to T2), perceived autonomy significantly decreased (small change, d=.47). Perceived relatedness (small change, d=.3) significantly increased from T1 to T2 for YDP players. In general, in S2 (from T3 to T4), perceived autonomy, competence, and relatedness significantly decreased. The decrease in perceived autonomy was very small (d=.15, Sawilowsky, 2009) and the decreases in perceived competence (d=.41) and relatedness (d=.21) were small (Cohen, 1988).

Achievement Goals. The MANOVAs indicated that in general, in S1, mastery goal orientation significantly moderately increased from T1 to T2 (d=.79). For YDP players, approach goal and mastery goal orientations significantly increased from T1 to T2. The increases in YDP players' approach goal and mastery goal orientations were small (d=.4) and moderate (d=.61) respectively. For FP players, approach, avoidance, mastery, and performance goal orientations significantly increased from T1 to T2. The increases in FP players' avoidance (d=.74) and performance (d=.61) goal orientations were moderate, the increase in approach goal orientation was large (d=.89, Cohen, 1988) and the increase in mastery goal orientation was very large (d=1.21, Sawilowsky, 2009).

Mental Health. The MANOVAs indicated that in S2 (from T3 to T4), anxiety symptom frequency and depression symptom frequency significantly increased for PDP players; the increase in anxiety was moderate (d=.53) and the increase in depression was large (d=.94). In S3, in general, anxiety symptoms (GAD-10) significantly, moderately increased from T5 to T6 (*d*=.53). The ANOVAs indicated that in both S2 and S3, mental health (MHI) significantly decreased (worsened) for PDP players, and significantly increased (improved) for FP players. FP players' increases were small for S2 (*d*=.35) and S3 (*d*=.38). PDP players' decreases were moderate for S2 (*d*=.54) and small for S3 (*d*=.42, Cohen, 1988).

3.5.3 Summary and Short Discussion

General Change. When testing hypotheses H_{1b}, H_{2b}, H_{3b}, and H_{4b} to explore the temporal change in psychological demands, resources, and mental health during three separate seasons, the nature of variable change differed between seasons. Considering the end of S2 was confounded by the COVID-19 lockdown period, the only consistent patterns of change were an increase in perceived demands during a season (S1 and S3) and declines in PDP player mental health (S2 and S3) and improvements in FP player mental health (S2 and S3). Looking at general (total mean) change during each season separately, perceived demands, perceived resources and mastery goal orientation significantly increased during S1, partially supporting H_{1b}, H_{2b}, and H_{3b}. During S3, perceived demands and anxiety symptoms significantly increased, in support of H_{2b} and refutation of H_{4b} respectively. Correspondingly, players became significantly less challenged, and their coping potential significantly decreased during S3; a perceived ability to cope with the demands of football at T5 changed to a perceived inability to cope at T6.

The increase in perceived demands from T1 to T2 was practically significant since players generally changed from not perceiving academy football as demanding at T1 (M=3.85; below the central, neutral point of four on the Likert scale, towards disagree), to perceiving football as demanding at T2 (M=4.45, towards agree). Based on the between group analyses, this aspect of the observed change was most likely due to the changes in FP players' demand appraisals. The general increases in perceived demands during the seasons may reflect the increases in objective demands during a season; sport scientists challenge players to develop football fitness through exposure to periodised training loads over the course of a season (Verheijen, 2014), and uncertainty regarding contract decisions and players' status within the academy grows since these decisions are typically made towards the end of a football season. Participation in tournaments also tends to occur later in the season and at older age groups, increasing the physical and psychological demand on players over time. Thus, this change during seasons resonates with Lazarus and Folkman's (1984) contention that cognitive appraisal intensifies as important events (e.g., contract renewals and tournaments) draw closer.

Increases in mastery goal orientation during S1 may also be related to the increases in perceived demands. It is logical that the desire to pursue mastery (i.e., to push and challenge oneself to improve one's own competence and skills) would be observed (and indeed would be more likely) during a task and within an environment where demands are intensifying and providing a platform for such increased challenge and development. An individual would be unlikely to show increasing motivation toward self-improvement in an environment where the standard and level of challenge is low, where performance is easy, and performers are not being pushed to improve (indeed, such environments may encourage performance rather than mastery goals, Senko, 2019). Supporting research for this notion within the education literature shows that mastery goals are beneficial for educational outcomes since they encourage increased persistence, and effort including within physical education (e.g., Agbuga & Xiang, 2008; Sideris & Kaplan, 2011). Persistence and effort are associated with a challenge state (Jones et al., 2009) and required in the face of increasing demands if a performer is to excel. In contrast, if demands do not increase, these persistent and effortful behaviours, and the associated mastery goal orientation are less likely to be observed. Within the sport and exercise psychology literature, the relationships between achievement goals and stress appraisals tend to refer to challenge or threat appraisals (see Adie et al., 2008; 2010), rather than demand and resource appraisals, from which challenge and threat states are calculated. These particular studies observed positive relationships between challenge appraisals and mastery approach goal orientations (Adie et al., 2008; 2010), but the relationship specifically with demand appraisals cannot be inferred due to the way stress appraisals were measured in those studies. Further analysis of the observed change in perceived demands and mastery goal orientation is required to substantiate this possible relationship between the two variables and is presented in chapter four.

The lack of a significant increase in perceived demands during S2 may be explained by the fact that many players (U9-U14) had ceased playing football at the latter data collection timepoint in S2 (T4), due to the COVID-19 lockdown. Thus, players were not experiencing the physical demands of academy football and so may have reported lower perceived demands than they would if they had continued training and competing.

The significant increase in anxiety during S3 (refuting H_{4b}) may reflect the increased statistical power with a larger sample size (Serdar et al., 2021). In S3, 104 players completed the GAD-10 at both timepoints, in comparison to 80 during S1 and 84 in S2. The absence of significant change in S1 and S2 may reflect the smaller sample sizes and thus reduced statistical power at these timepoints. However, there was little change in anxiety scores during the first two seasons; from T1 to T4 mean anxiety scores ranged from 0.35 to 0.39. In contrast, mean anxiety was 0.12 at T5, and 0.23 at T6. Since anxiety was significantly lower after the pandemic in S3 than at any prior point in the study, the significant increase during S3 may reflect anxiety levels returning to a pre-pandemic ‘normal’ level.

On the other hand, the increase in anxiety during S3 may be explained by the significant increase in perceived demands and the absence of a significant increase in perceived resources during S3; players became less challenged (challenge and threat ratio) and perceived an inability to cope with football demands by the end of the season after initially perceiving an ability to cope with demands at the start of the season (DRES). Since anxiety did not significantly increase during S1 when both perceived demands and resources increased, it may be that, as players became less challenged (moving towards threat), they experienced greater anxiety (Grupe & Nitsche, 2014). This resonates with previous research where threat appraisals strongly related to anxiety (Britton et al., 2011), and when athletes' perceived demands exceed their perceived resources (i.e., they are in a state of threat), they are more likely to experience negative mental health outcomes (Raedeke & Smith, 2004; Williams et al., 1991).

During S2, perceived autonomy, competence and relatedness significantly decreased, refuting H_{1b}. This may reflect the impact of lockdown and social distancing measures imposed throughout the UK; BPN satisfaction decreased during home confinement and after a month of lockdown (Costa et al., 2022). Players' opportunities to connect with friends, family, teammates, and coaches was significantly reduced, which may explain the reduction in perceived relatedness. Since the opportunity to play and practice football was reduced and restricted for many of the players at T4 (the end of S2), this may have contributed to the reduction in perceived competence. Finally, on a national and international scale, the human race largely saw their autonomy over every aspect of their lives removed, as a result of the social distancing measures and rules implemented by governments upon citizens. Therefore, it follows that players' perceptions of autonomy would decrease from T3 to T4.

Between Group Change. Within S1, FP players' perceived demands, perceived resources, and approach, mastery and performance goal orientations significantly increased whilst perceived competence significantly decreased, supporting H_{2b} and H_{3b} and partially supporting H_{1b}. The increase in FP players' perceived demands was also practically significant, changing from not perceiving academy football as demanding at T1 (M=3.35) to perceiving football as demanding at T2 (M=4.38). Furthermore, the increase in FP players' mastery goal orientation equated to an entire Likert-response option increase, whilst the increases in approach, and performance goal orientation equated to just under an entire Likert-response option increase.

FP players' avoidance goal orientation also significantly increased during S1, change which was also practically significant and equating to just under an entire Likert-response option increase, refuting H_{3b}. The increase in all four achievement goal orientations for FP players during S1 suggests that FP players were increasingly behaviourally and emotionally engaged with their football throughout the season (see Mih et al., 2015). Thus, the increase in FP players' perceived resources alongside the increase in perceived demands could be explained by their high levels of engagement and enjoyment at the academy, as suggested by the significant increases in achievement goal motivation at this time (Jones et al., 2009). That avoidance goal orientation changed in the same way as approach, mastery, and performance goals is somewhat surprising and fails to support H_{3b}; this may reflect the difficulty children have in interpreting and understanding negatively framed questions (Benson & Hocevar, 1985; Marsh, 1986).

Meanwhile during S1, YDP players' perceived demands, perceived relatedness and mastery and approach goal orientations significantly increased, supporting H_{1b}, H_{2b} and H_{3b}. However, YDP players' perceived autonomy significantly decreased during S1, refuting H_{1b}. Since FP and YDP players' approach and mastery goal orientations increased alongside perceived demands during S1, this again suggests an association between perceived demands and mastery goal orientation. Furthermore, players appeared to show an advantageous motivational response to the increase in perceived demands experienced during the season, suggesting that demands did not increase too much; one would expect motivation to decline rather than increase if that were the case (see Senko & Hulleman, 2013).

The increase in YDP players' perceived relatedness during S1 suggests YDP players were able to develop positive relationships with their teammates and coaches throughout the season to a greater extent than players in the FP and PDP. This may be because YDP players trained for longer periods and more frequently during the week than players in the FP, thus allowing a greater amount of time for relationship development with teammates and coaches. Football in the PDP is much more competitive than in the YDP. For example, whilst PDP players compete for places in the starting line up at the weekend, YDP players are guaranteed at least 50% match time. Furthermore, unlike at YDP, league points are on offer based on the result of weekend fixtures at PDP level, meaning there is greater pressure and more at stake. Thus, this lesser level of competition for match time and for points from matches at YDP level may explain why perceived relatedness was able to increase during S1 for YDP players but not PDP players.

The decrease in YDP players' perceived autonomy during S1 may reflect the coaches' increasing demands over the course of a football season. Coaches' interpersonal style can influence young football players' BPNs and well-being (Balaguer et al., 2012). Since coaches often experience increasing stress and burnout over the course of a season (Altfeld et al., 2015), and a failure to adequately recover from the physical and emotional fatigue from coaching can result in reductions in athlete engagement and perceived autonomy support (Balk et al., 2019), this may explain the observed decreases in perceived autonomy for YDP players during S1.

Whilst perceived competence and personal resources are separate constructs, the two share a focus on positive expectancies about goal achievement and/or skill possession. Therefore, the decrease in FP players' perceived competence during S1 is surprising and fails to support H_{1b}, since FP players' perceived resources significantly increased during S1 (supporting H_{1b}). These conflicting changes may reflect the complexity of conducting research with youth samples and/or the nature of stress appraisals in youths (e.g., Turner et al., 2013). Alternatively, the differences may reflect the difference between the two constructs or youth players difficulty in assessing their own competence.

During S2 and S3, FP players' mental health increased (improved, supporting H_{4b}) whilst PDP players' mental health decreased (worsened, refuting H_{4b}). PDP players' anxiety and depression symptoms also significantly increased within S2, further refuting H_{4b}. PDP players' increases in anxiety and depression symptoms during S2 were practically significant; the anxiety change represented an increase from "occasionally" to "more than half of the time", and the depression change represented an increase from less than "several days", to between "several days" and "more than half of the days". Similarly, the worsening of PDP mental health in S3 was practically significant since this change represented a decrease in feeling good from "most of the time" to "a good bit of the time" (i.e., a Likert-scale response option change).

That FP players' mental health improved whilst PDP players' mental health worsened is unsurprising given that poor mental health is less prevalent in young children (i.e., those in FP) and mental health worsens during adolescence (Kessler et al., 2005; 2007; Sarmento et al., 2021; Solmi et al., 2022) and the junior-to-senior transition in sport (Cronin et al., 2020; Küettel et al., 2021). These opposing changes also resonate with the mixed relationships between sport participation and mental health (see Blakelock et al., 2019; Bruner et al., 2008; Eime et al., 2013; Jewett et al., 2014) and may reflect different motivational climates in the two phases (Smith et al., 2007). Consideration of adolescent identity formation literature could provide an alternate explanation of these differences. Specifically, FP players may benefit from the burnout and mental health protective benefits of a broad sense of identity, comprising athletic, academic and familial components, owed to their age-related involvement in football, school and family commitments. In contrast, the PDP players may lose this breadth and be at greater risk of identity foreclosure; their athletic identity amplified as their involvement within football becomes greater, more pressurised and life encompassing (Brewer & Petitpas, 2017; Lee et al., 2017; Ronkainen et al., 2016). Moving away from home/family, exiting the formal educational system in the UK, and entering a performance focused environment fulltime may amplify the "performance narrative" in the story of PDP players' identity, which could contribute to increasing perceived pressure and mental health declines (see Carless & Douglas, 2013; Heird & Steinfeldt, 2013; Kilcullen et al., 2022).

Still, within the FP, emphasis was placed on promoting enjoyment and development whilst within the PDP, emphasis was placed on performance and development. This could explain the increase in FP players' mental health during S2 and S3. Nevertheless, it is surprising that FP players' mental health improved during S3 whilst their perceived coping potential declined, changing from a perceived ability to cope with football demands at T5 to a perceived inability to cope at T6.

The fact that FP players' mental health did not significantly improve during S1 (in fact, it slightly worsened) could be reflective of the significant increase in FP players' avoidance goal orientations during S1. The increase in avoidance goals may have stifled the FP players' improvement in mental health and contributed to the slight decrease (Chen & Luo, 2015; Daumiller et al., 2021; Elliot et al., 1977; Senko & Freund, 2015).

That the pattern of change in depression symptom frequency mirrored those observed with anxiety symptoms for PDP players is unsurprising since depression and anxiety are positively related (Jansson-Fröjmark & Lindblom, 2008) and highly comorbid in adolescents (Ollendick & Hirshfield-Becker, 2002). Furthermore, rates of anxiety and depression are higher in adolescents than in children, leaving PDP players at greater risk of experiencing poor mental health, such as anxiety, than YDP or FP players (Kessler et al., 2005; 2007;

Solmi et al., 2022). Likewise, football at PDP level poses the most psychological demand compared to the YDP and FP, since PDP players leave their family home often for the first time, football becomes more serious and for some, it becomes their profession (Gustafsson et al., 2017). Starting to earn money from football and the associated increase in pressure to perform well may alter PDP players' motivation orientations and contribute to increasing anxiety. This could explain the increase in PDP players' anxiety and depression symptoms during S2. Furthermore, the increases may reflect lockdown concerns conveyed in the media towards the end of S2, national uncertainty in the UK and uncertainty regarding their professional contract decision (Grupe & Nitsche, 2013).

Exploring change within each season separately increased the sample size relative to the longitudinal analysis and helped to show differences in the nature of in-season change between groups. This highlighted additional, significant, in-season change which took place during the study period, and once again there was mixed support for the hypotheses. To strengthen the power of the analyses further, and to generate an understanding of "composite" in-season change patterns, data from early-season timepoints were combined and data from late-season timepoints were combined, to create a "composite" early season timepoint and a "composite" late-season timepoint. Change during a composite football season was explored and is presented in the next section.

3.6 Change During a Composite Season When Timepoints Are Combined

In this analysis, the individuals' data included in the previous section's separate season analyses were included. The data from the separate seasons were combined to create one "composite season" data set. Data from the early-season timepoints were combined, and data from the late-season timepoints were combined, to maximise the sample size, provide greater statistical power, and to allow the exploration of changes in psychological demands, resources and mental health during a composite season (see Figure 4), in line with hypotheses H_{1b}, H_{2b}, H_{3b}, and H_{4b}.

3.6.1 Method

Design and Participants. Cross-sectional data collected over three football seasons, using a within-subjects, repeated measures design was combined to create two timepoints: an early-season timepoint and a late-season timepoint. Players' questionnaire data from T1, T3, and T5 were combined to create the early-season timepoint whilst the data from T2, T4, and T6 were combined to create the late-season timepoint. This produced a sample size of 404 for the change analysis of stress appraisals, BPNs, and achievement goals. Age at the early-season timepoint ranged from 8 to 19-years (M*age*=12.18, SD=2.73). The sample size for the change analysis of GAD-10 and PHQ-8 data was 268; age at the early-season timepoint ranged from 11 to 19-years (M*age*=13.76, SD=1.93). The sample size for the change analysis of MHI data was 326; age at the early-season timepoint ranged from 8 to 19-years (M*age*=11.92, SD=2.88).

Analytic Strategy. Mixed (within and between subjects) 2x3 MANOVA and ANOVA were used to examine temporal change for each dependent variable during a composite season. A total of five MANOVAs and three ANOVAs were conducted (see Table 37); participants' phase was included as a between-subjects factors to examine whether change during a season differed between players in the FP, YDP and PDP.

Figure 4

Visual illustration of the data used to test hypotheses H_{1b}, H_{2b}, H_{3b}, and H_{4b} through exploring temporal change during a composite season.

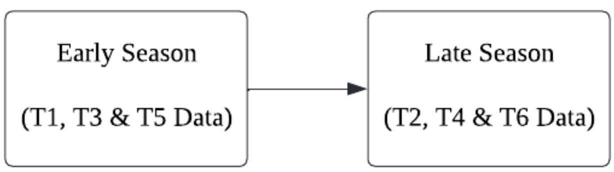


Table 37

Illustration of the analyses when temporally exploring changes during a composite season when timepoints are combined.

Scale(s) Included	Type of Analysis	Timepoints Used		Sample Size
		Early Season	Late Season	
Demands, Resources	MANOVA	T1, T3, T5	T2, T4, T6	404
Challenge and Threat Ratio	ANOVA	T1, T3, T5	T2, T4, T6	404
Coping Potential	ANOVA	T1, T3, T5	T2, T4, T6	404
Autonomy, Competence, Relatedness	MANOVA	T1, T3, T5	T2, T4, T6	404
Approach Goals, Avoidance Goals	MANOVA	T1, T3, T5	T2, T4, T6	404
Mastery Goals, Performance Goals	MANOVA	T1, T3, T5	T2, T4, T6	404
Anxiety, Depression	MANOVA	T1, T3, T5	T2, T4, T6	268
Mental Health Inventory	ANOVA	T1, T3, T5	T2, T4, T6	326

(M*ageT1*=11.92, SD=2.88)

Table 38

In-season temporal change during a composite season; mean (M) and standard deviation (SD) scores for all variables measured early and late in a season, collated over three seasons.

Variable	Group	Stage of Season Early	Late
		M (SD)	M (SD)
Demands	Total	4.16 (.88)	4.38 (.84)**
	PDP	4.69 (.60)	4.82 (.81)
	YDP	4.38 (.85)	4.51 (.83)*
	FP	3.79 (.83)	4.14 (.78)**
Resources	Total	6.11 (.79)	6.24 (.57)*
	PDP	6.28 (.51)	6.38 (.50)
	YDP	6.37 (.51)	6.32 (.54)
	FP	5.81 (.96)	6.12 (.60)**
Challenge and Threat Ratio	Total	.69 (.15)	0.71 (.16)*
	PDP	.75 (.11)	0.76 (.15)
	YDP	.69 (.16)	0.72 (.15)
	FP	.66 (.15)	0.69 (.16)
Coping Potential	Total	-.03 (1.32)	-0.21 (1.20)
	PDP	-.26 (1.55)	-0.24 (1.19)
	YDP	-.01 (1.24)	-0.21 (1.12)
	FP	.03 (1.32)	-0.20 (1.29)
Autonomy	Total	4.62 (.73)	4.54 (.73)*
	PDP	4.51 (.63)	4.30 (.70)
	YDP	4.86 (.69)	4.80 (.68)
	FP	4.42 (.74)	4.37 (.72)
Competence	Total	5.08 (.57)	4.99 (.57)**
	PDP	4.83 (.57)	4.59 (.59)
	YDP	5.14 (.54)	5.10 (.55)
	FP	5.10 (.58)	4.997 (.52)
Relatedness	Total	5.36 (.60)	5.33 (.59)
	PDP	4.87 (.73)	4.87 (.63)
	YDP	5.35 (.58)	5.39 (.60)
	FP	5.52 (.50)	5.39 (.50)*

Note. This includes the significant Bonferroni pairwise differences, * p <0.05. ** p<0.001

Table 38

Variable	Group	Stage of Season Early M (SD)	Stage of Season Late M (SD)
Approach Goals	Total	6.06 (.98)	6.17 (.88)
	PDP	6.14 (.84)	6.00 (.86)
	YDP	6.28 (.78)	6.31 (.74)
	FP	5.83 (1.13)	6.08 (.99)**
Avoidance Goals	Total	3.56 (1.44)	3.76 (1.37)
	PDP	3.83 (1.23)	3.74 (1.37)
	YDP	3.79 (1.48)	3.86 (1.33)
	FP	3.25 (1.39)	3.66 (1.40)**
Mastery Goals	Total	5.15 (.98)	5.39 (0.87)**
	PDP	5.58 (.76)	5.61 (.83)
	YDP	5.29 (.91)	5.47 (.80)
	FP	4.89 (1.02)	5.25 (.92)
Performance Goals	Total	4.47 (1.39)	4.54 (1.32)
	PDP	4.39 (1.29)	4.13 (1.34)
	YDP	4.78 (1.45)	4.71 (1.37)
	FP	4.20 (1.30)	4.48 (1.24)**
Anxiety (GAD-10)	Total	.27 (.31)	.31 (.30)**
	PDP	.26 (.30)	.43 (.36)**
	YDP	.27 (.32)	.26 (.26)
	FP	.32 (.25)	.38 (.31)
Depression (PHQ-8)	Total	.26 (.27)	.27 (.27)
	PDP	.23 (.19)	.36 (.31)**
	YDP	.26 (.30)	.24 (.26)
	FP	.30 (.27)	.28 (.26)
Mental Health (MHI-5)	Total	80.91 (11.62)	81.09 (11.33)
	PDP	78.67 (10.81)	72.82 (14.09)*
	YDP	83.86 (9.61)	83.22 (10.38)
	FP	79.39 (12.70)	81.67 (10.30)*

Note. This includes the significant Bonferroni pairwise differences, * p <0.05. ** p<0.001

Table 39

Inferential statistics for change during a composite season with timepoints combined.

Variable	Time: Multivariate	Time: Univariate	Time x Phase: Multivariate	Time x Phase: Univariate
Demands+	$F(2,400) = 10.58$, $p < 0.001$, Wilk's $\Lambda = 0.95$, $\eta=0.05$, $1\text{-}\beta=0.99$	$F(1,401) = 18.02$, $p = < 0.001$, $\eta=0.04$, $1\text{-}\beta=0.99$	$F(4,800) = 5.79$, $p < 0.001$, Wilk's $\Lambda = 0.94$, $\eta=0.03$, $1\text{-}\beta=0.98$	$F(2,401) = 3.93$, $p = 0.020$, $\eta=0.02$, $1\text{-}\beta=0.71$
Resources+		$F(1,401) = 7.19$, $p = 0.008$, $\eta=0.02$, $1\text{-}\beta=0.76$		$F(2,401) = 9.93$, $p = < 0.001$, $\eta=0.05$, $1\text{-}\beta=0.98$
Challenge and Threat Ratio+	$F(1,401) = 6.05$, $p = 0.014$, Wilk's $\Lambda = 0.99$, $\eta=0.02$, $1\text{-}\beta=0.69$		$F(2,401) = 0.20$, $p = 0.816$, Wilk's $\Lambda = 0.999$, $\eta=0.001$, $1\text{-}\beta=0.08$	
Coping Potential+	$F(1,401) = 2.54$, $p = 0.112$, Wilk's $\Lambda = 0.99$, $\eta=0.01$, $1\text{-}\beta=0.36$		$F(2,401) = 0.60$, $p = 0.550$, Wilk's $\Lambda = 0.997$, $\eta=0.003$, $1\text{-}\beta=0.15$	
Autonomy+	$F(3,399) = 5.34$, $p = 0.001$, Wilk's $\Lambda = 0.96$, $\eta=0.04$, $1\text{-}\beta=0.93$	$F(1,401) = 6.42$, $p = 0.012$, $\eta=0.02$, $1\text{-}\beta=0.72$	$F(6,798) = 2.36$, $p = 0.029$, Wilk's $\Lambda = 0.97$, $\eta=0.017$, $1\text{-}\beta=0.82$	$F(2,401) = 0.996$, $p = 0.370$, $\eta=0.01$, $1\text{-}\beta=0.22$
Competence+		$F(1,401) = 14.01$, $p = < 0.001$, $\eta=0.03$, $1\text{-}\beta=0.96$		$F(2,401) = 2.16$, $p = 0.117$, $\eta=0.01$, $1\text{-}\beta=0.44$
Relatedness+		$F(1,401) = 0.75$, $p = 0.388$, $\eta=0.002$, $1\text{-}\beta=0.14$		$F(2,401) = 3.996$, $p = 0.019$, $\eta=0.02$, $1\text{-}\beta=0.71$
Approach Goals+	$F(2,400) = 1.42$, $p = 0.244$, Wilk's $\Lambda = 0.99$, $\eta=0.01$, $1\text{-}\beta=0.30$	$F(1,401) = 0.76$, $p = 0.384$, $\eta=0.002$, $1\text{-}\beta=0.14$	$F(4,800) = 3.36$, $p = 0.010$, Wilk's $\Lambda = 0.97$, $\eta=0.02$, $1\text{-}\beta=0.85$	$F(2,401) = 3.97$, $p = 0.020$, $\eta=0.02$, $1\text{-}\beta=0.71$
Avoidance Goals+		$F(1,401) = 2.46$, $p = 0.118$, $\eta=0.01$, $1\text{-}\beta=0.35$		$F(2,401) = 3.94$, $p = 0.020$, $\eta=0.02$, $1\text{-}\beta=0.71$

Note. Observed power = $1\text{-}\beta$ where $\alpha=0.05$, + assumption of sphericity violated.

Table 39

Variable	Time		Time x Phase	
	Multivariate	Univariate	Multivariate	Univariate
Mastery Goals+	$F(2,400) = 4.92$, $p = 0.008$, Wilk's $\Lambda = 0.98$, $\eta=0.02$, $1-\beta=0.81$	$F(1,401) = 9.13$, $p = 0.003$, $\eta=0.02$, $1-\beta=0.85$	$F(4,800) = 3.35$, $p = 0.010$, Wilk's $\Lambda = 0.97$, $\eta=0.02$, $1-\beta=0.85$	$F(2,394) = 2.52$, $p = 0.082$, $\eta=0.01$, $1-\beta=0.50$
Performance Goals+		$F(1,401) = 0.03$, $p = 0.853$, $\eta=0.00$, $1-\beta=0.05$		$F(2,394) = 5.56$, $p = 0.004$, $\eta=0.03$, $1-\beta=0.85$
Anxiety (GAD-10)+	$F(2,264) = 5.73$ $p = 0.004$, Wilk's $\Lambda = 0.96$, $\eta=0.04$, $1-\beta=0.86$	$F(1,265) = 11.44$, $p = 0.001$, $\eta=0.04$, $1-\beta=0.92$	$F(4,528) = 5.43$, $p < 0.001$, Wilk's $\Lambda = 0.92$, $\eta=0.04$, $1-\beta=0.98$	$F(2,265) = 6.21$, $p = 0.002$, $\eta= 0.05$, $1-\beta=0.89$
Depression (PHQ-8)+		$F(1,265) = 2.65$, $p = 0.105$, $\eta=0.01$, $1-\beta=0.37$		$F(2,265) = 8.58$, $p = < 0.001$, $\eta=0.06$, $1-\beta=0.97$
Mental Health (MHI-5)+	$F(1,323) = 3.10$, $p = 0.079$, Wilk's $\Lambda = 0.99$, $\eta=0.01$, $1-\beta=0.42$		$F(2,323) = 7.87$, $p < 0.001$, Wilk's $\Lambda = 0.95$, $\eta=0.05$, $1-\beta=0.95$	

Note. Observed power = $1-\beta$ where $\alpha=0.05$, + assumption of sphericity violated.

3.6.2 Results

For means and standard deviations, see Table 38, and for inferential statistics, see Table 39.

Stress appraisals. The MANOVAs indicated perceived demands and perceived resources significantly increased during a composite season; from the early-season timepoint to the late-season timepoint. The increase in demands was small (*d*=.26, Cohen, 1988) and the increase in resources was very small (*d*=.19, Sawilowsky, 2009). At a group level, FP and YDP players' perceived demands significantly increased during a season. The increase for YDP players was very small (*d*=.15, Sawilowsky, 2009). The increase in perceived demands for FP players was small (*d*=.43, Cohen, 1988). FP players' perceived resources also significantly increased during a season (small change, *d*=.39). The ANOVA revealed that the challenge and threat ratio significantly increased during a season; players became less challenged (very small change, *d*=.13, Sawilowsky, 2009).

Basic Psychological Needs. The MANOVAs indicated perceived autonomy and perceived competence significantly decreased during a season. These changes were very small (*d*=.11 and *d*=.16 respectively, Sawilowsky, 2009). At a group level, FP players' relatedness significantly decreased during a season (small change, *d*=.26, Cohen, 1988).

Achievement Goals. The MANOVAs indicated mastery goal orientation significantly increased during a season (small change, *d*=.26). At a group level, FP players' approach (*d*=.24), avoidance (*d*=.29) and performance goal orientations (*d*=.22) significantly increased during a season. These increases were all small (Cohen, 1988).

Mental Health. The MANOVAs indicated anxiety symptom frequency (GAD-10) significantly increased during a season (very small change, *d*=.13). At a group level, PDP players' anxiety (GAD-10, *d*=.51) and depression (PHQ-8, *d*=.51) symptom frequency significantly, moderately increased during a season. The ANOVA indicated that PDP players' mental health scores (MHI) significantly decreased whilst FP players' mental health scores significantly increased during a season. These changes were small for both PDP players (*d*=.47) and FP players (*d*=.2, Cohen, 1988).

3.6.3 Summary and Short Discussion

When early-season (T1, T3 and T5) and late-season timepoints (T2, T4 and T6) were combined to produce composite early and composite late-season timepoints respectively, perceived demands and perceived resources significantly increased during a season, supporting H_{1b} and H_{2b}. This change in perceived demands was significant for FP and YDP players; the change in perceived resources was significant for FP players only. The increase in FP players' perceived demands was practically significant; the increase represented a change from "disagree" (i.e., football is not demanding) to "agree" (i.e., football is demanding). Alongside this, players became less challenged during a season. These findings replicate those found in the earlier analyses when each season was considered separately.

Perceived autonomy and perceived competence significantly decreased during a composite season, and FP players perceived less relatedness over the course of a season, collectively refuting H_{1b}. Furthermore, mastery goal orientation generally increased during a season, and FP players' approach, and performance goal orientations increased during a season, supporting H_{3b}. However, FP players' avoidance goal orientation also increased during a season, refuting H_{3b}.

The decreases in perceived autonomy and competence during a composite season replicate the decreases observed during S2 and thus, the decrease during a composite season analysis may be influenced by the S2 change and the associated influence of the COVID-19 lockdown on the data. Indeed, the decrease in perceived competence during a composite season contrasts with Cumming et al's (2017) observation that self-efficacy increased over the course of a rowing season. Practicing a skill can improve self-efficacy and perceived competence by providing opportunities to generate memories of successful performance, thus, as opportunities to practice skills are provided throughout a season, one would expect self-efficacy and perceived competence to increase (Bandura, 1977). Still, these differences in findings could reflect differences in the construct being measured (i.e., perceived competence vs. self-efficacy) or differences in the nature of the sample (i.e., non-expert, child and adolescent football players vs. expert, elite rowers).

The decrease in perceived competence alongside a significant increase in mastery goal orientation is also surprising, since students with high perceived competence have been shown to have greater mastery goal orientations (Cocks & Watt, 2004). Even with increasing mastery goal orientations and opportunities to develop and improve their skills throughout a season, it is possible that the increasing demands meant players developed more or stronger memories of struggling to cope with these increasing demands, whilst still seeking to improve their own skills, which may explain why perceived competence decreased whilst mastery goal orientations increased during a season. Still, further analyses are required to test the relationships between these changing variables, and these are presented in chapter four.

The decrease in perceived relatedness for FP players during a composite season is surprising since their simultaneous increases in approach and performance goal orientations suggests greater engagement, which has been associated with greater perceptions of relatedness in children (Furrer & Skinner, 2003; King, 2015). Still, FP players' avoidance goal orientation significantly increased during a season; FP players became increasingly motivated to outperform their teammates (i.e., increasing performance goals), and/or not perform worse than their teammates (i.e., increasing avoidance goals) which may have created tension amongst players within the phase and reduced the quality of interpersonal relationships and thus the perception of relatedness (e.g., Jackson et al., 2010; Kuster et al., 2017; Ommundssen et al., 2005). As the season became more demanding and competitive, this may have strained relationships amongst teammates reducing FP players' sense of relatedness.

The significant increase in FP players' approach goal orientation during a composite season may be related to the simultaneous increase in FP players' perceived resources, as per the explanation provided in the longitudinal analysis. Furthermore, the significant increase in FP players' avoidance and performance goal orientations during a composite season may be related to the simultaneous increase in FP players' perceived demands. Drawing upon the TCTSA, TCTSA-R and the TTSC, demands are not likely to be perceived when the situation or task is motivationally irrelevant (Jones et al., 2009; Lazarus & Folkman, 1984; Meijen et al., 2020). In other words, football must be perceived as motivationally relevant to the players in order for the stress process to be initiated and thus demands to be appraised. If football were motivationally irrelevant to the players, and they did not hold meaningful goals related to their football, then demand appraisals would be low or non-existent. Thus, as football becomes more motivationally relevant to players (indicated by increasing goal orientations), it seems reasonable to expect that demand appraisals would also increase. Equally and furthermore, a stronger motivation to win (i.e., performance goal orientation) and avoid failure (i.e., avoidance goal orientation) is likely to contribute to increased demand appraisals since consistently winning and performing without error is a difficult (arguably impossible) and effortful endeavour, and demand appraisals comprise perceptions of difficulty and effort (Jones et al., 2009; Meijen et al., 2020). Still, the issue of reciprocity is relevant here, as under greater demands, individuals may be increasingly motivated to win and avoid failure, because the task is of greater motivational relevance/significance.

Finally, anxiety symptomology increased during a season, and PDP players' anxiety and depression symptomology increased during a season, refuting H_{4b}. In support of H_{4b}, mental health improved over the course of a season for FP players, but mental health worsened for PDP players. The improvement in FP players' mental health was also practically significant; positive mental health changed from being experienced "a good bit of the time" in the early-season timepoint to "most of the time" by the late-season timepoint. Once again, these findings replicate those observed within the separate season analyses. It might be that, since cup competitions run throughout a season and tournaments take place later in the season, the increase in frequency of anxiety symptoms over a season reflects increased anxiety ahead of games of greater magnitude. This corroborates with Swain and Jones' (1992; 1993) findings where, as important events grow nearer, the frequency of cognitive anxiety symptoms (intrusive anxious thoughts) increased. Notwithstanding this, since a general measure of anxiety was used and not a sport specific measure, the observed increase in anxiety symptoms may reflect other events in players' lives, such as approaching their end of year exams at school (see Putwain & Daly, 2014). Indeed, the COVID-19 lockdown that took place towards the end of S2, as data was being collected from under-9 to under-14 players, may have also contributed to this broader picture of increasing anxiety during a season.

That FP players' mental health generally improved during a season whilst avoidance goal orientation increased and perceived relatedness generally decreased is surprising since avoidance goals have been related to worse mental health outcomes (Chen & Luo, 2015; Daumiller et al., 2021; Elliot et al., 1977; Senko & Freund, 2015) and relatedness and social connectedness are positively related to better mental health outcomes (Cobb, 1976; Kawachi & Berkman, 2001; Ng et al., 2012; Sheldon & Bettencourt, 2002). Instead, increases in FP players' perceived resources (Bovier et al., 2004), the maintenance of challenge appraisals, and increases in achievement motivation may have contributed to FP players' improving mental health during a season. Indeed, greater approach and performance motivation may reflect players' increased engagement with and motivation towards football, promoting enjoyment, protecting players against stress, and encouraging positive mental health outcomes (e.g., Salmelo-Aro & Upadyaya, 2014; Chaabouni, 2021). Nevertheless, FP players' mental health did not significantly increase during S1 when all four achievement goal orientations significantly increased, hinting at the complexity of these relationships. Further analyses are required to better understand the interaction between these variables and possible causal relationships.

By combining data from different timepoints to create "composite" early-season and late-season timepoints, greater statistical power was gained from the considerably larger sample size. Thus, this analysis highlighted the salient changes for players during a composite season, which may have otherwise been unrepresented in analyses with smaller sample sizes and thus weaker statistical power. Once again, some hypotheses were partially supported whilst others were unsupported.

3.7 General Discussion

Ecologically valid, applied research exploring the TCTSA and mental health in youth samples is lacking (cf. Dixon et al., 2019; Turner et al., 2013; 2021). Furthermore, the nature of longitudinal and temporal change in these variables is relatively unknown (cf. Cumming et al., 2017). The present study tested a series of hypotheses to examine the nature of change in youth football players' psychological demands, resources, and mental health; longitudinally over three seasons and temporally during seasons. Whilst some hypotheses received some support (i.e., hypothesised changes were significant but not always observed), others received mixed support (i.e., hypothesised changes were sometimes observed, see Table 40). Some dependent variables did change over time; the nature of change depended upon the change period referred to (e.g., during separate seasons or over six consecutive timepoints) and players' phase of football development.

Table 40

Illustration of the degree of support observed for each hypothesis.

Variable(s)	Longitudinally $_{(a)}$		During Seasons $_{(b)}$	
	Hypothesised Change (H)	Support for H	Hypothesised Change (H)	Support for H
Perceived resources, basic psychological needs $_{(1)}$	Increase (H_{1a})	Some support	Increase (H_{1b})	Mixed support
Perceived demands $_{(2)}$	Increase (H_{2a})	Some support	Increase (H_{2b})	Some support
Achievement goals $_{(3)}$	Approach, mastery, and performance goals increase Avoidance goals decrease (H_{3a})	Some support	Approach, mastery, and performance goals increase Avoidance goals decrease (H_{3b})	Mixed support
Mental health $_{(4)}$	Improve (i.e., decrease for anxiety and depression, increase for MHI) (H_{4a})	Mixed support	Improve (i.e., decrease for anxiety and depression, increase for MHI) (H_{4b})	Mixed support

Concerning stress appraisals, both demand and resource appraisals tended to increase during a season and over time. Low coping potential and a lower challenge state (i.e., more towards threat) appeared to be related to anxiety in S3 and during a composite season; decreasing coping potential and decreasing challenge (i.e., movement towards threat) was observed alongside increasing anxiety symptom frequency. Regarding BPNs, perceived autonomy and competence tended to decrease during seasons. Changes in perceived relatedness were mixed. Generally, changes in BPNs tended to only be significant for FP and YDP players; they remained consistent for PDP players. Mastery goal orientations tended to increase during seasons, whilst approach goal orientations increased over time (i.e., longitudinally). FP players' achievement goal orientations showed the most change; all orientations tended to increase during a season. The mastery goal orientation seemed to relate to perceived demands (they increased together) whilst the approach motivation orientation seemed to relate to perceived resources. Regarding changes to mental health, anxiety symptom frequency tended to increase during a season. PDP players experienced worsening mental health during seasons, in contrast to FP players who experienced improving mental health during seasons.

The COVID-19 pandemic was a considerable confounding factor within the 32-month study period. The impact appeared to be reflected in the data since all basic psychological needs significantly decreased during S2, with the first nationwide lockdown impacting the second timepoint in S2. Furthermore, symptoms of anxiety and depression were significantly lower in the season following the lockdown (i.e., in S3) than at any prior timepoint. Anxiety symptoms also significantly increased during S3, which may have been influenced in part by some uncertainty surrounding a potential second nationwide closure of schools and pause of academy football programmes around the time of the final timepoint.

3.8 Limitations

This analysis is not without its limitations; non-response bias is prevalent since some players left the academy and were lost from the research study (Berg, 2010). Thus, the longitudinal change represented here is biased since only players who remained within the academy for at least three seasons were represented within the analyses (i.e., survivorship bias). By losing access to monitoring the psychological demands and resources and mental health of players who left the academy (including those who were released), only part of the picture regarding how psychological demands and resources and mental health change over time in youth academy football players is provided due to the selective sample.

Secondly, the manipulation of mental health data to create common anxiety and depression scores is problematic, since only moderate correlations were observed between the GAD-10 and PHQ-8 scores and the MHI-5 anxiety/depression scores respectively. Whilst manipulating the data was necessary for a more adequate sample size and analysis of the data (Cohen, 1988), findings from these common scores should be interpreted with caution.

Nevertheless, the patterns of change in common anxiety/depression scores did resonate with the patterns of change in GAD-10 and PHQ-8 scores respectively.

Similarly, the process of combining data from different timepoints for the purpose of maximising the dataset is problematic. The combined data sets include a mixture of independent (i.e., players who provided data for one full season and so feature only once in the combined dataset) and repeated samples (i.e., players who provided data for more than one full season and so feature multiple times as separate "participants" in the combined dataset). Therefore, the assumption that individual observations from the repeated sample are independent is not realistic (UK Data Service, 2015). Duplicate cases could have been removed so that participants did not feature in the combined dataset more than once, but the purpose of combining the data was to maximise the sample size and so this decision was not taken.

As children in a highly evaluative environment, with a desire to be viewed favourably by, and seek approval from, coaches and academy support staff, acting in a socially desirable manner is expected within the study context. Thus, players were at an increased risk of responding to questionnaires in socially desirable ways (Crandall, 1966; Crowne & Marlowe, 1960). Specifically, players may have believed rating demands highly as expected and desired by coaches who would take insult if a player described a training session as being "easy". Furthermore, believing in yourself and demonstrating positive motivation towards football is a desirable attribute; something coaches look for in players. Therefore, despite being reassured by the researcher that coaches could not view player responses, these biases may have been prevalent. Responses may have also been influenced by survey fatigue response error bias, although this is unlikely given that players only completed the questionnaire twice per season and there were approximately six months between each timepoint (Wilson & Putnam, 1982, see Table 2 and Table 3).

Change analyses such as (M)ANOVA rely on pooled or mean data, meaning an idiographic approach is not taken. Failing to take an idiographic approach in this case means that some individuals' change, which may be significant and contain valuable insight for understanding challenge and threat states in youth athletes, is missed. For example, whilst on the whole challenge and threat states showed little change overtime, some individual players did change from challenge to threat, and others changed from threat to challenge over the course of a season/the study period. These potentially very important and salient changes are lost from the story, because the two types of change cancel each other out when data are pooled within MANOVA analyses (i.e., when positive change is combined with negative change, the average change is *no change*).

Finally, results here merely show change over time; conclusions regarding the causes of change can only be hypothesised. Thus, further analyses exploring change relationships should be conducted to provide greater insight into the causal effects of change. In particular, regression analyses should be conducted to explore whether the TCTSA as a framework can explain football performance and mental health in youth academy football players.

3.9 Research Implications

The findings presented here bestow several implications for future research. First, when conducting research with youth samples, it is important to adapt questionnaires for age to support comprehension of the questions and thus, the validity of the questionnaire. Young players should also be guided through the questionnaire at first completion, with key terms defined and explained. It is clear from the results presented here that important psychometric variables change over time and differ in athletes depending on their age and stage of sporting development. Further research and analyses of the present dataset is required to enhance the understanding of these changes. More research with PDP level players (or athletes aged 16 to 19 years) with regards to their mental health appears to be warranted.

The mechanisms behind the changes reported here require greater analysis which will be addressed in chapter four. Nevertheless, increased monitoring of youth athletes' psychological demands and resources seems necessary, including across different sports, cultures, and within female performers; the results presented here may only apply to male academy football players within the UK. Relatedly, the present research study should be replicated in other football academies as the results here may reflect cohort effects. This study could also be replicated within female youth football environment to explore possible gender differences, and across other sports (e.g., Davies et al., 2023) and development pathways. Moreover, increasing the number of observations (i.e., in-season timepoints) of psychological demands and resources and mental health within a season could provide greater insight into fluctuations during a season. For instance, in previous research, the pre-season period was shown as a time where football players' mental health was at its worst during a season (Fessi et al., 2016). Thus, before and after the pre-season period may represent two additional and suitable times to measure players' psychological demands and resources and mental health. Furthermore, measuring player stress and mental health during the off-season period could provide valuable insight into the psychological effects of being within an environment, through observing the changes brought about from taking a break / being away from the environment. Relatedly, to understand the effect of leaving or being released from talent development pathways on athlete stress and mental health, psychological demands and resources and mental health should be captured from such individuals before and after they leave the environment.

There are many challenges associated with conducting research (especially longitudinal) in applied settings, including attrition and limited opportunities for prolonged access to players and athletes throughout their development. To overcome these problems, research institutes could develop mutually beneficial relationships with sports organisations, and seek to explore performers' experiences both whilst they are within developmental pathways and as they transition out of such pathways (e.g., when academy players are released). Longitudinal research with larger sample sizes bestowed by such mutually beneficial relationships would provide greater statistical power and enable the use of more rigorous statistical analyses on data, such as cross-lagged analyses which could provide insight into causal relationships.

To address the research-practice gap, applied research exploring the effectiveness and impact of interventions which look to develop challenge states (e.g., Williams et al., 2010; Jamieson et al., 2013) in youth athletes should be conducted. Do such interventions develop challenge states in youth athletes as they do in adult samples? Does this influence performance, learning, development, and mental health? Relatedly, randomised control trial (RCT) research would be beneficial for illustrating causal effects of interventions targeting resource appraisals, whilst idiosyncratic case studies could provide valuable insight into the factors influencing changes in resource appraisals (and other factors). Such research would support applied practitioners' selection of interventions through providing a more robust evidence base. Finally, it is recommended that sport psychologists who use the TCTSA to guide their practice publish their work and reflections (e.g., Hobson & Dixon, 2023). In particular, sport psychologists working in an interdisciplinary manner to influence athlete demand and resource appraisals over the course of a season could share their reflections on doing so, including the decision making behind when to try to alter such appraisals, for who and how this can be achieved and the impact monitored. Not only would this benefit other applied sport psychologists through sharing best practice and recommendations, but it would also benefit the research community through illustrating how theoretical knowledge is used in practice, and which areas of knowledge require further study to support practitioners in their work.

Since psychometric data represents only part of the TCTSA model, CVR and hormonal (cortisol) indicators of challenge and threat states in youth performers should also be studied. Whilst it is challenging to implement such procedures in applied settings, it is feasible (e.g., Dixon et al., 2019) and may be useful for overcoming measurement issues associated with using questionnaires with youth samples, such as social desirability (Crandall, 1966; Crowne & Marlowe, 1960), comprehension (de Leeuw, 2011; Borgers et al., 2000) and survey fatigue response error bias (Wilson & Putnam, 1982). Measuring CVR indicators of challenge and threat states in youths may be challenging because the testing procedures require the individual to remain motionless whilst measures are taken, thus taking hormonal measures may be better suited and ultimately less time consuming. Still, this research would provide valuable and robust knowledge. Intervention studies incorporating physiological measures would also help advance the evidence base and more rigorously test the feasibility of the TCTSA model for explaining performance and mental health.

Continuing on the theme of strengthening measurement protocols within TCTSA research, future research could triangulate data from players, coaches, and parents to offer a more holistic and interdisciplinary approach to studying stress. For instance, research could explore how parents' and coaches' challenge and threat states relate to players' challenge and threat states, how coach and parent behaviour influence players' challenge and threat states, and parent and coach perceptions of players challenge and threat responses. Furthermore, efforts to define and measure behavioural indicators of challenge and threat could provide a greater understanding of how stress appraisals influence sporting behaviour / performance, which would be valuable for bridging the research-practice gap. It could also offer a pragmatic method of studying challenge and threat states during performance and offer insight into the mechanisms through which challenge and threat states influence performance.

Finally, youth athletes' psychophysiological challenge and threat responses to acute stressors should be explored. The trier social stress test-modified (Yim et al., 2015) represents a suitable procedure through which such processes could be studied in youth athletes. Future research could adopt this methodology, discover youth players' physiological challenge and threat responses to the acute stress, and establish whether responses to social stress predict mental health, and sporting performance and development.

3.10 Applied Practice Implications

The findings presented here bestow implications for academy players, their parents/guardians, the staff working within academy football environments and the governing bodies of sport. First, since players' psychological demands and resources and mental health change overtime, and most likely in response to external events, these variables should be monitored throughout a season. Such monitoring would enable an astute understanding of players' changing psychological needs over the course of a season and facilitate adequate support/intervention delivery in responses to changing needs (Sothern & O'Gorman, 2021). Indeed, more frequent monitoring may highlight key events or patterns within seasons which are associated with acute decrements in mental health. This could improve the support provided in response to such events, protecting mental health. Correspondingly, more frequent monitoring may also facilitate the evaluation of not only interventions but also the nature of the talent development environment as a whole (Hill et al., 2016). The present findings may also facilitate the delivery of developmentally appropriate interventions considering the differences highlighted between players in different stages of their development (Harwood & Thrower, 2019; Holland et al., 2010; Thrower et al., 2023, 2024).

The responsibility of monitoring stress and mental health may and should lie with sport psychologists or well-being practitioners operating within academy settings. However, this could not be implemented in academies that do not employ sport psychologists, employ inadequately trained practitioners who have not completed accredited training, or fail to provide the resources for sport psychologists to adequately monitor these factors. Thus, academies ought to invest in this area to support the monitoring of players' stress and well-being. In particular and based on the data, the PDP should be prioritised given the increased likelihood of PDP players experiencing worsening mental health over a season.

An important overarching finding is that whilst depression and anxiety scores did show some statistically significant change over time, these changes were relatively small and did not take scores into concerning cut off scores. Thus, this particular academy environment was not concerningly harmful to players' mental health. Whilst much negative press is targeted at academy football environments (see Men's Health, 2022), and research conducted with players within these environments paints a negative picture, this is mostly because such research focuses on the emotions experienced when players are released from these academies (e.g., Blakelock et al., 2019; Sothern & O'Gorman, 2021). Thus, whilst players are within an academy, their mental health may not be a particular concern; there could be benefits to more closely monitoring and supporting those players who are destined to be released from the academy.

Considering the longitudinal analyses and that perceived demands and resources increased after the first timepoint (when players collectively indicated academy football was not demanding), and remained consistent over the remaining timepoints (with players then believing academy football was demanding), this bestows implications for sport psychologists who might seek to administer stress appraisal questionnaires to children. It is possible the first completion of such a questionnaire produces less reliable data with it being a novel metacognitive task; practitioners might consider incorporating an additional data collection timepoint at the start of their work to act as a pilot and thus account for this factor. Alternatively, children may require support and education during their first completion of a novel questionnaire to improve their understanding of what the questions are referring to and to support their thinking about their appraisals.

Still, it cannot be proven that the first data collection timepoint provided less reliable data than the subsequent timepoints. It is plausible the changes from T1 reflect true increases in perceived demands over time. Thus, it may be worthwhile for sport psychologists (and other interdisciplinary staff) who work in academy environments to be honest and clear with players (especially new signings) about how demands will increase over time. Alongside doing so, sport psychologists could help prepare players to cope with increasing demands through focusing on developing players' personal resources, either directly via intervention or psychoeducational means (e.g., Hobson & Dixon, 2023) or indirectly through coaches (e.g., Harwood, 2008) and working at organisational and/or systems levels (e.g., Dixon & Jones, 2020; Wagstaff & Quartiroli, 2023). Indeed, conversations with players in such environments could involve asking players to recall times where they have previously sucessfully adjusted to increasing demands, and to consider the positive attributes they possess which enabled them to be selected into this environment, to enhance resource appraisals and support the develeopment of challenge states.

Considering the lack of change in BPNs satisfaction as players developed through the academy system, coaches, sport psychologists and other key stakeholders working within these environments should work collaboratively to implement interventions which intentionally target these appraisals. Indeed, opportunities for player autonomy should be overtly communicated to players to facilitate recognition of this autonomy and thus changes in their appraisals. Time and effort should be invested into supporting players in the development of their self-regulatory skills, so they are better able to recognise their own developing competence (e.g., PST). Efforts to promote positive player-to-player and coach-to-player relationships should be ongoing throughout a season and over the course of multiple seasons to facilitate the development and maintenance of perceived relatedness.

Considering how players' achievement goal orientations changed longitudinally within the present study, applied practitioners ought to consider how processes and procedures within a performance environment (or development pathway) might influence the achievement goal orientations of performers within those environments, knowing that approach and mastery orientations can increase over time. Processes and procedures for sport psychologists to monitor and contribute to might include how success is defined by key stakeholders and how these are communicated to performers, the nature of performance review and goal setting processes, and how feedback is provided to performers including the nature of praise and coaches' use of positive reinforcement (e.g., Anderman & Anderman, 1999). Whilst not necessarily having an immediate impact (indeed, few in-season changes in achievement goal orientations were observed), the development and maintenance of mastery-approach climate through the use of process (and outcome) praise (Amemiya & Wang, 2018; Dixon et al., 2023; Droe, 2013), setting approach-focused process and performance goals (Bucic & Robinson, 2017), defining success in approach rather than avoidance terms (Murayama & Elliot, 2012), avoiding making comparisons between players and instead focusing on providing individualised, mastery-focused feedback, might help to foster incremental beliefs of ability and subsequently greater approach and mastery goal orientations in the longer term (Gardner et al., 2017; Pintrich, 2000).

Athlete mental health symptoms should be monitored by sport psychologists, in particular following significant life events. Such monitoring should take place without the assumption that mental health symptoms will worsen following a significant life event since in the present analyses both anxiety and depression symptom frequency were lower in S3 (the season which followed the first COVID-19 lockdown) than in the preceding seasons. Since depression symptoms were lower in S3 after what was in many respects, a prolonged off-season period for the players, sport psychologists may wish to contribute to discussions surrounding player schedules and the logistical planning of football seasons to ensure adequate consideration is given to players' need for rest, to lower the possible rise in depression symptomology. This may represent an avenue for interdisciplinary working across coaching, sport science, and player care disciplines. Given that anxiety increased in S3, sport psychologists should consider that players' support needs may change over time following a significant life event, with players' needs potentially increasing from the short to the medium term. Interventions targeting the development of perceived resources may represent suitable ways of protecting and improving players' mental health.

Considering the separate season and composite season temporal analyses, since in-season change differed between seasons, and between phases of development, it is challenging to advise practitioners on how variables may change within seasons and thus make concrete recommendations. Indeed, the findings from the present study illustrate the importance of regular monitoring of stress and mental health markers such that sport psychology practitioners can sufficiently respond to the needs of those they are supporting. Practitioners should pay particular attention to how athlete needs may differ across a development pathway, with mid- to late- adolescent athletes (i.e., PDP players in the present analyses) representing a group whose mental health need may be greater than those of children (i.e., FP and younger YDP players) and young adolescents (i.e., older YDP players), and which intensify over the course of a competitive season. Practitioners might also consider systemic and holistic strategies to support the maintenance of a broad sense of identity in players throughout developmental pathways, to reduce the likelihood of (athletic) identity foreclosure, potentially protecting mental health (Carless & Douglas, 2013; Heird & Steinfeldt, 2013; Kilcullen et al., 2022).

Since both demand and, to a lesser extent, resource appraisals tended to increase over the course of a season (individuals became less challenged), several applied implications can be considered. On the one hand, upon considering this finding, applied practitioners may seek to lower perceived demand towards the end of a season. This could be achieved through working with coaches on their communication style to players, ensuring demands are de-emphasised towards the end of the season (e.g., Dixon et al., 2017; Evans et al., 2018; Turner et al., 2014). However, a counter argument is that, lowering perceived demands may not represent a sensible long-term solution to player development since talent development environments and pathways are by nature, increasingly demanding. Talent development environments are psychologically demanding because they are evaluative in nature, and there are negative consequences for poor performance or a lack of demonstration of development. It may not be feasible or indeed reflective of reality to attempt to lower an individual's demand appraisals. Furthermore, failing to expose individuals to increasing demands could undermine the possible development of personal resources and an individual's belief in their ability to cope with and successfully meet increasing demands over time (Hobson & Dixon, 2023; Low et al., 2021, 2023; Stoker et al., 2017, 2019; Turner & Jones, 2018). In other words, players may not develop a belief in their ability to manage high task demands if they are not exposed to high task demands. Thus, as previously described, a more suitable course of action may be to support the development of athletes' personal resources within these environments, and relatedly their self-regulatory skills. Within football academies, such work might be best targeted at players within the YDP and PDP since greater demands are perceived within these phases relative to the FP, and personal resources tended to increase over the course of a season for FP players, but not for YDP and PDP players. Furthermore, sport psychologists could encourage coaches to emphasise their athletes' resources towards the end of seasons.

Building on the recommendation for supporting players' development of personal resources during a season, based on the data, perceived control/autonomy and perceived competence/self-efficacy may represent two particularly salient appraisals to target; perceived autonomy and competence tended to decrease during seasons (particularly during S2). Considering young players' self-judgements may be inaccurate due to their less well-developed self-regulatory skills in comparison to older players and adults (see Thrower et al., 2024), applied practitioners could help coaches and players to establish on an individualised basis what small signs of success might look like for each player throughout a season (this could also foster mastery approach goal orientations). During the season, close attention should be paid to small signs of success, and highlighted to the young player who may struggle to recognise these signs and their own progress. Such efforts may be especially important when a player experiences greater demands (e.g., in a particularly difficult match or when playing/training with an older age group). Furthermore, consistently providing players with opportunities for autonomy throughout a season may help to prevent the reduction in perceived autonomy, which could offer performance and mental health benefits. The benefits of perceived autonomy on player effort, persistence, motivation, enjoyment, performance, and mental health should be made clear to key stakeholders to develop their buy-in to providing such opportunities, ensuring opportunities are not merely a one-off "tick box" exercise which is satisfied at the start of a season and not addressed again.

Considering anxiety tended to increase during a season (for PDP players and during S3), to support players' mental health and limit such increases, sport psychologists working within talent development environments could take several approaches. First, PDP players' season expectations could be managed through limiting uncertainty and providing greater clarity and insight regarding the season ahead and whether their contract is likely to be renewed. Uncertainty (which can lead to greater anxiety) could also be reduced by ensuring academy processes and protocols are consistent and predictable. However, preventing players from experiencing uncertainty may be counterintuitive, since life is uncertain, and this cannot always be avoided. Instead, developing a tolerance for uncertainty, and a skillset for managing uncertainty would appear to be a more sensible approach to take. Talent development environments could support athletes' tolerance for uncertainty through offering strategic exposure to uncertainty and providing suitable support alongside. This support might include fostering positive beliefs about uncertainty through highlighting the skills developed and benefits gained from working through uncertainty (e.g., reappraisal, Jamieson et al., 2010, 2018; Robazza et al., 2023; Sammy et al., 2017; Smits et al., 2012; Troy et al., 2010). Furthermore, psychoeducation for managing uncertainty could be provided, outlining an advantageous approach to managing uncertainty which could include focusing on one's coping resources and those aspects which are still certain amidst the uncertainty (e.g., one's knowledge and skills, the support network available to the performer etc.). Relatedly, much uncertainty within talent development environments is tied in with the evaluative nature and the judgements being consistently made by key stakeholders about athletes and players. Players could be encouraged to actively seek judgement and feedback as a method of approaching and resolving uncertainty, ameliorating potentially debilitative emotions (i.e., anxiety). Such feedback should be provided in a supportive way, with space in those conversations for the athlete/player to ask further questions and provide their own thoughts and opinions. Sport psychologists working in football academies / talent development environments could support the development of best practice within this area through providing feedback to and working collaboratively with relevant key stakeholders.

Since the data showed that mental health worsened in S3 when demands significantly increased but perceived resources did not, sport psychologists many consider the ongoing and changeable needs following a significant life event or when a performer is returning from a significant break from sport (such as injury) and may benefit from focusing their efforts on developing athletes' perceived resources over the course of a season, as previously outlined.

Considering depression also tended to increase over a season for PDP players, this could indicate the importance of providing adequate psychoeducation at the YDP stage of academy football, to equip players with coping skills (e.g., personal resources) to reduce the chances of such difficulties emerging in future. Still, this is not sufficient since players may enter the academy system at PDP level having no prior experience within an academy. Thus, when new players sign at an academy, conducting an intake of their coping strategies may be beneficial to highlight a players' needs and identify areas of deficiency in their knowledge. Finally, key stakeholders should consider the schedules of PDP players and ensure adequate opportunity for rest and recovery is included, not just from a physical but also a mental perspective. This type of conversation is something applied sport psychologists could initiate and lead, to reduce the chances of PDP players' depression symptoms increasing over the course of a season.

The context of academy football in the UK ought to be considered alongside these applied implications. The Premier League's EPPP guidelines are often the driving force behind academy investment decisions, since the EPPP stipulates the levels of support necessary to award an academy its status (Premier League, 2011). Only at category one level is it a necessity for an academy to employ a fulltime sport psychologist. In addition, the structuring of responsibilities within the EPPP places the role of mental health and well-being support at the door of education and safeguarding staff, who may not have adequate training to spot and support individuals experiencing stress and mental ill-health. The findings from this analysis highlight the necessity for greater sport psychology provision across all categories of academy in the UK. EPPP guidelines should stipulate the necessity for adequate training and competence in the individual who monitors and responds to changes in stress and mental health variables (see Jones, 2018).

Finally, players, players' parents and player facing staff should be made aware of how psychological demands, resources, and mental health outcomes may change for players over the course of a season. Whilst the explanations for change presented here are hypothetical, the patterns of change do corroborate with external, sometimes predictable factors within a season which may increase stress and mental health issues for players, in particular the young professionals (PDP players). The negative impact these factors have on players could thus be reduced if academies adopted processes which reduce uncertainty and involve the provision of adequate player support. Further, players and their parents could be supported and made more aware of likely challenges during a season, support networks and effective coping strategies and techniques which can be used to overcome those challenges.

3.11 Conclusion

From the present longitudinal and temporal analysis of the data it can be concluded that youth academy football players' psychological demands and resources, and mental health do change over time. This finding builds on previous qualitative accounts (e.g., Blakelock et al., 2019; Sothern & O'Gorman, 2021) and cross-sectional research (e.g., Androkikos et al., 2021; Gerbert et al., 2021; Jensen et al., 2018; Küettel et al., 2022) to provide novel insight into how these variables change over time within youth academy football players. Strong applied practice recommendations can thus be made, encouraging the monitoring of youth athletes' psychological demands, resources, and mental health as they develop through sport performance pathways, thanks to the improved understanding of how psychological variables change over time in children (see Harwood & Thrower, 2019). Indeed, interventions with youth athletes such as PST should target the development of and measure changes in perceived resources (e.g., Hase et al., 2019a; Williams & Cumming, 2012a; 2012b; Williams et al., 2010; 2017; 2021) to further the extant literature and test underlying mechanisms behind the impact of PST on performance and well-being (Harwood & Thrower, 2019; Meggs & Chen, 2019; Thrower et al., 2023).

Considering the nature of change in players' psychological demands, resources and mental health is likely to be influenced by their stage of development (i.e., phase) and external factors beyond their control (i.e., significant life events such as the pandemic), these findings contribute to the extant literature by offering novel insight into the impact of youth development experiences on mental health (Mills et al., 2011), knowledge which has been called for previously (see Harwood, 2008; Sothern & O'Gorman, 2021). Moreover, these findings build on the recommendations made by Henriksen et al (2014); that a long-term development focus should be present in work with young people. Only with greater insight into how psychological variables change over the course of a youth athlete's development can an evidence informed approach to supporting long-term development be proffered. Importantly from the present research, the differences in needs between players of different phases could inform the type of work prioritised in different stages of an athlete's development, with an awareness that an athlete could be prepared during earlier stages for the demands they may face in later stages. Additional investment by academies into monitoring and supporting players in the areas of stress and mental health is recommended, particularly for players within the PDP.

The present research also builds on the extant temporal and longitudinal research into challenge and threat states and mental health in sport (i.e., Chadha et al., 2023; Cumming et al., 2017; Davies et al., 2023; Norabi et al., 2020; 2021; Tabei et al., 2020) by surveying these variables over a longer timeframe (i.e., three consecutive seasons). Consequently, this research contributes novel findings; the nature of in-season change is unlikely to be the same each season and depends upon an individual's stage of development. Relative to the aforementioned studies, sample sizes within the present analyses are greater and the range of athletes surveyed vaster, adding further weight to the value of contribution made by this research to the extant literature. Of course, further analysis of the data is required to broaden the contributions of this research, such as through exploring relationships between variables, such as how change in one variable might be related to change in another.

Since psychological variables constituting the target of an intervention (e.g., BPNs) change naturally over time, this should be considered when evaluating the impact of interventions (e.g., PST); any change (or lack of change) following an intervention may be partly due to factors beyond the applied practitioner’s control (such as external events or natural development) as opposed to the intervention itself. Together, these factors should be taken into consideration when planning the intervention monitoring and evaluating procedures, and when interpreting data.

4.0 CHAPTER 4. RELATIONSHIPS BETWEEN CHANGES OVER TIME.

4.1 Introduction

In chapter three, the need for examining longitudinal and temporal change in academy football players' psychological demands and resources and mental health markers was established and change over time analyses were presented. The findings were complex and mixed; stress appraisals, BPNs, achievement goals and mental health variables did change over time, and this appeared to be related to external factors such as the COVID-19 pandemic. Moreover, in-season change differed between seasons and was dependent upon a players' phase of development. Further investigation into the nature of variable change is required to develop a greater understanding of the change, possible predictors of change, and relationships between changing variables. Such investigation is presented within the present chapter and is useful for establishing how closely related different variables are to each other. For instance, if changes in stress appraisals are related to changes in mental health markers, this suggests stress appraisals are related to mental health. Establishing such relationships is important for informing our understanding of stress and mental health in youth athletes, as well as the content of interventions delivered by sport and exercise psychologists which might target performance and mental health outcomes.

Within the present chapter, correlations between residualised change scores for all study variables are reported, together with regression analyses to discover whether changes in psychological demands and resources were related to changes in mental health markers. Regression analyses exploring whether changes in the psychological demands and resources and mental health markers were related to football performance are also provided. This chapter addresses the second and third PhD aims, to explore how changes in psychological demands and resources relate to changes in mental health, and to explore how changes in psychological demands, resources, and mental health relate to changes in football performance. By testing the TCTSA model in this way (i.e., using residualised change scores) and establishing relationships between changing variables, this can show how closely related the variables are to each other. If there is a relationship between the nature of change in different study variables, this indicates the variables are closely related and potentially influence one another, offering stronger support for such associations/relationships than mere correlations.

In the TCTSA (Jones, et al., 2009) sporting performance is deemed to be influenced by the perceived situational demands and personal resources held by athletes. An athlete is expected to perform well when in a challenge state (Jones et al., 2009); perceived resources are equal to or greater than perceived demands. Athletes in a challenge state have high self-efficacy, focus on controllable aspects of their performance, and is motivated towards achieving success (rather than avoiding failure). Any anxiety experienced is perceived as facilitative for performance. These characteristics are hypothesised to improve performance through more efficient delivery of oxygen to the muscles, improved concentration and decision making, increased anaerobic power and task engagement, and reduced likelihood of reinvestment and loss of resource due to self-regulation (Jones et al., 2009). In contrast, performance suffers when an athlete is in a threat state; when perceived demands are greater than perceived resources, self-efficacy is low and there is little focus on the controllable aspects of performance. The athlete is motivated towards avoiding failure whilst appraising anxiety as unhelpful for performance. That challenge is beneficial for sport/athletic performance compared to threat has been reported consistently across extant literature (Behnke & Kaczmarek, 2018; Hase et al., 2018; Meijen et al., 2020).

There is a growing body of sport psychology literature investigating the TCTSA across various sports (Blascovich et al., 2004; Williams et al., 2010) including golf (Moore et al., 2013; 2015), netball (Davies et al., 2023; Turner et al., 2012; 2021), rowing (Cumming et al., 2017), cricket (Turner et al., 2013), and football (Dixon et al., 2019). Research supports the use of the TCTSA as a framework to conceptualise performers' acute psycho-physiological states in anticipation of competitive performance. For instance, within a laboratory-based golf competition, experienced golfers' pre-task demand and resource appraisals predicted superior performance when appraisals reflected a challenge state (i.e., sufficient resources to cope with perceived demands; Moore et al., 2013). Further, when challenge and threat states were manipulated in experienced golfers prior to a putting task, individuals in an induced challenge state outperformed those in an induced threat state (Moore et al., 2013). Similarly, a biophysiological challenge response prior to a motivated performance situation bestowed performance benefits when compared to a biophysiological threat response within the lab (see Brimmell et al., 2018; Turner et al., 2012). Whilst this research has been useful in supporting the utility of the TCTSA within sport and acute performance settings, much of the research has taken place in laboratory settings (e.g., Moore et al., 2012; 2014; 2015), and thus lacks ecological validity. This prevents findings from being generalised to real-world sport and applied practice settings. Furthermore, by only considering the impact of challenge and threat states on acute sporting performance, insight into the more enduring impact of challenge and threat states on patterns of performance (and thus sporting development) are relatively unknown. Since the research to date has, mostly, supported the TCTSA, it makes sense to longitudinally examine TCTSA components and understand its utility in ecologically valid settings, to further test the theory and inform applied psychologists' use of the TCTSA in their practice.

A primary purpose of longitudinal research is to describe patterns of change; both its direction and magnitude of change over time (Menard, 2002). Two methods to achieve this are analysing interrelationships in variable change (i.e., correlations between variable change) and the determinants of change (Baltes & Nesselroade, 1979). Such analysis is valuable since if two change variables are related, this indicates a closer relationship between the variables, allowing sound recommendations to be made for both future research and applied practice (Cobley & Till, 2017; Grammer et al., 2013; Maxwell & Cole, 2007).

Within statistical analyses of change, difference or residualised change scores may be used. Difference scores refer to the raw change in scores calculated by subtracting the latter score from the initial score and have been deemed problematic because they fail to account for error in measurement, which is a particular issue when psychometric data is used because error in measurement is high. Ultimately, this reduces the reliability of the difference score (Lord, 1956). In contrast, residualised change scores account for error in measurement by regressing one score onto the other (Zumbo, 1999). A residualised change score represents the change in the variable, controlling for the variable score at the initial timepoint (Valente & MacKinnon, 2017). The latter score is regressed onto the earlier score, meaning a residualised change score represents the change in the variable at the second timepoint which cannot be explained by the variable score at the first timepoint (Cronbach & Furby, 1970). Thus, residualised change scores are suitable for the present analyses and for addressing the second and third PhD aims, since psychometric data is used and there is likely to be similarity in the variable scores for each individual at each timepoint (e.g., Chadha et al., 2023; Cumming et al., 2017; Skinner & Brewer, 2002). Furthermore, the method for creating the residualised change score assumes non-normality, which is largely the case within the present dataset (Lind & Zumbo, 1993) and residualised change models offer greater statistical power than difference models (Castro-Schilo & Grimm, 2018).

4.2 Hypotheses

Within the present analyses there were two core hypotheses (see Table 41), in line with those made in chapter three. First, it was hypothesised that increases in anxiety and depression (worsening mental health) would be related to increases in the challenge and threat ratio (indicating higher threat relative to challenge), increases in avoidance goal orientations, and decreases in BPNs, and approach goal orientations (H_5). Second, it was hypothesised that superior performance would be related to decreases the challenge and threat ratio (indicating higher challenge relative to threat), avoidance goal orientations, anxiety, and depression symptoms (i.e., improved mental health), and increases in BPNs, and approach goal orientations (H_6).

Table 41

Hypothesised relationships between changing variables.

Variable(s)	Hypothesised Relationships	
	Worsening Mental Health (H_5)	Superior Performance (H_6)
Challenge and threat ratio	Increase	Decrease
Basic psychological needs	Decrease	Increase
Approach goal orientation	Decrease	Increase
Avoidance goal orientation	Increase	Decrease
Anxiety and Depression	N/A	Decrease
Mental Health (MHI)	N/A	Increase

4.3 Method

4.4 Data Preparation

To test H_5 and H_6, season average scores for each study variable were calculated. Furthermore, residualised change scores were computed for each study variable during each of the change periods being tested; during S1 (T2 regressed onto T1), during S2 (T4 regressed onto T3), during S3 (T6 regressed onto T5), during a composite season (late-season regressed onto early-season), and season average change from S1 to S2 (S2 average regressed onto S1 average), from S2 to S3 (S3 average regressed onto S2 average), and from S1 to S3 (S3 average regressed onto S1 average).

4.4.1 Season Average Scores

Season average scores for all study variables (i.e., questionnaire data and football performance) were calculated via the compute variable function within SPSS.

Questionnaire Data. Individual scale scores from T1 were summed with their corresponding scores from T2, which were then divided by two to provide a 'S1' scale score for each individual. This process was repeated for S2 using T3 and T4 scores, and S3 using T5 and T6 scores. Once computed, the Z scores for the questionnaire data season averages were calculated and significant outliers ($p<0.05$, e.g., Mendes et al., 2003) were Winsorized according to the guidelines for small sample sizes; data points with Z scores greater than 3.29 or smaller than -3.29 were changed to the nearest data score with a Z score smaller than 3.29 or greater than -3.29 respectively (Tabachnick & Fidell, 2013; Smith, 2011). In total, 16 season average cases (0.24% of the total season average cases) were Winsorized.

Performance Data. As described in chapter two, player performance was scored out of 10 after every game they played in, by their coach. Performance scores throughout a season were collated into three separate performance periods; within each period, player match performance ratings were averaged. Therefore, there were nine separate performance periods during the study timeframe (see Table 6). The first performance period (P1) in each season included matches played in the 12 weeks which followed T1, T3 or T5. The second performance period (P2) in each season included matches played within the 12 weeks which followed P1 and preceded T2, T4, and T6. The third performance period (P3) in each season included matches played in the 12 weeks which followed P2 and T2, T4, and T6.

Regarding season average scores for football performance, this calculation was made more complicated due to the COVID-19 lockdowns in April 2020 and December 2020, which impacted S2 and S3 respectively. Specifically, S2P3 contained no performance data; no games were played by any players because the first lockdown began at the start of this performance period. As such, average S2 performance scores were computed using S2P1 and S2P2 data only; these ratings were summed and divided by two. Similarly, S3P2 contained no performance data for players within the under-9, under-10, under-11, under-12, under-13, under-14, under-15, and under-16 age groups; no games were played by players within these age groups because the second lockdown occurred within this performance period. As such, average S3 performance scores for under-18 and under-23 players were computed by summing S3P1, S3P2 and S3P3 performance scores and dividing by three. Average performance scores for the remaining players were computed by summing S3P1 and S3P3 performance scores and dividing by two. Unlike with the questionnaire data, the performance data were not Winsorized. This was because the performance scores were based on observations of behaviour and thus deemed less prone to error relative to the psychometric data.

4.4.2 Residualised Change Scores

Unstandardised residualised change scores were calculated within SPSS for the change taking place in questionnaire data from T1 to T2, T3 to T4, T5 to T6, from the early-season timepoint to the late-season timepoint during a composite season; variable scores from the latter timepoint were regressed onto variable scores from the earlier timepoint (Zumbo, 1999). Furthermore, residualised change scores were calculated for the performance data for each season, documenting change from P1 to P2, from P2 to P3 and from P1 to P3 (where data allowed). Finally, residualised change in the season average scores for each variable were calculated from S1 to S2, from S2 to S3 and from S1 to S3. Once computed, all residualised change scores (except for the performance residualised change scores) were Winsorized according to the processes outlined previously.

4.5 Participants

Within S1, 130 players provided questionnaire data at both T1 (M*age*=11.75, SD=2.45) and T2; 80 completed the GAD-10 (Craske et al., 2013) and PHQ-8 (Kroenke et al., 2009) whilst the remaining 50 completed the MHI-5 (Berwick et al., 1991). Of those 130, performance data was available from 119 players at S1P1, 115 players at S1P2 and 115 players at S1P3. Within S2, 126 players provided questionnaire data at both T3 (M*age*=12.25, SD=2.68) and T4; all 126 completed the MHI-5 whilst 84 completed the GAD-10 and PHQ-8. Of those 126, performance data was available from 123 players at S2P1 and 122 players at S2P2 (no performance data was collected at S2P3 for the reasons outlined previously). Within S3, 150 players provided questionnaire data at both T5 (M*age*=12.55, SD=2.96) and T6; all 150 completed the MHI-5 whilst 104 completed the GAD-10 and PHQ-8). Of those 150, performance data was available from 147 players at S3P1, 22 at S3P2 and 120 players at S3P3.

Regarding the composite season, questionnaire data from 404 players was available for analysis (M*age*=12.18, SD=2.73); GAD-10 and PHQ-8 scores were available for 268 players (M*age*=13.76, SD=1.93) and MHI-5 scores were available for 326 players (M*age*=11.92, SD=2.88). Of those 404, P3 performance data was available for 236 players. Performance data was available for 232 players at both P1 and P3.

Finally, regarding the season average change analyses, questionnaire data from 90 players were available for the S1 to S2 analysis (M*T1age*=11.89, SD=2.45); GAD-10 and PHQ-8 scores were available for 60 players (M*T1age*=13.27, SD=1.69) and MHI-5 scores were available for 30 players (M*T1age*=9.13, SD=.94). No performance data was available from any players during S2P3 due to the COVID-19 lockdown.

Questionnaire data from 105 players were available for the S2 to S3 analysis (M*T3age*=12.13, SD=2.73); GAD-10 and PHQ-8 scores were available for 69 players

(M*T3age*=13.70, SD=1.94) and MHI-5 scores were available for all 105 players. Of the 105 players, S3P3 performance data were available for 80 players.

Lastly, questionnaire data from 88 players were available for the S1 to S3 analysis (M*T1age*=11.70, SD=2.49); GAD-10 and PHQ-8 scores were available for 56 players (M*T1age*=13.20, SD=1.75) and MHI-5 scores were available for 32 players (M*T1age*=9.09, SD=.96). Of the 88 players, S3P3 performance data were available for 65 players.

4.6 Analytic Strategy

The relationships between changes in study variables were examined, in other words and for example, do changes in BPNs relate to changes in mental health symptoms? To achieve this, Pearson bivariate correlations of residualised change scores were run for each period of change; during S1 (T1 to T2), during S2 (T3 to T4), during S3 (T5 to T6), during a composite season (early to late season timepoints) and from S1 (T1 and T2 average) to S2 (T3 and T4 average), from S2 (T3 and T4 average) to S3 (T5 and T6 average), from S1 to S3. In general, the correlation sample sizes were sufficient since a priori analyses conducted using G*Power (Faul et al., 2007) indicated that to detect a medium effect size using correlation (0.3, Cohen, 1988), a sample of 67 participants would be needed to achieve 80% power, where α=0.05. To view the descriptive statistics and correlations between the study variables' residualised change scores, see Table 42 for the change during S1, Table 43 for the change during S2, and Table 44 for the change during S3. The descriptive statistics and correlations between the study variables' residualised change scores during a composite season can be found in Table 45. Finally, to view the descriptive statistics and correlations between the average season study variables' residualised change scores, see Table 46 for the change from S1 to S2, Table 47, for the change from S2 to S3, and Table 49 for the change from S1 to S3.

Multiple linear regression analyses were conducted to test whether change in psychological demands and resources were related to change in mental health and football performance in youth academy football players. Residualised change scores in the regression models allowed the investigation of whether changes in psychological demands and resources were related to changes in mental health and performance. In total, 50 mental health and 11 performance regressions were conducted, using the model(s) outlined in Error! Reference source not found.. A priori analyses conducted using G*Power (Faul et al., 2007) indicated that to detect a medium effect size using linear multiple regression (0.15, Cohen, 1988) when seven predictors are included in the model (which is the case for the mental health regression models), a sample of 103 participants would be needed to achieve 80% power, where α=0.05. When nine predictors are included in the model (which is the case for the performance regression models), a sample size of 114 participants would be needed to achieve 80% power, where α=0.05. Thus, adequate sample sizes to provide the necessary statistical power were available for some but not all of the regressions.

Regression analyses using residualised change scores were conducted over other methods of change analysis (such as mediation and cross-lagged analyses) because the residualised change method maximises the dataset; all relevant data from the two timepoints within each analysis are incorporated into the model. In other words, and for example, the "during S1" regression analysis would incorporate stress appraisal, BPNs, achievement goal and mental health data from both T1 and T2 into the model. By doing so, the analysis controls for more factors (relative to other methods analysis such as mediation) and consequently offers strong support that variables are related (Cronbach & Furby, 1970; Valente & MacKinnon, 2017). In contrast and for example, mediation analyses omit certain portions of the dataset, meaning fewer variables are controlled for and thus the support that variables are related is weaker. Related to the previous example, a mediation analysis predicting T2 mental health from T1 stress appraisal data omits both T1 mental health and T2 stress appraisals, T1 and T2 BPNs and achievement goal orientations, which are likely to influence and relate to the data being analysed. In other words, the impact of T1 mental health on T2 mental health is not considered in a mediation analysis but is controlled for within regression analyses along with other variables (Cronbach & Furby, 1970).

Figure 5

Illustration of the regression models used to explain mental health and performance.

Model Steps	Dependent Variable	
	Mental Health Variable	Performance Score
Level 1	Age at earlier timepoint	
Level 2	Residualised change scores for perceived autonomy, competence, and relatedness	
Level 3	Residualised change score for the challenge and threat ratio	
Level 4	Residualised change scores for approach and avoidance goal orientations	
Level 5	N/A	Residualised change scores for common anxiety and common depression

Furthermore, the residualised change regression models enable a dynamic understanding of variable change and relationships between variable change. The regression models in the present analyses can indicate where changes in one variable relate to changes in another. This provides strong support for the existence of a relationship between those two variables. For example, if increases in BPNs are shown to be related to decreases in anxiety, this lends strong support that BPNs are related to anxiety. Furthermore, the use of change scores within the analysis accounts for the issue of reciprocity, whereby the direction of the relationship between variables is not certain and indeed could be bi-directional. Building on the previous example, it would not be possible to tell whether increases in BPNs led to decreases in anxiety, or whether decreases in anxiety enabled greater recognition and perception of opportunities for autonomy, competence, and relatedness. Using change scores

Table 42

*Descriptive statistics and correlations for the residualised changes in study variables from T1 to T2, *p < .05, **p < .001.*

Residualised Change Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	130	0	.63	-	.511**	.355**	-.046	.320**	-.213*	.184*	.092	-0.151	-.116
2. Competence	130	0	.47		-	.514**	-.225*	.464**	-.400**	.352**	.188*	-.263**	-.136
3. Relatedness	130	.005	.49			-	-.248**	.417**	-.425**	.391**	.178*	-0.038	-.009
4. Demands	130	-.001	.68				-	-.112	.820**	-.391**	.119	.391*	.201*
5. Resources	130	0	.52					-	-.583**	.347**	.226**	-.174*	0.01
6. Challenge and Threat Ratio	130	-.001	.13						-	-.494**	.006	.362**	.142
7. Coping Potential	130	0	1.25							-	.019	-.277**	-.204*
8. Approach Goals	130	0	.81								-	.199*	.323**
9. Avoidance Goals	130	0	1.15									-	.701**
10. Mastery Goals	130	0	.76										-

Table 42

Residualised Change Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17	18	19
1. Autonomy	130	0	.63	-0	-.421**	-.286*	.198	-.219*	-.141	-.059	.055	.06
2. Competence	130	0	.47	-0	-.403**	-.436**	.460**	-.354**	-.355**	-.115	-.054	-.128
3. Relatedness	130	.005	.49	0.09	-.425**	-.306**	.216	-.222*	-.214*	-.048	-.078	-.079
4. Demands	130	-.001	.68	.342**	.284*	.232*	-.235	.148	.308**	.085	-.035	-.02
5. Resources	130	0	.52	-0	-.219	-.229*	.338*	-.104	-.275**	.048	-.05	-.045
6. Challenge and Threat Ratio	130	-.001	.13	.271**	.300**	.296**	-.345*	.118	.353**	.083	.001	.019
7. Coping Potential	130	0	1.25	-0.1	-.159	-.305**	.334*	-.153	-.260**	-.082	.087	.06
8. Approach Goals	130	0	.81	.688**	-.057	-.117	.001	-.048	-.025	-.058	-.021	-.003
9. Avoidance Goals	130	0	1.15	.688**	.212	.182	-.294*	.173*	.308**	.005	-.024	.039
10. Mastery Goals	130	0	.76	.273**	.153	.161	-.185	.122	.225*	-.05	.045	.058
11. Performance Goals	130	0	1.14	-	.068	0	-.188	.071	.149	-.005	-.063	.005
12. Anxiety (GAD-10)	80	0	.29		-	.459**	-	.945**	.509**	-.004	.118	.083
13. Depression (PHQ-8)	80	-.006	.23			-	-	.464**	.950**	-.03	.09	-.02
14. Mental Health (MHI-5, U9-U11)	50	0	9.50				-	-.767**	-.584**	-.061	.065	-.154
15. Common Anxiety	130	-.032	.38					-	.295**	.081	.084	.141
16. Common Depression	130	-.036	.37						-	.136	.035	.133
17. Performance (P1-P2)	119	0	.65							-	-.194*	.337**
18. Performance (P2-P3)	115	0	.55								-	.827**
19. Performance (P1-P3)	115	0	.55									-

Table 43

*Descriptive statistics and correlations for the residualised changes in study variables from T3 to T4, *p < .05, **p < .001.*

Residualised Change Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	124	0	.60	-	.508**	.484**	-.087	.196*	-.177*	-.051	.085	-.152	-.167
2. Competence	124	0	.55		-	.479**	.018	.247**	-.119	.023	.027	-.158	-.079
3. Relatedness	124	.002	.49			-	-.058	.128	-.103	.028	-.049	-.227*	-.147
4. Demands	124	0	.72				-	-.078	.873**	-.556**	.103	.410**	.393**
5. Resources	124	0	.53					-	-.529**	.234**	.402**	-.144	.062
6. Challenge and Threat Ratio	124	0	.13						-	-.581**	-.085	.415**	.296**
7. Coping Potential	124	0	1.18							-	-.015	-.298**	-.240**
8. Approach Goals	124	0	.76								-	.086	.265**
9. Avoidance Goals	124	0	1.08									-	.729**
10. Mastery Goals	124	0	.81										-

Table 43

Residualised Change Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17
1. Autonomy	124	0	.60	.032	-.336**	-.360**	.355**	-.218*	-.163	.097
2. Competence	124	0	.55	-.109	-.346**	-.431**	.411**	-.149	-.288**	.254**
3. Relatedness	124	.002	.49	-.166	-.326**	-.281*	.389**	-.231**	-.225*	.153
4. Demands	124	0	.72	.211*	.078	.111	-.200*	.062	.063	.166
5. Resources	124	0	.53	.066	-0	.001	.119	-.069	-.109	.041
6. Challenge and Threat Ratio	124	0	.13	.166	.079	.102	-.222*	.084	.102	.139
7. Coping Potential	124	0	1.18	-.148	-0.2	-.15	.126	-.112	-.078	-.131
8. Approach Goals	124	0	.76	.630**	.064	.152	.033	-.139	.026	-.003
9. Avoidance Goals	124	0	1.08	.540**	.079	.265*	-.293**	.265**	.182*	-.09
10. Mastery Goals	124	0	.81	.163	.083	.280*	-.241**	.035	.116	.015
11. Performance Goals	124	0	.94	-	.055	.173	-.149	.159	.192*	-.108
12. Anxiety (GAD-10)	84	-.005	.25		-	.469**	-.354**	.830**	.426**	-.421**
13. Depression (PHQ-8)	84	-.003	.23			-	-.543**	.465**	.939**	-.288*
14. Mental Health (MHI-5)	126	.036	11.20				-	-.501**	-.601**	.105
15. Common Anxiety	126	.016	.30					-	.405**	-.207*
16. Common Depression	126	.006	.33						-	-.231*
17. Performance (P1-P2)	148	0	.71							-

Table 44

*Descriptive statistics and correlations for the residualised changes in study variables from T5 to T6, *p<.05, **p<.001.*

Residualised Change Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	150	.004	.650	-	.502**	.229**	-.111	.339**	-.262**	.193*	.083	-.089	.036
2. Competence	150	0	.465		-	.387**	-.245**	.364**	-.376**	.199*	.062	-.259**	-.161*
3. Relatedness	150	-.004	.409			-	-.09	.167*	-.157	.09	-.019	-.240**	-.109
4. Demands	150	0	.629				-	-.098	.871**	-.351**	.075	.204*	.215**
5. Resources	150	0	.486					-	-.557**	.345**	.202*	-.165*	.078
6. Challenge and Threat Ratio	150	0	.118						-	-.455**	-.033	.235**	.129
7. Coping Potential	150	0	.946							-	.04	-.216**	-.109
8. Approach Goals	150	0	.702								-	.137	.234**
9. Avoidance Goals	150	0	1.215									-	.714**
10. Mastery Goals	150	0	.812										-

Table 44

Residualised Change Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17	18	19
1. Autonomy	150	.004	.65	-.084	-.225*	-.238*	.142	-.055	.018	.38	-.161	.031
2. Competence	150	0	.47	-.124	-.263**	-.283**	.362**	-.172*	-.129	.482*	-.009	.072
3. Relatedness	150	-.004	.41	-.165*	-.04	-.05	.368**	-.176*	-.115	.477*	.126	.304**
4. Demands	150	0	.63	.113	.268**	.426**	-.269**	.170*	.324**	-.285	.331	.184*
5. Resources	150	0	.49	-.132	-.225*	-.09	.155	-.272**	-.13	.125	-.086	-.053
6. Challenge and Threat Ratio	150	0	.12	.15	.332**	.413**	-.308**	.275**	.331**	-.249	.248	.153
7. Coping Potential	150	0	.95	-.138	-.17	-.18	.127	-.199*	-.073	.206	-.267	.031
8. Approach Goals	150	0	.70	.603**	.124	.112	-.064	-.011	-.006	.005	.01	.067
9. Avoidance Goals	150	0	1.22	.657**	.135	.105	-.302**	.206*	.187*	-.295	-.177	-.105
10. Mastery Goals	150	0	.81	.186*	.234*	.225*	-.282**	.192*	.246**	-.342	-.232	-.069
11. Performance Goals	150	0	1.09	-	.113	.058	-.180*	.094	.035	-.064	.026	-.011
12. Anxiety (GAD-10)	104	-.005	.22		-	.495**	-.510**	.980**	.544**	-.314	.264	.041
13. Depression (PHQ-8)	104	-.002	.17			-	-.292**	.493**	.954**	-.019	.016	.139
14. Mental Health (MHI-5)	150	0	9.39				-	-.542**	-.403**	.211	.176	.035
15. Common Anxiety	150	-.003	.29					-	.439**	-.306	.255	-.122
16. Common Depression	150	-.004	.26						-	-.132	.077	.005
17. Performance (P1-P2)	22	0	.62							-	-.251	.557*
18. Performance (P2-P3)	20	0	.58								-	.652**
19. Performance (P1-P3)	117	0	.63									-

Table 45

*Descriptive statistics and correlations for the residualised changes in study variables during a composite season when timepoints are combined, *p < .05, **p < .001.*

Residualised Change Variable	n	M	SD	2	3	4	5	6	7	8	9	10
1. Autonomy	404	.001	.63	.487**	.348**	-.07	.276**	-.210**	.110*	.102*	-.121*	-.06
2. Competence	404	.002	.50	-	.465**	-.133**	.342**	-.267**	.178**	.109*	-.225**	-.120*
3. Relatedness	404	.002	.47		-	-.125*	.233**	-.222**	.168**	.06	-.154**	-.08
4. Demands	404	-.004	.69			-	-.07	.836**	-.454**	.133**	.361**	.323**
5. Resources	404	0	.52				-	-.532**	.298**	.311**	-.147**	.05
6. Challenge and Threat Ratio	404	0	.13					-	-.517**	-.03	.331**	.198**
7. Coping Potential	404	0	1.12						-	-.01	-.279**	-.199**
8. Approach Goals	404	0	.78							-	.169**	.306**
9. Avoidance Goals	404	0	1.18								-	.714**
10. Mastery Goals	404	0	.82									-

Table 45

Residualised Change Variable	n	M	SD	11	12	13	14	15	16	17	18	19	20
1. Autonomy	404	.001	.63	-.02	-.326**	-.291**	.222**	-.133**	-.09	.04	.06	.05	.04
2. Competence	404	.002	.50	-.08	-.358**	-.388**	.396**	-.232**	-.255**	.10	-.01	-.03	.03
3. Relatedness	404	.002	.47	-.06	-.265**	-.229**	.356**	-.213**	-.182**	.08	-.02	.12	.143*
4. Demands	404	-.004	.69	.246**	.209**	.278**	-.286**	.165**	.279**	.11	-.02	.10	.07
5. Resources	404	0	.52	-.01	-.157*	-.09	.163**	-.119*	-.154**	.05	-.06	-.07	-.19
6. Challenge and Threat Ratio	404	0	.13	.201**	.230**	.267**	-.273**	.154**	.263**	.09	.01	.09	.02
7. Coping Potential	404	0	1.12	-.163**	-.158**	-.210**	.162**	-.156**	-.165**	-.10	.06	.04	.05
8. Approach Goals	404	0	.78	.652**	.03	.04	-.03	-.03	.03	-.03	-.01	.05	.02
9. Avoidance Goals	404	0	1.18	.651**	.139*	.184**	-.329**	.240**	.264**	-.05	-.03	-.01	-.08
10. Mastery Goals	404	0	.82	.235**	.156*	.219**	-.272**	.138**	.217**	-.04	-.02	.00	-.03
11. Performance Goals	404	-.001	1.07	-	.07	.07	-.194**	.129**	.153**	-.03	-.06	.01	-.07
12. Anxiety (GAD-10)	268	-.001	.26		-	.497**	-.484**	.935**	.512**	-.179*	.12	.07	.09
13. Depression (PHQ-8)	268	-.003	.21			-	-.433**	.487**	.952**	-.14	.04	.00	.00
14. Mental Health (MHI-5)	326	.015	10.28				-	-.584**	-.532**	.04	.14	-.07	.00
15. Common Anxiety	406	-.005	.33					-	.393**	-.05	.10	.02	.01
16. Common Depression	406	-.007	.33						-	-.03	.02	.07	-x.01
17. Performance (P1toP2)	292	0	.69							-	-.239**	.400**	.186*
18. Performance (P2toP3)	139	0	.56								-	.752**	.853**
19. Performance (P1toP3)	234	0	.60									-	.831**
20. Performance (P3)	242	6.202	.71										-

Table 46

*Descriptive statistics and correlations for the residualised changes in study variables from S1 to S2, *p<.05, **p<.001.*

Residualised Change Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	89	.04	.52	-	.555**	.512**	-.105	.254*	-.164	.1	.082	-.241*	-.264*
2. Competence	89	.00	.41		-	.474**	-.205	.392**	-.343**	.11	.059	-.225*	-.207
3. Relatedness	89	-.04	.37			-	-.008	.219*	-.117	.085	.017	-.162	-.118
4. Demands	89	.05	.54				-	-.001	.847**	-.550**	.189	.339**	.374**
5. Resources	89	-.03	.39					-	-.461**	.122	.518**	-.278**	-.039
6. Challenge and Threat Ratio	89	.02	.10						-	-.489**	-.041	.395**	.252*
7. Coping Potential	89	-.04	.82							-	.04	-.321**	-.250*
8. Approach Goals	89	-.09	.55								-	.115	.220*
9. Avoidance Goals	89	-.12	.94									-	.584**
10. Mastery Goals	89	-.04	.57										-

Table 46

Residualised Change Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17
1. Autonomy	89	.04	.52	-.053	-.352**	-.390**	.383*	-.373**	-.292**	.198
2. Competence	89	.00	.41	-.102	-.15	-.343**	.603**	-.326**	-.332**	.015
3. Relatedness	89	-.04	.37	-.092	-.325*	-.316*	.331	-.326**	-.288**	.322**
4. Demands	89	.05	.54	.234*	.092	.208	-.387*	.288**	.338**	-.081
5. Resources	89	-.03	.39	.02	.006	-.13	.622**	-.039	-.132	.217*
6. Challenge and Threat Ratio	89	.02	.10	.231*	.052	.237	-.654**	.220*	.339**	-.121
7. Coping Potential	89	-.04	.82	-.168	-.04	-.04	-.058	-0.2	-.151	.114
8. Approach Goals	89	-.09	.55	.579**	.019	.033	.12	.105	-.014	.206
9. Avoidance Goals	89	-.12	.94	.725**	.18	.168	-.483**	.367**	.196	-.297**
10. Mastery Goals	89	-.04	.57	.156	.163	.183	-.184	.321**	.246*	-.075
11. Performance Goals	89	-.15	.93	-	.101	.093	-.291	.231*	.083	-.127
12. Anxiety (GAD-10)	60	-.02	.21		-	.502**	-	.896**	.514**	-.269*
13. Depression (PHQ-8)	60	.02	.19			-	-	.474**	.980**	-.322*
15. Mental Health (MHI-5)	30	1.23	6.90				-	-.537**	-.453*	.332
16. Common Anxiety	90	-.01	.27					-	.368**	-.169
17. Common Depression	90	-.02	.22						-	-.266*
18. Performance (S1toS2)	100	.07	.61							-

Table 47

*Descriptive statistics and correlations for the residualised changes in study variables from S2 to S3, *p<.05, **p<.001.*

Residualised Change Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	104	.0938	.49	-	.423**	.276**	.011	.326**	-.151	.161	.206*	-.042	.004
2. Competence	104	-.0123	.41		-	.489**	-.019	.446**	-.187	.07	.209*	-.071	-.113
3. Relatedness	104	-.0371	.37			-	.01	.176	-.053	.068	.101	-.105	.058
4. Demands	104	.0752	.59				-	.056	.904**	-.380**	.054	.245*	.253**
5. Resources	104	.0244	.34					-	-.346**	.221*	.368**	-.016	-.02
6. Challenge and Threat Ratio	104	.0097	.10						-	-.453**	-.076	.262**	.263**
7. Coping Potential	104	.0226	.93							-	.04	-.083	-.118
8. Approach Goals	104	-.0496	.52								-	.275**	.243*
9. Avoidance Goals	104	.0092	1.06									-	.715**
10. Mastery Goals	104	.0632	.58										-

Table 47

Residualised Change Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17
1. Autonomy	104	.09	.49	.075	.029	-.205	.119	.083	-.210*	.111
2. Competence	104	-.01	.41	.102	-.08	-.116	.214*	.019	-.107	.128
3. Relatedness	104	-.04	.37	-.091	.016	-.129	.083	.078	.013	.065
4. Demands	104	.08	.59	.095	.300*	.211	-.445**	.011	.306**	.012
5. Resources	104	.02	.34	.207*	-.19	.013	.218*	-.202*	-.143	-.212
6. Challenge and Threat Ratio	104	.01	.10	.041	.364**	.205	-.498**	.086	.345**	.089
7. Coping Potential	104	.02	.93	.052	-.21	-.052	.205*	-.08	-.211*	.043
8. Approach Goals	104	-.05	.52	.646**	.014	-.167	.098	-.11	-.126	-.026
9. Avoidance Goals	104	.01	1.06	.773**	.266*	-.097	-.168	-.04	-.006	.103
10. Mastery Goals	104	.06	.58	.295**	.437**	.146	-.217*	.093	.096	-.081
11. Performance Goals	104	-.09	1.05	-	.019	-.265*	.02	-.13	-.164	.153
12. Anxiety (GAD-10)	69	-.02	.15		-	.504**	-.441**	.737**	.522**	-.049
13. Depression (PHQ-8)	69	-.02	.13			-	-.142	.350**	.970**	-.165
15. Mental Health (MHI-5)	105	.25	7.18				-	-.375**	-.348**	.035
16. Common Anxiety	105	-.07	.24					-	.311**	-.136
17. Common Depression	105	-.02	.19						-	-.072
18. Performance (S2toS3)	91	-.01	.57							-

Table 48

*Descriptive statistics and correlations for the residualised changes in study variables from S1 to S3, *p<.05, **p<.001.*

Residualised Change Variable	*n*	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1. Autonomy	88	.09	.59	-	.419**	.339**	-.293**	.290**	-.363**	.264*	.156	-.021	-.138
2. Competence	88	-.04	.46		-	.491**	-.102	.391**	-.267*	.131	.115	-.161	-.147
3. Relatedness	88	-.10	.37			-	-.038	.082	-.06	.103	.044	-.176	.031
4. Demands	88	.12	.65				-	-.101	.898**	-.559**	.108	.388**	.470**
5. Resources	88	-.01	.41					-	-.482**	.301**	.353**	-.174	-.149
6. Challenge and Threat Ratio	88	.02	.12						-	-.576**	-.053	.396**	.450**
7. Coping Potential	88	-.08	1.11							-	-.002	-.262*	-.349**
8. Approach Goals	88	-.15	.74								-	.266*	.247*
9. Avoidance Goals	88	-.15	1.00									-	.652**
10. Mastery Goals	88	-.02	.60										-

Table 48

Residualised Change Variable	*n*	*M*	*SD*	11	12	13	14	15	16	17
1. Autonomy	88	.09	.59	.144	-.26	-.15	-.089	-.074	-.147	.195
2. Competence	88	-.04	.46	.005	-.375**	-.292*	.134	-.155	-.169	.043
3. Relatedness	88	-.10	.37	-.137	-.05	-.05	.221	-.088	-.011	.293*
4. Demands	88	.12	.65	.173	.443**	.423**	-.348	.106	.436**	-.029
5. Resources	88	-.01	.41	.155	-.265*	-.08	.149	-.15	-.204	-.173
6. Challenge and Threat Ratio	88	.02	.12	.081	.494**	.408**	-.369*	.163	.450**	.005
7. Coping Potential	88	-.08	1.11	-.052	-.19	-.17	.167	-.032	-.236*	.076
8. Approach Goals	88	-.15	.74	.751**	.149	.162	-.043	.054	.027	.093
9. Avoidance Goals	88	-.15	1.00	.707**	.291*	.144	-.234	.068	.068	-.04
10. Mastery Goals	88	-.02	.60	.211*	.474**	.243	-.312	.256*	.246*	-.113
11. Performance Goals	88	-.27	1.13	-	.124	.101	-.064	-.043	-.047	.087
12. Anxiety (GAD-10)	56	.01	.16		-	.572**	-	.990**	.555**	-.084
13. Depression (PHQ-8)	56	.02	.16			-	-	.544**	.961**	-.066
14. Mental Health (MHI-5)	32	.79	7.24				-	-.601**	-.561**	-.251
15. Common Anxiety	88	-.09	.28					-	.365**	.103
16. Common Depression	88	-.01	.20						-	.072
17. Performance (S1toS3)	63	.06	.57							-

means that multiple tests do not need to be run in "both directions" (i.e., with anxiety as an outcome variable and then with basic psychological needs as outcome variables), because the bi-directional relationship is accounted for within the change score. By contrast, mediation analyses only indicate a relationship between one variable at one timepoint and another variable at a later timepoint (offering less insight by comparison to the residialised change regression analyses) and fail to account for reciprocity (multiple tests would need to be run with various outcome variables). Finally, the G* power analyses indicated adequate statistical power for the regression analyses but not for cross lagged or mediation analyses (Faul et al., 2007).

4.7 Results

When testing the extent to which psychological demands and resources can explain changes in mental health and football performance, changes in psychological demands and resources were incorporated into regression models (see Figure 5). Regarding mental health data (H_5), five linear hierarchical multiple regressions were conducted for each change period analysed (i.e., during S1, S2, S3, and a composite season, and from S1 to S2, S2 to S3 and S1 to S3); the dependent variables were change in anxiety (GAD-10), depression (PHQ-8), mental health (MHI), common anxiety, and common depression. Thus, a total of 35 regression analyses were conducted using the mental health data. Age was included in step one of the regression models to account for the potential influence of age on mental health (which was evidenced in the analyses reported in chapter three of this thesis).

Regarding the performance data (H_6), in S1 and S3, three linear hierarchical regressions were conducted for each season, using performance from the third performance period, change in performance from the first to the third performance period, and season average performance as the dependent variables. When looking at performance in S2, one regression was conducted using average season performance as the dependent variable. This is because no performance data were collected during S2P3, due to the COVID-19 lockdown. With regards to performance in a composite season, two regression analyses were run using performance from the third performance period and change in performance from the first to the third performance period as the dependent variables. Finally, two regression analyses were conducted using change in average season data to test whether the model could explain significant proportions of variance in performance during the third performance period in the third season. In total, 11 regressions were conducted using the football performance data.

The results from the regression analyses are provided here by timepoint, as per the structure of the results in chapter three. Concise summarises of the regression outputs are provided for brevity; more detailed regression statistics can be found in the corresponding tables should the reader be interested.

4.8 Change During Season One

For S1 (change from T1 to T2), the proportion of variance explained for each outcome variable was; change in anxiety = 24.3% (see Table 49), depression = 14.7% (see Table 50), MHI = 17.1% (see Table 51), common anxiety = 24.3% (see Table 52), common depression = 20.9% (see Table 53), performance during the third performance period = 0% (see Table 54), performance from the first to the third performance period =.6% (see Table 55), and average S1 performance = 1.5% (see Table 56). During S1, increases in anxiety were related (p<.05) to decreases in perceived relatedness and perceived autonomy. Increases in depression and decreases in (i.e., worsening) mental health were related (p<.05) to decreases in perceived competence. Increases in common anxiety were related to (p<.05) older age and decreases in perceived competence. Increases in common depression were related to (p<.05) younger age, decreases in perceived competence and increases in the challenge and threat ratio (i.e., less challenge, more threat).

Table 49

Regression analyses relating to change in anxiety during S1 (from T1 to T2).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	-.014	.012	-.122	-1.207	.231
Change in Autonomy	-.115	.052	-.254	-2.212	.03
Change in Competence	-.051	.08	-.083	-.628	.532
Change in Relatedness	-.143	.072	-.248	-2	.049
Change in Challenge & Threat Ratio	.15	.255	.07	.586	.559
Change in Approach Goals	.001	.037	.002	.018	.986
Change in Avoidance Goals	.022	.028	.091	.794	.43

Note. $F(7,74)=4.615$, $p<.001$, $R^2=.243$

Table 50

Regression analyses relating to change in depression during S1 (from T1 to T2).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	-.004	.01	-.045	-.415	.68
Change in Autonomy	-.027	.045	-.074	-.608	.545
Change in Competence	-.143	.069	-.289	-2.054	.044
Change in Relatedness	-.03	.062	-.064	-.489	.626
Change in Challenge & Threat Ratio	.205	.221	.118	.931	.355
Change in Approach Goals	-.016	.032	-.057	-.52	.605
Change in Avoidance Goals	.01	.024	.052	.427	.671

Note. $F(7,72)=2.938$, $p=.009$, $R^2=.147$

Table 51

Regression analyses relating to change in mental health during S1 (from T1 to T2).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	.614	.526	.157	1.168	.25
Change in Autonomy	-.767	2.303	-.051	-.333	.741
Change in Competence	8.457	3.557	.419	2.377	.022
Change in Relatedness	-1.361	3.175	-.071	-.429	.67
Change in Challenge & Threat Ratio	-12.978	11.292	-.182	-1.149	.257
Change in Approach Goals	-.401	1.624	-.034	-.247	.806
Change in Avoidance Goals	-.72	1.252	-.087	-.575	.568

Note. $F(7,42)=2.443$, $p=.034$, $R^2=.171$

Table 52

Regression analyses relating to change in common anxiety during S1 (from T1 to T2).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	-.061	.012	-.39	-4.922	<.001
Change in Autonomy	-.022	.054	-.037	-.412	.681
Change in Competence	-.234	.084	-0.289	-2.786	.006
Change in Relatedness	-.031	.075	-.04	-.411	.682
Change in Challenge & Threat Ratio	-.125	.267	-.044	-.47	.639
Change in Approach Goals	-.004	.038	-.008	-.093	.926
Change in Avoidance Goals	.008	.03	.023	.258	.797

Note. $F(7,122)=6.923$, $p<.001$, $R^2=.243$

Table 53

Regression analyses relating to change in common depression during S1 (from T1 to T2).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	-.033	.012	-.213	-2.637	.009
Change in Autonomy	.038	.055	.064	.691	.491
Change in Competence	-.196	.084	-.247	-2.326	.022
Change in Relatedness	.009	.075	.012	.125	.901
Change in Challenge & Threat Ratio	.612	.267	.218	2.289	.024
Change in Approach Goals	-.012	.038	-.026	-.31	.757
Change in Avoidance Goals	.043	.03	.134	1.463	.146

Note. $F(7,122)=5.855$, $p<.001$, $R^2=.209$

Table 54

Regression analyses relating to performance during S1P3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	-.053	.028	-.208	-1.921	.057
Change in Autonomy	.082	.11	.083	.747	.457
Change in Competence	-.129	.178	-.097	-.727	.469
Change in Relatedness	-.003	.151	-.003	-.022	.983
Change in Challenge & Threat Ratio	-.045	.551	-.01	-.083	.934
Change in Approach Goals	-.038	.077	-.049	-.494	.622
Change in Avoidance Goals	-.06	.06	-.111	-.999	.32
Change in Common Anxiety	-.035	.184	-.022	-.192	.848
Change in Common Depression	.038	.183	.023	.209	.835

Note. $F(9,106)=.703$, $p=.705$, $R^2=-.024$

Table 55

Regression analyses relating to change in performance from S1P1 to S1P3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	-.042	.024	-.184	-1.715	.089
Change in Autonomy	.153	.096	.176	1.602	.112
Change in Competence	-.217	.155	-.186	-1.402	.164
Change in Relatedness	-.044	.132	-.039	-.331	.741
Change in Challenge & Threat Ratio	-.215	.479	-.052	-.448	.655
Change in Approach Goals	.015	.067	.023	.228	.82
Change in Avoidance Goals	-.015	.052	-.031	-.283	.778
Change in Common Anxiety	.032	.16	.022	.202	.841
Change in Common Depression	.084	.16	.057	.524	.601

Note. $F(9,105)=1.077$, $p=.386$, $R^2=.006$

Table 56

Regression analyses relating to change in average S1 performance.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	-.057	.024	-.26	-2.439	.016
Change in Autonomy	-.047	.093	-.056	-.509	.612
Change in Competence	-.007	.15	-.006	-.044	.965
Change in Relatedness	.096	.128	.089	.751	.454
Change in Challenge & Threat Ratio	.182	.466	.045	.39	.697
Change in Approach Goals	-.085	.065	-.129	-1.307	.194
Change in Avoidance Goals	-.087	.051	-.188	-1.713	.09
Change in Common Anxiety	-.146	.155	-.104	-.941	.349
Change in Common Depression	.006	.155	.004	.038	.969

Note. $F(9,105)= 1.190$, $p=.309$, $R^2=.015$

4.9 Change During Season Two

For S2 (change from T3 to T4), the proportion of variance explained for each outcome variable was; change in anxiety = 14% (see Table 57) depression = 30.6% (see Table 58), MHI = 28.1% (see Table 59), common anxiety = 10.7% (see Table 60), common depression = 5.7% (see Table 61), and average S2 performance = 0.8% (see Table 62). During S2, decreases in (i.e., worsening) mental health were related to ($p<.05$) younger age and increases avoidance goal orientations. Increases in common anxiety were also related to ($p=.009$) increases in avoidance goal orientations.

Table 57

Regression analyses relating to change in anxiety during S2 (from T3 to T4).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T3	.02	.011	.212	1.86	.067
Change in Autonomy	-.08	.053	-.193	-1.501	.138
Change in Competence	-.064	.058	-.144	-1.119	.267
Change in Relatedness	-.059	.064	-.117	-.919	.361
Change in Challenge & Threat Ratio	-.044	.222	-.023	-.197	.844
Change in Approach Goals	.012	.035	.036	.338	.736
Change in Avoidance Goals	-.005	.027	-.022	-.192	.849

Note. $F(7,74)=2.886, p=.010, R^2=.140$

Table 58

Regression analyses relating to change in depression during S2 (from T3 to T4).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T3	.029	.009	.336	3.279	.002
Change in Autonomy	-.085	.043	-.227	-1.972	.052
Change in Competence	-.099	.047	-.244	-2.116	.038
Change in Relatedness	.03	.052	.066	.579	.564
Change in Challenge & Threat Ratio	-.201	.18	-.119	-1.115	.268
Change in Approach Goals	.025	.029	.086	.891	.376
Change in Avoidance Goals	.042	.022	.203	1.931	.057

Note. $F(7,74)=6.098, p<.001, R^2=.306$

Table 59

Regression analyses relating to change in mental health during S2 (from T3 to T4).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T3	-1.039	.359	-.245	-2.895	.005
Change in Autonomy	2.411	1.775	.129	1.358	.177
Change in Competence	3.642	1.924	.18	1.893	.061
Change in Relatedness	3.186	2.139	.141	1.489	.139
Change in Challenge & Threat Ratio	-1.896	7.41	-.023	-.256	.799
Change in Approach Goals	1.266	1.176	.086	1.077	.284
Change in Avoidance Goals	-1.841	.9	-.177	-2.045	.043

Note. $F(7,116)=7.851, p<.001, R^2=.281$

Table 60

Regression analyses relating to change in common anxiety during S2 (from T3 to T4).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T3	-.016	.011	-.14	-1.484	.14
Change in Autonomy	-.053	.054	-.104	-.982	.328
Change in Competence	-.009	.058	-.016	-.153	.878
Change in Relatedness	-.098	.065	-.16	-1.517	.132
Change in Challenge & Threat Ratio	-.083	.224	-.036	-.369	.713
Change in Approach Goals	-.054	.036	-.135	-1.514	.133
Change in Avoidance Goals	.072	.027	.256	2.651	.009

Note. $F(7,116)=3.100$, $p=.005$, $R^2=.107$

Table 61

Regression analyses relating to change in common depression during S2 (from T3 to T4).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T3	.006	.012	.049	.511	.611
Change in Autonomy	.009	.059	.016	.149	.882
Change in Competence	-.131	.064	-.223	-2.043	.043
Change in Relatedness	-.057	.071	-.086	-.795	.428
Change in Challenge & Threat Ratio	.023	.247	.009	.093	.926
Change in Approach Goals	.003	.039	.008	.083	.934
Change in Avoidance Goals	.036	.03	.118	1.192	.236

Note. $F(7,116)=2.068$, $p=.052$, $R^2=.570$

Table 62

Regression analyses relating to change in average S2 performance.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T3	.023	.028	.085	.819	.414
Change in Autonomy	-.019	.137	-.016	-.142	.888
Change in Competence	.236	.151	.183	1.567	.12
Change in Relatedness	.024	.166	.017	.146	.884
Change in Challenge & Threat Ratio	.374	.569	.07	.658	.512
Change in Approach Goals	.017	.091	.019	.19	.85
Change in Avoidance Goals	-.033	.071	-.05	-.465	.643
Change in Common Anxiety	.343	.255	.146	1.346	.181
Change in Common Depression	-.351	.231	-.16	-1.514	.133

Note. $F(9,110)= .892, p=.535, R^2=.008$

4.10 Change During Season Three

For S3 (change from T5 to T6), the proportion of variance explained for each outcome variable was; change in anxiety = 16.8% (see Table 63), depression = 23% (see Table 64), MHI = 31.5% (see Table 65), common anxiety = 8.1% (see Table 66), common depression = 10.1% (see Table 67), performance during the third performance period = 8.3% (see Table 68), performance from the first to the third performance period = 9.3% (see Table 69), and average S3 performance = 8.8% (see Table 70). During S3, increases in anxiety and depression were related to (p<.05) older age and increases in the challenge and threat ratio (i.e., less challenge, more threat). Decreases in (i.e., worsening) mental health were related to older age (p<.001), decreases in perceived relatedness (p<.001), and avoidance goal orientations (p=.013) and the challenge and threat ratio (i.e., less challenge, more threat, p<.043). Increases in the challenge and threat ratio (i.e., less challenge, more threat) were related to increases in common anxiety (p=.009) and common depression (p<.001). Lower performance in the third performance period was related (p<.05) to decreases in perceived relatedness and increases in common depression. Decreases in performance from the first to the third performance period were related to (p<.05) decreases in perceived relatedness and the challenge and threat ratio (i.e., more challenge, less threat). Lower average season performance was related to decreases in perceived relatedness (p=.003).

Table 63

Regression analyses relating to change in anxiety during S3 (from T5 to T6).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T5	.018	.007	.245	2.645	.01
Change in Autonomy	-.057	.035	-.173	-1.618	.109
Change in Competence	-.045	.054	-.098	-.836	.405
Change in Relatedness	.043	.052	.081	.823	.413
Change in Challenge & Threat Ratio	.483	.18	.266	2.689	.008
Change in Approach Goals	.053	.028	.173	1.879	.063
Change in Avoidance Goals	.005	.017	.027	.283	.778

Note. $F(7,96)=3.977$, $p<.001$, $R^2=.168$

Table 64

Regression analyses relating to change in depression during S3 (from T5 to T6).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T5	.015	.005	.25	2.814	.006
Change in Autonomy	-.044	.027	-.166	-1.609	.111
Change in Competence	-.037	.042	-.099	-.88	.381
Change in Relatedness	.034	.04	.08	.838	.404
Change in Challenge & Threat Ratio	.527	.139	.36	3.79	<.001
Change in Approach Goals	.042	.022	.171	1.932	.056
Change in Avoidance Goals	-.003	.013	-.025	-.263	.793

Note. $F(7,96)=5.390$, $p<.001$, $R^2=.230$

Table 65

Regression analyses relating to change in mental health during S3 (from T5 to T6).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T5	-1.005	.225	-.311	-4.462	<.001
Change in Autonomy	.068	1.168	.005	.058	.954
Change in Competence	2.86	1.781	.142	1.605	.111
Change in Relatedness	5.796	1.714	.252	3.381	<.001
Change in Challenge & Threat Ratio	-14.888	5.922	-.187	-2.514	.013
Change in Approach Goals	-1.088	.927	-.081	-1.174	.242
Change in Avoidance Goals	-1.153	.564	-.149	-2.045	.043

Note. $F(7,142)=10.789$, $p<.001$, $R^2=.315$

Table 66

Regression analyses relating to change in common anxiety during S3 (from T5 to T6).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T5	-.011	.008	-.112	-1.389	.167
Change in Autonomy	.041	.042	.092	.981	.328
Change in Competence	-.04	.064	-.063	-.619	.537
Change in Relatedness	-.076	.062	-.106	-1.227	.222
Change in Challenge & Threat Ratio	.56	.213	.227	2.631	.009
Change in Approach Goals	-.015	.033	-.036	-.449	.654
Change in Avoidance Goals	.03	.02	.124	1.467	.145

Note. $F(7,142)=2.873$, $p=.008$, $R^2=.081$

Table 67

Regression analyses relating to change in common depression during S3 (from T5 to T6).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T5	.006	.007	.066	.823	.412
Change in Autonomy	.05	.037	.125	1.348	.18
Change in Competence	-.007	.057	-.013	-.129	.898
Change in Relatedness	-.042	.055	-.065	-.758	.45
Change in Challenge & Threat Ratio	.72	.189	.325	3.805	<.001
Change in Approach Goals	-.006	.03	-.015	-.189	.85
Change in Avoidance Goals	.023	.018	.105	1.253	.212

Note. $F(7,142)=3.403$, $p=.002$, $R^2=.101$

Table 68

Regression analyses relating to performance during S3P3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T5	.02	.024	.075	.824	.412
Change in Autonomy	-.054	.125	-.046	-.433	.666
Change in Competence	.093	.189	.056	.49	.625
Change in Relatedness	.547	.183	.289	2.987	.003
Change in Challenge & Threat Ratio	1.145	.663	.175	1.727	.087
Change in Approach Goals	.12	.098	.109	1.219	.225
Change in Avoidance Goals	-.073	.06	-.115	-1.207	.23
Change in Common Anxiety	-.042	.268	-.016	-.157	.876
Change in Common Depression	-.388	.301	-.132	-1.288	.2

Note. $F(9,107)=2.268$, $p=.023$, $R^2=.088$

Table 69

Regression analyses relating to change in performance from S3P1 to S3P3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T5	.009	.02	.044	.473	.637
Change in Autonomy	-.005	.103	-.005	-.051	.96
Change in Competence	0.011	.155	.008	.071	.943
Change in Relatedness	.466	.15	.304	3.105	.002
Change in Challenge & Threat Ratio	1.333	.545	.251	2.448	.016
Change in Approach Goals	.084	.081	.094	1.043	.299
Change in Avoidance Goals	-.042	.05	-.081	-.846	.4
Change in Common Anxiety	-.27	.22	-.125	-1.228	.222
Change in Common Depression	.062	.247	.026	.249	.804

Note. $F(9,110)=2.326$, $p=.020$, $R^2=.093$

Table 70

Regression analyses relating to change in average S3 performance.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T5	.022	.02	.101	1.087	.28
Change in Autonomy	-.033	.104	-.034	-.314	.754
Change in Competence	.088	.157	.065	.561	.576
Change in Relatedness	.37	.152	.24	2.439	.016
Change in Challenge & Threat Ratio	.49	.55	.092	.891	.375
Change in Approach Goals	.11	.082	.123	1.35	.18
Change in Avoidance Goals	-.061	.05	-.117	-1.21	.229
Change in Common Anxiety	.113	.222	.052	.511	.61
Change in Common Depression	-.53	.25	-.221	-2.124	.036

Note. $F(9,107)= 2.160$, $p=.030$, $R^2=.083$

4.11 Change During a Composite Season

For a composite season (change from early season to late season), the proportion of variance explained for each outcome variable was; change in anxiety = 17.6% (see Table 71), depression = 20.6% (see Table 72), MHI = 27.2% (see Table 73), common anxiety = 13.5% (see Table 74), common depression = 12.6% (see Table 75), performance during the third performance period = 0.2% (see Table 76), and performance from the first to the third performance period = 1.1% (see Table 77). During a composite season, increases in anxiety were related to ($p<.05$) older age and decreases in perceived autonomy and competence. Increases in depression were related to ($p<.05$) older age, increases in the challenge and threat ratio (i.e., less challenge, more threat) and decreases in perceived autonomy and competence. Decreases in (i.e., worsening) mental health were related to ($p<.001$) older age, increases in avoidance goal orientations and decreases in perceived competence and relatedness. Increases in common anxiety were related to younger age ($p<.001$), increases in avoidance goal orientations ($p<.001$), and decreases in perceived competence ($p=.011$) and relatedness ($p=.015$). Increases in common depression were related to ($p=.001$) increases in the challenge and threat ratio (i.e., less challenge, more threat) and avoidance goal orientations, and decreases in perceived competence.

Table 71

Regression analyses relating to change in anxiety during a composite season (early to late).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at Early Season Timepoint	.011	.005	.112	1.985	.048
Change in Autonomy	-.078	.027	-.191	-2.92	.004
Change in Competence	-.102	.037	-.196	-2.786	.006
Change in Relatedness	-.043	.035	-.079	-1.225	.222
Change in Challenge & Threat Ratio	.222	.123	.111	1.809	.072
Change in Approach Goals	.028	.019	.083	1.443	.15
Change in Avoidance Goals	.003	.013	.014	.235	.815

Note. $F(7,258)=9.089$, $p<.001$, $R^2=.176$

Table 72

Regression analyses relating to change in depression during a composite season (early to late).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at Early Season Timepoint	.013	.004	.17	3.061	.002
Change in Autonomy	-.046	.021	-.139	-2.162	.032
Change in Competence	-.109	.029	-.258	-3.745	<.001
Change in Relatedness	-.007	.028	-.016	-.259	.796
Change in Challenge & Threat Ratio	.225	.098	.139	2.31	.022
Change in Approach Goals	.023	.015	.083	1.475	.141
Change in Avoidance Goals	.01	.011	.054	.903	.368

Note. $F(7,258)=10.821$, $p<.001$, $R^2=.206$

Table 73

Regression analyses relating to change in mental health during a composite season (early to late).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at Early Season Timepoint	-.656	.184	-.172	-3.569	<.001
Change in Autonomy	.243	.904	.015	.268	.789
Change in Competence	4.479	1.235	.217	3.625	<.001
Change in Relatedness	4.079	1.184	.188	3.445	<.001
Change in Challenge & Threat Ratio	-6.883	4.136	-.087	-1.664	.097
Change in Approach Goals	-.445	.648	-.034	-.687	.493
Change in Avoidance Goals	-1.94	.455	-.223	-4.265	<.001

Note. $F(7,316)=18.210$, $p<.001$, $R^2=.272$

Table 74

Regression analyses relating to change in common anxiety during a composite season (early to late).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at Early Season Timepoint	-.026	.006	-.214	-4.552	<.001
Change in Autonomy	.013	.028	.026	.48	.631
Change in Competence	-.096	.038	-.146	-2.504	.013
Change in Relatedness	-.088	.037	-.128	-2.391	.017
Change in Challenge & Threat Ratio	.121	.128	.048	.945	.345
Change in Approach Goals	-.018	.02	-.043	-.911	.363
Change in Avoidance Goals	.047	.014	.172	3.372	<.001

Note. $F(7,396)=9.953$, $p<.001$, $R^2=.135$

Table 75

Regression analyses relating to change in common depression during a composite season (early to late).

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at Early Season Timepoint	-.006	.006	-.051	-1.074	.284
Change in Autonomy	.042	.028	.081	1.486	.138
Change in Competence	-.126	.039	-.191	-3.256	.001
Change in Relatedness	-.045	.037	-.065	-1.214	.225
Change in Challenge & Threat Ratio	.418	.129	.165	3.237	.001
Change in Approach Goals	.011	.02	.026	.539	.59
Change in Avoidance Goals	.044	.014	.159	3.107	.002

Note. $F(7,396)=9.297$, $p<.001$, $R^2=.126$

Table 76

Regression analyses relating to performance during P3 in a composite season.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at Early Season Timepoint	-.015	.018	-.058	-.852	.395
Change in Autonomy	.017	.086	.015	.197	.844
Change in Competence	-.078	.12	-.055	-.656	.512
Change in Relatedness	.25	.114	.167	2.201	.029
Change in Challenge & Threat Ratio	.463	.399	.084	1.16	.247
Change in Approach Goals	.029	.062	.032	.471	.638
Change in Avoidance Goals	-.061	.044	-.102	-1.391	.166
Change in Common Anxiety	.077	.163	.035	.469	.639
Change in Common Depression	-.017	.162	-.008	-.107	.914

Note. $F(9,226)=.953$, $p=.480$, $R^2=.002$

Table 77

Regression analyses relating to change in performance from P1 to P3 in a composite season.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at Early Season Timepoint	-.016	.015	-.071	-1.045	.297
Change in Autonomy	.069	.073	.073	.945	.346
Change in Competence	-.149	.101	-.124	-1.484	.139
Change in Relatedness	.21	.096	.166	2.192	.029
Change in Challenge & Threat Ratio	.572	.336	.124	1.702	.09
Change in Approach Goals	.045	.052	.058	.865	.388
Change in Avoidance Goals	-.038	.037	-.076	-1.034	.302
Change in Common Anxiety	.005	.137	.003	.037	.97
Change in Common Depression	.098	.136	.053	.716	.475

Note. $F(9,222)=1.279$, $p=.249$, $R^2=.011$

4.12 Change From Season One to Season Two

For season average change from S1 to S2, the proportion of variance explained for each outcome variable was; change in anxiety = 35.4% (see Table 78), depression = 15% (see Table 79), MHI = 54.3% (see Table 80), common anxiety = 20.7% (see Table 81), and common depression = 14.3% (see Table 82). From S1 to S2, increases in anxiety were related to older age ($p<.001$) and decreases in perceived autonomy ($p=.045$). Decreases in (i.e., worsening) mental health were related to ($p<.05$) decreases in perceived competence and increases the challenge and threat ratio (i.e., less challenge, more threat). Increases in common anxiety were related to increases avoidance goal orientations ($p=.037$).

Table 78

Regression analyses relating to season average change in anxiety from S1 to S2.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	.047	.01	.538	4.828	<.001
Change in Autonomy	-.116	.056	-.282	-2.056	.045
Change in Competence	.052	.072	.099	.718	.476
Change in Relatedness	-.107	.073	-.187	-1.465	.149
Change in Challenge & Threat Ratio	-.46	.283	-.207	-1.627	.11
Change in Approach Goals	.015	.042	.038	.35	.728
Change in Avoidance Goals	.043	.027	.189	1.575	.122

Note. $F(7,51)=5.549$, $p<.001$, $R^2=.354$

Table 79

Regression analyses relating to season average change in depression from S1 to S2.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	.017	.01	.221	1.73	.09
Change in Autonomy	-.09	.056	-.252	-1.606	.114
Change in Competence	-.048	.072	-.106	-.67	.506
Change in Relatedness	-.054	.073	-.11	-.748	.458
Change in Challenge & Threat Ratio	.144	.282	.075	.513	.61
Change in Approach Goals	.025	.042	.073	.596	.554
Change in Avoidance Goals	.006	.027	.031	.224	.824

Note. $F(7,51)=2.466$, $p=.029$, $R^2=.150$

Table 80

Regression analyses relating to season average change in mental health from S1 to S2.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	.242	.376	.085	.644	.526
Change in Autonomy	.232	2.16	.017	.107	.916
Change in Competence	5.993	2.782	.355	2.154	.042
Change in Relatedness	1.277	2.81	.069	.455	.654
Change in Challenge & Threat Ratio	-32.699	10.869	-.455	-3.008	.006
Change in Approach Goals	1.358	1.611	.108	.843	.408
Change in Avoidance Goals	-1.607	1.046	-.219	-1.536	.139

Note. $F(7,22)=5.918$, $p<.001$, $R^2=.543$

Table 81

Regression analyses relating to season average change in common anxiety from S1 to S2.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	-.013	.011	-.114	-1.139	.258
Change in Autonomy	-.1	.063	-.195	-1.58	.118
Change in Competence	-.052	.081	-.079	-.635	.527
Change in Relatedness	-.107	.082	-.15	-1.3	.197
Change in Challenge & Threat Ratio	.25	.318	.09	.784	.435
Change in Approach Goals	.049	.047	.1	1.033	.305
Change in Avoidance Goals	.065	.031	.229	2.125	.037

Note. $F(7,81)=4.281$, $p<.001$, $R^2=.207$

Table 82

Regression analyses relating to season average change in common depression from S1 to S2.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	.009	.009	.103	.99	.325
Change in Autonomy	-.046	.054	-.11	-.856	.395
Change in Competence	-.061	.069	-.114	-.879	.382
Change in Relatedness	-.082	.07	-.14	-1.17	.245
Change in Challenge & Threat Ratio	.512	.271	.225	1.891	.062
Change in Approach Goals	.006	.04	.015	.154	.878
Change in Avoidance Goals	.007	.026	.032	.286	.775

Note. $F(7,81)=3.102$, $p=.006$, $R^2=.143$

4.13 Change From Season Two to Season Three

For season average change from S2 to S3, the proportion of variance explained for each outcome variable was; change in anxiety = 18% (see Table 83), depression = 6.2% (see Table 84), MHI = 21.4% (see Table 85), common anxiety = 0.1% (see Table 86), common depression = 10.1% (see Table 87), and performance in S3P3 = -5.2% (see Table 88). From S2 to S3, increases in anxiety were related to ($p<.05$) older age and increases in the challenge and threat ratio (i.e., less challenge, more threat). Decreases in (i.e., worsening) mental health and increases in common depression were related to (p<.001) increases in the challenge and threat ratio (i.e., less challenge, more threat).

Table 83

Regression analyses relating to season average change in anxiety from S2 to S3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T3	.018	.007	.322	2.71	.009
Change in Autonomy	.021	.037	.07	.558	.579
Change in Competence	-.01	.048	-.029	-.21	.834
Change in Relatedness	.031	.05	.081	.632	.53
Change in Challenge & Threat Ratio	.38	.171	.266	2.227	.03
Change in Approach Goals	.016	.035	.057	.458	.648
Change in Avoidance Goals	.026	.017	.192	1.583	.119

Note. $F(7,60)=3.104$, $p=.007$, $R^2=.180$

Table 84

Regression analyses relating to season average change in depression from S2 to S3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T3	.012	.006	.238	1.875	.066
Change in Autonomy	-.049	.037	-.178	-1.335	.187
Change in Competence	.025	.048	.077	.522	.603
Change in Relatedness	-.033	.049	-.092	-.668	.506
Change in Challenge & Threat Ratio	.239	.169	.181	1.416	.162
Change in Approach Goals	-.003	.034	-.013	-.1	.921
Change in Avoidance Goals	-.019	.016	-.15	-1.154	.253

Note. $F(7,60)=1.6353p=.143$, $R^2=.160$

Table 85

Regression analyses relating to season average change in mental health from S2 to S3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T3	-.033	.255	-.012	-.13	.896
Change in Autonomy	-.185	1.443	-.013	-.13	.898
Change in Competence	2.1	1.895	.121	1.108	.271
Change in Relatedness	-.181	1.942	-.009	-.09	.926
Change in Challenge & Threat Ratio	-32.323	6.667	-.457	-4.85	<.001
Change in Approach Goals	.727	1.359	.053	.535	.594
Change in Avoidance Goals	-.374	.652	-.055	-.58	.567

Note. $F(7,96)=5.004$, $p<.001$, $R^2=.214$

Table 86

Regression analyses relating to season average change in common anxiety from S2 to S3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T3	-.017	.01	-.184	-1.738	.085
Change in Autonomy	.064	.054	.131	1.177	.242
Change in Competence	-.025	.071	-.043	-.352	.726
Change in Relatedness	.039	.073	.062	.542	.589
Change in Challenge & Threat Ratio	.299	.25	.127	1.195	.235
Change in Approach Goals	-.081	.051	-.176	-1.582	.117
Change in Avoidance Goals	-.004	.024	-.017	-.16	.873

Note. $F(7,96)=.992$, $p=.442$, $R^2=.001$

Table 87

Regression analyses relating to season average change in common depression from S2 to S3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T3	-.002	.007	-.023	-.23	.821
Change in Autonomy	-.064	.04	-.169	-1.6	.113
Change in Competence	-.003	.053	-.007	-.06	.949
Change in Relatedness	.038	.054	.076	.7	.486
Change in Challenge & Threat Ratio	.629	.185	.343	3.407	<.001
Change in Approach Goals	-.02	.038	-.056	-.53	.599
Change in Avoidance Goals	-.014	.018	-.081	-.79	.433

Note. $F(7,96)=2.648$, $p=.015$, $R^2=.101$

Table 88

Regression analyses relating to performance in S3P3 using change scores from S2 to S3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T3	-.047	.045	-.147	-1.039	.303
Change in Autonomy	.192	.233	.122	.823	.414
Change in Competence	.12	.305	.064	.393	.696
Change in Relatedness	.132	.304	.064	.435	.665
Change in Challenge & Threat Ratio	1.41	1.085	.186	1.299	.199
Change in Approach Goals	-.153	.211	-.103	-.725	.472
Change in Avoidance Goals	.05	.102	.068	.488	.627
Change in Common Anxiety	-.618	.444	-.191	-1.393	.169
Change in Common Depression	.136	.598	.033	.228	.82

Note. $F(9,58)=.630$, $p=.767$, $R^2=-.052$

4.14 Change From Season One to Season Three

For season average change from S1 to S3, the proportion of variance explained for each outcome variable was; change in anxiety = 41.1% (see Table 89), depression = 20.3% (see Table 90), MHI = 41.4% (see Table 91), common anxiety = 3% (see Table 92), common depression = 16.7% (see Table 93), and performance in S3P3 = -0.5% (see Table 94). From S1 to S3, increases in anxiety symptoms were related to ($p<.05$) older age and increases in approach goal orientations. Increases in depression were related to ($p<.05$) increases in the challenge and threat ratio (i.e., less challenge, more threat) and increases in approach goal orientations. Decreases in (i.e., worsening) mental health were related to ($p<.05$) younger age and increases in the perceived autonomy and the challenge and threat ratio (i.e., less challenge, more threat). Increases in common depression were related to increases in the challenge and threat ratio (i.e., less challenge, more threat, $p<.001$).

Table 89

Regression analyses relating to season average change in anxiety from S1 to S3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	.026	.008	.4	3.334	.002
Change in Autonomy	-.04	.034	-.149	-1.174	.246
Change in Competence	-.085	.044	-.248	-1.907	.062
Change in Relatedness	.069	.053	.163	1.315	.195
Change in Challenge & Threat Ratio	.291	.184	.213	1.58	.121
Change in Approach Goals	.062	.024	.29	2.552	.014
Change in Avoidance Goals	.016	.02	.103	.834	.408

Note. $F(7,48)=6.542$, $p<.001$, $R^2=.411$

Table 90

Regression analyses relating to season average change in depression from S1 to S3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	.016	.009	.241	1.726	.091
Change in Autonomy	.003	.041	.011	.072	.943
Change in Competence	-.079	.053	-.225	-1.48	.145
Change in Relatedness	.024	.063	.056	.385	.702
Change in Challenge & Threat Ratio	.45	.221	.32	2.037	.047
Change in Approach Goals	.065	.029	.293	2.212	.032
Change in Avoidance Goals	-.015	.023	-.094	-.655	.515

Note. $F(7,48)=3.005$, $p=.011$, $R^2=.203$

Table 91

Regression analyses relating to season average change in mental health from S1 to S3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	1.737	.482	.583	3.606	.001
Change in Autonomy	-6.083	2.094	-.497	-2.905	.008
Change in Competence	2.293	2.741	.147	.837	.411
Change in Relatedness	6.012	3.245	.31	1.853	.076
Change in Challenge & Threat Ratio	-45.3	11.336	-.726	-3.996	<.001
Change in Approach Goals	1.089	1.505	.111	.724	.476
Change in Avoidance Goals	.539	1.206	.074	.447	.659

Note. $F(7,48)=6.542$, $p<.001$, $R^2=.414$

Table 92

Regression analyses relating to season average change in common anxiety from S1 to S3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	-.033	.014	-.283	-2.311	.023
Change in Autonomy	.046	.062	.096	.739	.462
Change in Competence	-.116	.081	-.19	-1.429	.157
Change in Relatedness	-.028	.096	-.037	-.293	.77
Change in Challenge & Threat Ratio	.672	.334	.277	2.011	.048
Change in Approach Goals	.006	.044	.017	.145	.885
Change in Avoidance Goals	-.021	.036	-.074	-.585	.56

Note. $F(7,80)=1.379$, $p=.225$, $R^2=.030$

Table 93

Regression analyses relating to season average change in common depression from S1 to S3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	-.001	.01	-.014	-.121	.904
Change in Autonomy	.022	.041	.063	.527	.6
Change in Competence	-.047	.054	-.107	-.864	.39
Change in Relatedness	.008	.064	.015	.128	.899
Change in Challenge & Threat Ratio	.922	.224	.527	4.122	<.001
Change in Approach Goals	.028	.03	.1	.929	.356
Change in Avoidance Goals	-.037	.024	-.18	-1.538	.128

Note. $F(7,80)=3.489$, $p=.003$, $R^2=.167$

Table 94

Regression analyses relating to performance in S3P3 using change scores from S1 to S3.

Variables	Unstandardised β	Coefficients Std. Error	Standardised β	*t*	*p*
Age at T1	-.045	.048	-.142	-.941	.351
Change in Autonomy	.24	.202	.184	1.189	.24
Change in Competence	-.427	.267	-.257	-1.604	.115
Change in Relatedness	.648	.311	.314	2.081	.042
Change in Challenge & Threat Ratio	.864	1.2	.13	.72	.474
Change in Approach Goals	.046	.145	.044	.317	.752
Change in Avoidance Goals	-.039	.117	-.051	-.337	.738
Change in Common Anxiety	.072	.385	.026	.186	.853
Change in Common Depression	.07	.576	.018	.121	.904

Note. $F(9{,}55)$=.961, p=.481, R^2=-.005

4.15 Summary

In this section, the author reported the outcomes of the mental health and performance regression analyses. H_5 received a great deal of support; the model's ability to explain proportions of variance in changes in mental health variables was strong, with most models reaching statistical significance. All but three of the 35 regressions were statistically significant; the three non-significant mental health regressions related to the common anxiety (n=2) and common depression data (see Table 95).

Regarding changes in anxiety symptom frequency (GAD-10), between 14% and 41.1% of variance was explained by the model. Whilst the significant contributors to the models varied between the change periods referred to (i.e., there were different significant contributors across the different regressions), higher age, increases in the challenge and threat ratio (i.e., less challenge, more threat), and decreases in BPNs were related to increases in anxiety symptom frequency. Unexpectedly, increases in season average pursuit of approach goals was related to increases in anxiety symptom frequency from S1 to S3.

Regarding changes in depression symptom frequency (PHQ-8), between 14% and 30.6% of variance was explained by the model. Again, whilst the significant contributors to the models varied between the change periods referred to, higher age, increases in the challenge and threat ratio (i.e., less challenge, more threat) and decreases in perceived autonomy and competence were associated with increases in depression symptom frequency. Interestingly, once again, increases in season average pursuit of approach goals were related to increases in depression symptom frequency from S1 to S3.

Regarding changes in mental health (MHI-5), between 17% and 54.3% of variance was explained by the model. Higher or lower age, increases in perceived competence and relatedness, decreases in the pursuit of avoidance goals and the challenge and threat ratio (i.e., less threat, more challenge) were associated with increases (i.e., improvements) in mental health. From S1 to S3, increases in the average season pursuit of approach goals were related to increases (improvements) in mental health.

Regarding changes in common anxiety (significant), between 8.1% to 24.3% of variance was explained by the model. Lower age, decreases in perceived competence and relatedness, and increases in the challenge and threat ratio (i.e., less challenge, more threat) and the pursuit of avoidance goals were associated with increases in common anxiety. The regressions using season average change from S2 to S3, and from S1 to S3 were non-significant.

Finally, regarding changes in common depression (significant), between 10.1% and 20.9% of variance was explained by the model. Lower age, decreases in perceived competence, and increases in the challenge and threat ratio (i.e., less challenge, more threat) and the pursuit of avoidance goals were associated with increases in common depression. The regression using change during S2 was not significant.

Table 95

Percentage variance explained within each regression, and implications for the hypotheses; significant models indicate support, non-significant models indicate non-support.

Change Period	Outcome Variable	Percentage Variance Explained	Relation to Hypotheses
S1 (T1 to T2)	Anxiety (GAD-10)	24.3%	Supports H_1
	Depression (PHQ-8)	14.7%	
	Mental Health (MHI-5)	17.1%	
	Common Anxiety	24.3%	
	Common Depression	20.9%	
	Performance S1P3	0.0%	Non-support for H_2
	Performance S1P1 to S1P3	0.6%	
	Performance S1 Average	1.5%	
S2 (T3 to T4)	Anxiety (GAD-10)	14.0%	Supports H_1
	Depression (PHQ-8)	14.0%	
	Mental Health (MHI-5)	28.1%	
	Common Anxiety	10.7%	
	Common Depression	5.7%	
	Performance S2 Average	0.8%	Non-support for H_2
S3 (T5 to T6)	Anxiety (GAD-10)	16.8%	Support for H_1
	Depression (PHQ-8)	23.0%	
	Mental Health (MHI-5)	31.5%	
	Common Anxiety	8.1%	
	Common Depression	10.1%	
	Performance S3P3	8.8%	Support for H_2
	Performance S3P1 to S3P3	9.3%	
	Performance S3 Average	8.3%	
Composite Season (Early to Late)	Anxiety (GAD-10)	17.6%	Support for H_1
	Depression (PHQ-8)	20.6%	
	Mental Health (MHI-5)	27.2%	
	Common Anxiety	13.5%	
	Common Depression	12.6%	
	Performance P3	0.2%	Non-support for H_2
	Performance P1 to P3	1.1%	
S1 to S2	Anxiety (GAD-10)	35.4%	Support for H_1
	Depression (PHQ-8)	15.0%	
	Mental Health (MHI-5)	54.3%	
	Common Anxiety	20.7%	
	Common Depression	14.3%	

Table 95

S2 to S3	Anxiety (GAD-10)	18.0%	Support for H_1
	Depression (PHQ-8)	6.2%	Non-support for H_1
	Mental Health (MHI-5)	21.4%	Support for H_1
	Common Anxiety	0.1%	Non-support for H_1
	Common Depression	10.1%	Support for H_1
	Performance S3P3	-5.2%	Non-support for H_2
S1 to S3	Anxiety (GAD-10)	41.1%	
	Depression (PHQ-8)	20.3%	Support for H_1
	Mental Health (MHI-5)	41.4%	
	Common Anxiety	3.0%	Non-support for H_1
	Common Depression	16.7%	Support for H_1
	Performance S3P3	-0.5%	Non-support for H_2

H_6 was largely unsupported by the regression analyses; the model's ability to explain proportions of variance in football performance was poor, with most models failing to reach statistical significance. Only three of the 11 performance regressions were statistically significant, and they all related to the S3 data (see Table 95). The significant regressions explained between 8.3% to 9.3% of the variance in football performance in S3. Support was provided for H_6; increases in perceived relatedness and decreases in depression were associated with increases in (or better) performance. However, within one regression model, increases in the challenge and threat ratio (i.e., less challenge, more threat) were associated with increases in performance; a relationship opposite to that hypothesised here and within the TCTSA (Jones et al., 2009; Meijen et al., 2020).

Overall, H_5 was largely supported; the TCTSA model was effective at explaining variance in changes in mental health variables. In particular, decreases in BPNs, and increases in the challenge and threat ratio (i.e., less challenge, more threat) and the pursuit of avoidance goals were associated with worsening mental health. In contrast, H_6 was largely unsupported; the model was mostly ineffective at explaining variance in football performance or changes in football performance.

4.16 Discussion

For research findings to adequately inform practice, cause-and-effect relationships should be established (Cobley & Till, 2017; Grammer et al., 2013; Maxwell & Cole, 2007). Longitudinal research could help illustrate causal relationships, though vast amounts of data (including control variables), and large sample sizes bestowing substantial statistical power are required for such analyses. In the absence of this, within this chapter, analysis of interrelationships in variable change and determinants of change were presented (Baltes & Nesselroade, 1979). Thus, rather than illustrating causal relationships, the analysis evidences the degree of closeness between variables, and potential reciprocal relationships between variables. Two hypotheses were tested. The first; increases in anxiety and depression (worsening mental health) would be related to increases in perceived demands, the challenge and threat ratio, avoidance goal orientations, and decreases in perceived resources, perceived coping potential, BPNs, and approach goal orientations (H_5), received a great deal of support. The second; increases in performance would be related to decreases in perceived demands, the challenge and threat ratio, avoidance goal orientations, anxiety, and depression symptoms (improving mental health), and increases in perceived resources, BPNs, and approach goal orientations (H_6), received little to no support.

4.17 Change in Mental Health

The results of the analyses supported H_5; the TCTSA model explained significant proportions of the variance in mental health markers. This corresponds with previous research where, relative to perceived resources, greater perceived demands (i.e., threat states) were associated with greater anxiety (Bandura, 1997; Beck et al., 1985; Lazarus, 1991; Lazarus & Folkman, 1984; Sarason & Sarason, 1990; Skinner& Brewer, 1999) and worse mental health, and well-being outcomes across organisational (Bakker & Demerouti, 2007; Mayer et al., 2017), educational (Salmelo-Aro & Upadyaya, 2014), and sport settings (Gomes et al., 2017; Moore et al., 2013; Raedeke & Smith, 2004; Smith, 1986; Skinner & Brewer, 2002; Williams et al., 1991), although see Meijen and colleagues (2013) for an exception, where both challenge and threat appraisals were positively related to anxiety. Moreover, the present findings support previous where threat appraisals related to anxiety (Britton et al., 2011) and depression (Mak et al., 2004), and reappraisal of threat related to improvements in anxiety disorder symptoms following cognitive behavioural therapy (Smits et al., 2012). Along with the challenge and threat ratio, BPNs and avoidance goal orientations also emerged as significant contributors to the mental health regression models.

The emergence of BPNs as significant contributors to the mental health regression models resonates with prior research; self-determined motivation is associated with fewer symptoms of poor mental health (Deci & Ryan, 2008; Stenling et al., 2015) and a meta-analysis showed that satisfaction of BPNs relates to better mental health (affect, depression, and anxiety) in health settings (Ng et al., 2012). So powerful are these effects that daily fluctuations in emotional well-being could be explained by daily fluctuations in the satisfaction of BPNs (Reis et al., 2000). When BPNs are met, psychosocial adjustment and well-being are promoted (Ryan & Deci, 2017; Vansteenkiste et al., 2020) and more positive affect, less negative affect, and fewer symptoms of poor mental health are observed (Schutte & Malouff, 2021; Stanley et al., 2021).

Regarding each need separately, perceived competence and autonomy were the most common of the BPNs emerging as contributors to the model. Low perceived competence has been associated with more depression (Uhrlass et al., 2007) and anxiety (Putwain & Symes, 2012; Smári et al., 2001), particularly when avoidance goals are also adopted (Putwain & Daniels, 2010). Meanwhile, the satisfaction of the need for autonomy contributes to well-being (Ryan & Deci, 2017; Vansteenkiste et al., 2020), more positive affect (Nieboer et al., 2010; Van den Broeck et al., 2016) and improvements in mental health (Deci et al., 1989;

Ryan & Deci, 2000; Schutte & Malouff, 2021) and well-being. Indeed, in a 6-year longitudinal study which tracked physical activity, BNPs and mental health in 937 children, BNPs were shown to mediate the positive relationship between physical activity and mental health (Doré et al., 2020). Notwithstanding this, numerous studies from the organisational psychology literature have illustrated that increased job autonomy is related to better mental health (Park & Searcy, 2012; Schreurs et al., 2015; Vigoda-Gadot, 2007) and the results of a cross-sectional, nationally representative survey of employees showed job related autonomy support was associated with increased perceived supervisor support, which in turn enhanced mental health (Park & Jang, 2017). Similarly, in college students, autonomy support is related to reduced depressive symptoms longitudinally (Jiang & Tanaka, 2022; Van Der Giessen et al., 2014; Zhang et al., 2022). Complementary to the need satisfaction research, the frustration of BPNs predicts stress and worse well-being (Weinstein & Ryan, 2011), more depression (Cordeiro et al., 2016) and anxiety (Ng et al., 2012). BPN frustration was also shown to limit adolescents' development and increased their risk for psychopathology including negative affect (Milyavskaya et al., 2009) and depressive symptoms (Bartholomew et al., 2011). In addition, BPN frustration predicted vulnerability to suicidal ideation and behaviours in university students (Rowe et al., 2013) even when controlling for depressive symptoms (Tucker & Wingate, 2014).

It is surprising that perceived relatedness rarely emerged as a significant contributor in the mental health regression models; the satisfaction of this need has consistently been related to better mental health and well-being outcomes (Cobb, 1976; Kawachi & Berkman, 2001; Ng et al., 2012; Schmidt et al., 2020; Sheldon & Bettencourt, 2002) and more positive affect (Sheldon & Bettencourt, 2002), with the thwarting of relatedness associated with worse outcomes (Schmidt et al., 2020). The lack of such a finding in the present study could be due to the way mental health was measured; relatively "negative" measures of mental health were used (i.e., anxiety and depression) in contrast to more "positive" measures which tap into positive affect and psychological well-being (see Keyes, 2002). Perceived relatedness may have emerged as a significant contributor had a more positive and general measure of wellbeing been used as the dependent variable in a regression model.

Regarding research within the sport and exercise psychology domain, a review of the risk and protective factors for mental health in elite athletes showed that the perception of autonomy was a personal protective factor highlighted within qualitative studies (Küettel & Larsen, 2019). Furthermore, BPNs predicted variability in performers' experiences of positive affect (Adie et al., 2008; Quested & Duda, 2009, 2010) subjective vitality (Adie et al., 2008), burnout (Hodge et al., 2008), negative affective states (Quested & Duda, 2010), cortisol release and anxiety intensity (Quested et al., 2011). Thus, that perceived competence and autonomy emerged as significant contributors to mental health regression models within the present research, corroborates the aforementioned study findings. Put simply, BPNs may importantly implicate sport performers' mental health; greater perceptions of autonomy and competence facilitate better mental health outcomes.

The emergence of avoidance goal orientations as a significant contributor to some of the mental health regression models (i.e., MHI-5, common anxiety, and common depression) also resonates with previous research both within sport and exercise (Adie et al., 2010; Daumiller et al., 2021; McCarthy et al., 2013; Osório et al., 2017), educational settings (Chen & Luo, 2015; Elliot et al., 2005; Luo et al., 2011; Sideridis, 2005) and social settings (Kamarova et al., 2017); greater avoidance is associated with worse mental health and well-being outcomes. Still, it is surprising that avoidance goal orientations did not emerge as a significant contributor to the GAD-10 models, since in theory (e.g., Elliot & McGregor, 2001; Elliot & Thrash, 2002; Gray, 1982) and based on evidence, greater avoidance goal motivation is related to greater anxiety (e.g., Dickson, 2006; Dickson & MacLeod, 2004) and worse well-being (Elliot & Sheldon, 1997). Gray (1982) posited two affective-motivational systems; behavioural inhibition (BIS, reminiscent of avoidance goal orientation, Elliot & McGregor, 2001) and behavioural activation (BAS, reminiscent of approach goal orientation, Elliot & McGregor, 2001). Whilst the BIS is sensitive to punishment, novelty, and non-reward (i.e., potential threat) and is thus related to emotions of anxiety, sadness, and fear, the BAS is sensitive to reward and escape from punishment (i.e., potential gain), and thus related to emotions of happiness and hope (Gray, 1982). When applied to pathological conditions, both anxiety and depression are suggested to be related to high BIS (e.g., avoidance goal orientation), with depression also related to reduced BAS (e.g., approach goal orientation, Fowles, 1994). Still, avoidance goal orientation did not emerge as a significant contributor to the PHQ-8 models either, and thus may reflect the affective and cognitive differences between anxiety and depression (MacLeod & Byrne 1996; Mineka et al., 1998), replicating previous findings whereby depression was associated with decreases in the pursuit of approach goals but not in relation to changes in avoidance goal orientation (e.g., Dickson & MacLeod, 2004; Winch et al., 2015). That approach goal orienataion emerged as a significant positive contributor to the GAD-10 and PHQ-8 regression models, and a negative contributor to the MHI-5 regression model when looking at season average change from S1 to S3 is certainly surprising and conflicts with theory and previous findings. It may be that the smaller sample size of this analysis and associated issues with statistical power contributed to this unexpected finding (Cohen, 1988).

4.17.1 Reciprocity

An important factor to consider alongside the present study findings is that of reciprocity. Whilst the findings support H_5 through evidencing the relationships between the nature of appraisal change and mental health change, they do not indicate which variable influences the other. Indeed, it is likely the variables are interdependent, influencing each other in a bi-directional or cyclical nature (Beck & Haigh, 2014; Ellis, 1994; Pekrun, 2006). For instance, whilst the regressions indicate that increases in the challenge and threat ratio (i.e., less challenge, more threat) are related to increases in anxiety symptoms (as hypothesised), the findings do not show whether threat states lead to more anxiety, or whether more anxious individuals hold greater threat states. Both are likely to be true (Cisler & Koster, 2010; Hofmann et al., 2013; Mathews & MacLeod, 2002); to delineate such causality/the directional effects of one variable on another, cross-lagged analyses, growth-curve modelling and/or randomised controlled trails would be required. Inadequate statistical power within the present study precludes such analyses from being conducted.

This issue of reciprocity applies to each of the change relationships identified; decreases in BPNs are likely to worsen mental health outcomes (Liu et al., 2022) and at the same time, individuals with poor mental health may be less likely to perceive autonomy, competence, and relatedness due to holding a pessimistic outlook (see American Psychiatric Association, 2013). Therefore, if BPNs were shown to be lower at T2 than at T1, and anxiety symptoms were higher at T2 than at T1, it is not possible to delineate whether decreasing BPNs led to an increase in anxiety symptoms, or whether increasing anxiety led to decreasing perceptions of BPNs. Thus, whilst the present findings do still support the TCTSA, further research is required to establish the directional effects of appraisals on mental health and vice versa and these are discussed later in the research implications section.

4.18 Change in Performance

The results of the analyses largely failed to support H_6; the TCTSA model generally did not explain significant proportions of variance in changes in performance. This is perhaps not surprising considering the TCTSA is a theory of acute sport performance (Jones et al., 2009; Meijen et al., 2020); the first step within the TCTSA is that the performer faces an *acute* motivated performance situation. In contrast, performance measures used within the present research represent average performance ratings across periods of between 12 weeks and a full season (i.e., not acute, see Table 5). Related to this, just because a player illustrated a challenge state generally towards their academy football at one timepoint does not mean to say they appraised each match that followed in the same manner (cf. Cumming et al., 2017). In other words, a player may have felt capable of meeting the collective demands of academy football, but prior to a particular match, their perceptions may have been different. Those pre-match perceptions could be influenced by how they performed in training that week, the opponent (i.e., the other team), their direct opponent (i.e., who they are playing against in one-versus-one battles), how well they slept the night before, who else is playing in their own team (i.e., quality of teammates) and the relationship with the coach, to name a few. Thus, given the potential for acute challenge and threat states to fluctuate between the timepoints where general challenge and threat states were measured, and the lack of acute performance data used, this could explain why H_6 was not supported.

The absence of significant proportions of variance in football performance being explained by the TCTSA model within the present study also replicates findings from previous research where associations were absent (Turner et al., 2021), weak (Dixon et al., 2019) or at times opposite (i.e., threat states were related to superior performance) to those expected, particularly within youth sport performers (Turner et al., 2013). In the present study, the absence of hypothesised findings could be because performance in youth athletes is often inconsistent (Lidor et al., 2009). Indeed, the development of sport expertise is dynamic and non-linear (Abbott et al., 2005). Thus, if performance is highly fluctuant during a season and across seasons within youth sport performers, their cognitive appraisals and mental health markers may be equally so. These fluctuations may not have been captured by the two timepoints in the present research, at the start and end of seasons. As such, changes in cognitive appraisals and mental health from the start to the end of the season may not have been related to patterns of performance during a season, because players' cognitive appraisals and mental health are likely to have been changing between those two timepoints, impacting their acute game by game performance.

Relatedly, cardiovascular indicators of challenge and threat are better predictors of performance than psychometric indicators (Behnke & Kaczmarek, 2018; Hase et al., 2018; Turner et al., 2012; 2013). Furthermore, physical maturity (Malina et al., 2005), deliberate practice (Macnamara et al., 2016), genetics (Davidsen et al., 2011; Timmons et al., 2010), competition experience (Baker et al., 2003; Turner et al., 2021), playing multiple sports (rather than specialising in one sport early, Fransen et al., 2012), working memory capacity (Meinz & Hambrick, 2010), attentional control (Engle, 2002), perceptual and psychomotor speed (Ackerman & Cianciolo, 2000) and general intelligence (Ackerman, 1987; Gagné, 2013; Schmidt, 2014; Simonton, 2014) are all important factors that influence performance, to name a few. Indeed, in a longitudinal study of German elite football players, stronger football performers engaged in more non-organised football play, and organised training/practice in non-football than weaker football performers (Güllich et al., 2016). It is possible that since these factors contribute to performance, failing to control for them in the present research could have prevented the effect of psychological demands and resources on performance from being observed.

Furthermore, the measurement of individual performance within football is inherently challenging for several reasons. First, the result of a game is not a suitable measure since it does not represent individual differences in performance between teammates. Indeed, a team may perform poorly and win, and an individual may have their best ever game within a team-losing performance. Global win/loss data is also unlikely to be sufficiently sensitive to detect statistically significant effects of psychometric variables (Parfitt et al.,1990).

Second, there is no objective or shared definition of performance quality, which itself is a multi-dimensional concept (Pappalardo et al., 2017). Given the complexity when evaluating football performance, there is no unified, objective method for measuring individual football performance. Notwithstanding this, reducing complex football performance down to a single number is problematic since performance comprises a vast array of skills and abilities which may be unrepresented by a single number. Indeed, depending upon the state of the game, the same action (such as deciding to attack the opposition's goal) may be judged as good performance in one game (such as when the team is losing and needs to score to equalise) and poor performance in another (such as when the team is winning but the opposition are building momentum, and to win the team needs to manage the game, take no risks and maintain possession). Given the importance of decision making for successful performance in football, and the impact of in-game factors for defining whether a decision is good or bad, this makes performance measurement in football by nature, problematic.

Third, the demands placed on football players vary by position and thus, successful performance involves different skills and attributes depending on a player's position (Duch et al., 2010; Taylor, 1995). For example, successful performance for a goalkeeper is largely aerobic in nature and involves good communication, distribution (i.e., passing the ball) across short, medium, and longer distances, good decision making and reaction times, to name a few. In contrast, successful performance for a striker may involve aerobic and anaerobic actions, good timing and speed of movement, a good first touch, finishing (i.e., shooting) and decision making regarding when to pass and when to shoot. Given the very different requirements of these two positions (as well as others on the field of play), this also makes the adoption of a unified method of performance measurement problematic.

Still, these problems in measuring individual football performance are largely unavoidable; they are inherent problems in the measurement of dynamic sport performance. Reconciling football's performance measurement problem was beyond the scope of this PhD. The method adopted represented the most pragmatic and ecologically valid method available to the research (Christensen, 2009); utilising the knowledge and judgement of experts (i.e., football coaches) to evaluate the performance of players, an approach adopted in previous research (e.g., Hoare & Warr, 2000). Of course, whilst ecologically valid, these ratings could have been biased by several factors, including expectations about how well players will perform (i.e., confirmation bias, Bar-Tal, 2010) and player's age and maturation status (i.e., base rate bias, Kahneman, 2011). Still, it could be argued that coach rated indicators of performance are more important than objective measures of performance, because coaches make performance and selection decisions. Whilst efforts could have been made to objectively measure key subcomponents of football performance within each player at the academy (e.g., Netaji et al., 2024), this approach would have been both impractical and logistically impossible to implement in the present research context. The potential bias in performance measurement in the present study, as well as the general difficulty in adequately measuring football performance may have contributed to the lack of support observed for H_6 in the present analyses.

Finally, the ratings used as indicators of performance in the present research did not account for player effort (i.e., task engagement; Wright & Kirby, 2001) which is problematic since performance and effort are related to each other non-linearly and can depend upon task complexity and performer competence (Heckhausen, 1991). Poor performance could indicate low effort, or it could indicate effort that is great enough to interfere with the performer's ability to succeed (Ford & Neale, 1985). Nevertheless, finding an objective measure for performance in real-world, dynamic team sports such as football is challenging, and collectively this may explain why little support was observed for H_6.

4.19 Limitations

Whilst stronger conclusions regarding the relationships between variables can be drawn from the present analyses compared to those presented within chapter three, the analyses are not without their limitations. First, the correlation analyses fail to indicate which variable influences the other. For instance, considering that changes in the challenge and threat ratio significantly positively correlated with anxiety symptoms, it cannot be deduced whether the challenge and threat ratio influences anxiety, or whether anxiety influences the challenge and threat ratio. Of course, the regression analyses provide greater insight than the correlations, but the issue of reciprocity remains. Using data from more than two timepoints would be beneficial so that measurements both before and after a change, together with mediating variables can be incorporated into analyses (i.e., cross-lagged analyses, Cole & Maxwell, 2003; Maxwell & Cole, 2007). Still, to have incorporated a third or fourth data collection timepoint, this would have involved the data spanning a period of 18 to 24 months by which time, causal relationships could be harder to infer since variables may fluctuate between those times and thus a later timepoint score could not necessarily be attributed to an earlier timepoint score (e.g., Abbott et al., 2019; Bicalho et al., 2020; Fagundes et al., 2019; Faude et al., 2011; Fessi et al., 2016; Nobari et al., 2020; 2021; Sarmento et al., 2021; Tabei et al., 2020). A solution to this could have been to incorporate a third data collection timepoint within each season, but this would have created additional cognitive load, would have been logistically very challenging to complete and might had led to survey fatigue response error bias (Wilson & Putnam, 1982).

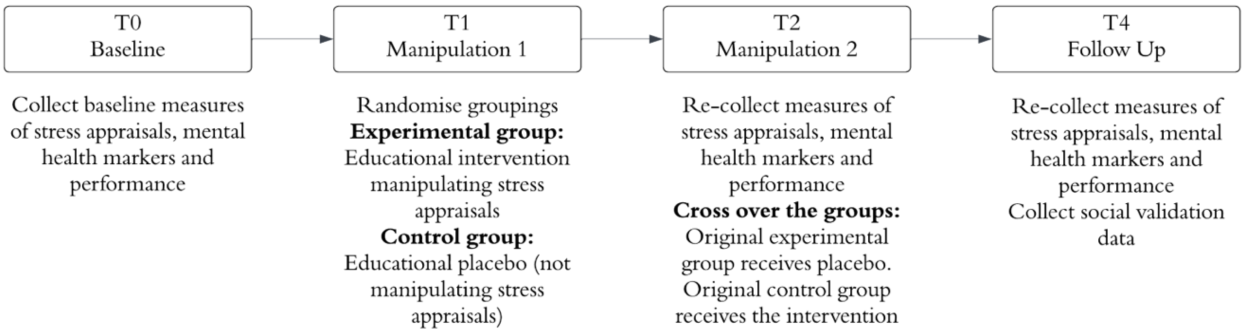
Notwithstanding this, years of football experience and players' experiences under pressure likely influence performance (Baker et al., 2003; Güllich et al., 2016; Turner et al., 2021), anxiety (Hanton et al., 2008) and mental health (Doré et al., 2019), yet this was not controlled for within the present analyses. This was to maintain as high a sample size as possible for the analyses and demographic data (including years of [academy] football experience) was not provided by every player. The same is true for players' injury status; injury through a season would likely limit performance and certainly worsen mental health (Abbott et al., 2019; Anchuri et al., 2020; Gulliver et al., 2015; Hutchinson et al., 2009; Junge & Feddermann-Demont, 2016; Mainwaring et al., 2010; Manuel et al., 2002; Sarmento et al., 2021). Had these factors been controlled for, the percentage of variance explained within the regression models may have been different, but statistical power in these analyses would have been lower owed to the smaller sample size.

4.20 Research Implications

The findings from these change analyses indicate several avenues for further research. First, mental health related intervention studies could be conducted to further test the TCTSA (and TCTSA-R) in its applicability to athlete mental health. Certainly, further research testing these relationships would add robustness to the claim that the TCTSA could be used to explain mental health and underpin intervention work. Second, similar research to that conducted within the present PhD should also be conducted within female football players to explore whether there are gender differences in the nature of change. Relatedly, a third avenue would be to conduct similar research testing the TCTSA within other sports, potentially where performance can be more objectively measured and recorded (such as darts, archery, and swimming). This would not only indicate how generalisable the present findings are to other sports, but it could also reveal different relationships between the psychometric measures collected here and sporting performance. Furthermore, additional longitudinal research could be conducted, with more frequent data collection during a season, which would allow greater insight into how variables fluctuate during a season, and factors which influence such fluctuations.

Figure 6

Illustration of RCT design to guide future TCTSA intervention research.



The extant sport and exercise psychology literature would be strengthened by the completion of more randomised controlled trials (RCTs, see Nejati et al., 2024). Such studies can demonstrate cause and effect relationships as they overcome the issue of reciprocity by showing the direction of relationships, owed to the number of factors controlled for, the controlled manipulation of independent variables (i.e., delivery of interventions), and the use of a control group (Kendall, 2003). Moreover, RCT research limit Hawthorn effects and have high internal validity (Berg & Latin, 2008). Consequently, to build on the present research, RCTs should be completed. Specifically, sport performers should be randomly allocated to either an experimental group or a control group, with four data collection timepoints (see Figure 6). The experimental group should receive an intervention targeting the development of personal resources. The impact of this intervention on the experimental group's mental health and sport performance should be measured and compared to a control group who receive a non-performance related educational programme (i.e., a placebo). The control group should then receive the experimental intervention, and the experimental group receive the placebo. Such research would offer more rigorous insight into the relationships identified within the present research, and stronger applied practice recommendations.

Despite the contribution the present body of research makes to the extant literature base, more research conducted within youth sport settings is still warranted, including intervention studies (e.g., RTCs) and studies where acute measures of performance are used. The sport and exercise psychology literature would benefit from future TCTSA research publishing demand and resource data (e.g., Carenzo et al., 2020) as well as challenge and threat data, since this might provide more nuance and thus, valuable insight for practitioners wishing to use research to inform their practice. Without understanding the separate contributions of high versus low demands and resources, practitioners are less informed in their work where they may wish to influence the demand and/or resource appraisals of those they work support. Given the issues highlighted here regarding the measurement of performance in sports like football, an interesting line of research could be to explore methods of measuring challenge and threat states behaviourally (i.e., via observation) across sports. Such work could allow the coding and thus more objective measurement of not just performance, but also challenge and threat states as they manifest behaviourally. Finally, more TCTSA research ought to be conducted within more diverse samples to test whether the findings present are also applicable cross-racially and cross-culturally.

4.21 Applied Practice Implications

The findings reported within the present chapter bestow implications for applied sport and exercise psychologists. For example, to satisfy the new standard of proficiency, to support health and prevent ill health of those they work with (Health & Care Professions Council, 2023), sport and exercise psychologists might consider using the TCTSA(-R) to underpin their practice (e.g., Hobson & Dixon, 2023). This could be both an impactful and efficient decision, supporting mental health as well as potentially performance. Aiming to develop challenge states, promote perceptions of competence and self-efficacy, and encouraging individuals to pursue approach rather than or alongside avoidance goals might offer both a protective role regarding mental health and a promotive role regarding performance. Indeed, the findings from these analyses support and extend the extant literature; for sport and exercise psychologists to target the development of challenge states (Skinner & Brewer, 2004), BPN satisfaction (Robazza et al., 2023), and the adoption of approach goals (Lochbaum & Gottardy, 2015) via methods such as imagery (Williams et al., 2010; 2018; 2021), self-talk (Hase et al., 2019), reappraisal (Beltzer et al., 2014; Moore et al., 2015), goal setting (Bird et al., 2022) and working with key stakeholders such as coaches to influence task instruction (Evans et al., 2018; Turner et al., 2014). These outcomes are particularly worth pursuing within academy football environments, not just because the present findings can be applied to that context, but also because these could be realistic educational outcomes of a sport psychology programme/curriculum (see Hobson & Dixon, 2023), which is a requirement of higher category academy programmes in the UK (Premier League, 2011). Relatedly, the present findings extend the PST literature through offering a potential mechanism through which PST may influence performance and mental health (Harwood & Thrower, 2019; Meggs & Chen, 2019; Thrower et al., 2023).

Relatedly, building on the implications discussed within chapter three; applied practitioners ought to monitor mental health, perceived demands and resources, BPNs, and achievement goal orientations of their athletes, because these factors are related, change over time, and offer an efficient way of assessing needs, monitoring the impact of interventions, and evaluating work (British Psychological Society, n.d.; Health & Care Professions Council, 2023; Schinke et al., 2017). Furthermore, to complement the psychometric measurement of challenge and threat states and mental health, applied sport and exercise psychologists may also want to consider, and indeed, define within their performance environments the visual indicators (i.e., behaviours) of challenge and threat states respectively.

Considering recent calls for PST literature to align with positive youth development research endeavours; taking a longer-term developmental focus and extending beyond performance to welfare and well-being domains (see Pierce & Erickson, 2022), measuring the impact of such interventions against the variables included within the present research could represent a suitable way of achieving this alignment. It may also help to illuminate mechanisms through which interventions influence performance and well-being outcomes (see Meggs & Chen, 2019), and help lead to stronger evaluations of the impact of such interventions (see Knight & Holt, 2012).

4.22 Conclusion

Following more detailed analysis of the data, the TCTSA appears to be suitable for predicting mental health in youth academy football players, but not for predicting their longer-term patterns of performance. This contribution builds on the largely cross-sectional extant literature (e.g., Jensen et al., 2018; Küettel et al., 2022; Turner et al., 2013; 2021) by offering insights into relationships between psychological demands and resources, and mental health as they change over time. Likewise, building on studies conducted within laboratory environments (e.g., Moore et al., 2012; 2013; 2014; 2015; Turner et al., 2014), a strength of the present research is its ecological validity. It offers a strong sense check of the TCTSA to indicate the extent to which the theory's predictions hold true for real performers pursuing real performance endeavours, in real sport environments. The absence of a predictive relationship between changes in psychological demands, resources and mental health and football performance suggests these predictions do not hold true outside of the lab. However, failing to test the TCTSA against acute sporting performance may also explain this absence of a relationship, because the TCTSA is geared towards explaining acute performance rather than longer-term patterns of performance (Jones et al., 2009; Meijen et al., 2020).

Furthermore, the present findings build on the emerging longitudinal and temporal research on challenge and threat states in sport (see Chadha et al., 2023; Cumming et al., 2017; Davies et al., 2023) by offering insights into how psychological demands and resources and mental health change over a longer time frame (i.e., three competitive seasons in comparison to a single season), in a different sport, across a larger sample of individuals. Indeed, to the best of the researcher's knowledge, this is the biggest and longest survey of youth athlete stress and mental health to date, and the first to provide insights into these topics in sports performers as young as 8-years-old.

The present research extends the predictions of the TCTSA beyond performance to mental health, offering a valuable and novel contribution to progress our understanding of stress and mental health in youth athletes. Through elucidating the relationships between changes in psychological appraisals and changes in mental health, the present findings build on the work of Jensen et al (2018) and satisfy the increasing calls for sport psychologists to ethically (i.e., within their boundaries of practice) support the mental health of those they work with (e.g., Ayoagi et al., 2012; Coppel, 2020; Souter et al., 2018). Specifically, those malleable psychological variables associated with mental health (i.e., perceived resources, BPNs, achievement goal orientation) could be the target of preventative programs/support interventions called for in previous research (Jensen et al., 2018). Indeed, considering it is likely much easier and more efficient to influence an individual's psychological demands and resources in comparison to their mental health, these solutions are pragmatic and overcome some of the logistical challenges associated with delivering effective sport psychology within youth sport environments, such as lack of resource and time (Dean et al., 2022). Furthermore, since any stakeholder within a talent development environment (but especially the coach) could influence the psychological demands and resources of performers within those environments (e.g., Dixon et al., 2017; Evans et al., 2018), multi-disciplinary interventions targeting these malleable variables (e.g., Harwood & Anderson, 2015; Harwood, 2008; Sherman & Pocwardowski, 2005; Sinclair & Sinclair, 1994) could help overcome professional practice challenges within youth sport environments, such as confidentiality (e.g., Champ et al., 2020; Feddersen et al., 2022; Hobson & Dixon, 2023; Konter et al., 2019). Confidentiality and attempts for staff to trick psychologists to break confidentiality could be minimised if those staff are involved in the delivery and evaluation of interventions targeting psychological attributes.

Relatedly, the present research builds on Parry's (1992) notion that early intervention is preferential when supporting youth mental health, offering guidance into what such early intervention could target in sporting environments, to improve or protect youth athlete mental health (see also Harwood, 2008). The findings align with Parry's comments (1992), since malleable psychological variables could be influenced via a multi-disciplinary team approach to supporting individual players (e.g., Rotella & Heyman, 1986; Zizzi et al., 2009) or generally to develop a facilitative talent development environment (e.g., Moodie et al., 2023).

Finally, heeding the calls for research to develop our understanding of elite (Foskett & Longstaff, 2018) and youth athlete mental health (see Hill et al., 2016; Sothern & O'Gorman, 2021), this research illuminates some of the factors predictive of poor mental health in elite youth athletes. Consequently, valuable recommendations not just for sport and exercise psychologists but also, individuals working within sport more broadly are provided. Moreover, considering the call for sport and exercise psychologists to support athletes experiencing subclinical mental health issues in a preventative manner (Hill et al., 2016; Schinke et al., 2017; Sothern & O'Gorman, 2021), the present research indicates the suitability of the TCTSA to theoretically underpin such work. As a flexible theory which can be adapted to meet the challenges posed when working with children and young people in an applied environment (see Hobson & Dixon, 2023), the present research furthers the extant literature by highlighting the suitability of the TCTSA to underpin applied work with young people (see Harwood & Thrower, 2019). The TCTSA was less effective at predicting performance in youth academy football players. This may reflect the challenges associated with accurately measuring football performance, and/or a caveat of the theory, in that it better explains acute performance, rather than patterns of performance across multiple occasions.

5.0 CHAPTER FIVE. GENERAL DISCUSSION.

5.1 Introduction

The present PhD tested whether the TCTSA could extend beyond explaining acute sport performance, to predicting mental health and sport performance more generally (Jones et al., 2009; Meijen et al., 2020) in youth athletes. Stress appraisals, BPNs, achievement goals (i.e., psychological demands and resources, Jones et al., 2009; Meijen et al., 2020), mental health, and football performance were collected from male youth football players registered at a category one academy in the UK, over three consecutive seasons (32 months). The data were longitudinally and temporally analysed. Based on the TCTSA (Jones et al., 2009), the aims of this thesis were to examine longitudinal change in psychological demands, resources, and mental health, to explore how changes in psychological demands and resources relate to changes in mental health, and to explore how changes in psychological demands, resources and mental health relate to football performance in youth academy football players.

In chapter one, a historical and conceptual overview of the stress and mental health literature was provided, culminating in a rationale for longitudinally studying these concepts within youth academy football players, and for extending the application of the TCTSA from athlete performance to athlete mental health. Chapter two provided detailed insight into how the data were collected throughout the 32-month study period, and how this data was subsequently prepared for analyses.

Addressing the first PhD aim (to examine longitudinal change in psychological demands, resources and mental health), in chapter three, analyses were provided regarding how the psychometric data changed longitudinally across three consecutive seasons, temporally during each season separately, and temporally during a composite season when early and late season timepoints were combined to create two timepoints with a large sample size. Results showed that variables did change over time; the nature of that change depended upon the particular variable, a player's stage of sporting development, and the change period of reference. In general, anxiety symptom frequency, perceived demands, and perceived resources, tended to increase over time. Perceived autonomy and competence tended to decrease during seasons, and the challenge and threat ratio changed in a similar pattern to anxiety; less challenge and more threat appeared to relate to more anxiety. Older (PDP) players' mental health tended to worsen whilst younger (FP) players' mental health tended to improve during a season, and younger players' approach goal orientation tended to increase during seasons.

Addressing the second (to explore how changes in psychological demands and resources relate to changes in mental health) and third (to explore how changes in psychological demands, resources and mental health relate to football performance in youth academy football players) PhD aims, analyses of relationships between changing variables were provided in chapter four. Multiple hierarchical regressions using residualized change scores were conducted, aiming to explain variance in changes in mental health and football performance. The TCTSA model explained variance in changes in mental health variables; decreases in BPNs and increases in the challenge and threat ratio (i.e., less challenge, more threat) and avoidance goal orientations were associated with worsening mental health. In contrast, variance in football performance was not explained by the TCTSA model.

In summary, this PhD showed that youth academy football players' stress appraisals, BPNs, achievement goal orientations and mental health markers change over time. The nature of this change depends upon the variable in question, a player's stage of development, and the change period of reference; the nature of in-season change can vary from season to season. Furthermore, the TCTSA model appears to be effective at predicting mental health, but ineffective at predicting general patterns of performance in male youth academy football players. In the present chapter, a general discussion of the core findings related to the PhD aims are firstly presented. Then, limitations of the research are provided followed by implications for both future research and applied practice. Finally, since the researcher held a dual role at the football academy where the research was conducted (working as both a PhD researcher and an academy psychologist), reflections are shared to provide the reader with insight into some of the challenges encountered throughout the completion of the PhD. Each reflection begins with a description of a challenge faced, followed by a concise yet deep reflection (e.g., Anderson et al., 2004), drawing upon the extant professional practice literature and illuminating implications on the present research.

5.2 Core Findings

5.2.1 Change Over Time

The TCTSA postulates that several acute psychological appraisals in relation to performance on an imminent task (i.e., a motivated performance situation) can predict sporting performance, though little is known regarding how these appraisals might change over time and influence patterns of performance. Chapter three showed how these appraisals (and mental health markers) change over the course of three consecutive seasons (spanning six timepoints), during each of those seasons separately, and during a composite season when timepoints are combined to create one “early-season” and one “late-season” timepoint.

Analyses showed that psychological demands and resources and mental health markers did change over time and the nature of that change depended upon the change period, the players’ stage of development, and the type of variable. Most of the changes in psychological demands and resources occurred during S1, with less change observed in the subsequent seasons. Nevertheless, perceived demands and resources tended to increase over time and during a season, with players’ stress appraisals tending to indicate less challenge and more threat during a season. BPNs predominantly changed (significantly decreased) during S2. Significant change in achievement goal orientations tended to only be significant for FP players, with these (i.e., approach, avoidance, mastery, and performance goals) tending to increase during seasons for FP players. Still, mastery goal orientations generally tended to increase following the first timepoint and during seasons. Finally, regarding mental health markers, anxiety tended to increase during a season; FP players' mental health tended to improve whilst PDP players' mental health tended to worsen during a season. These findings extend previous research (e.g., Chadha et al., 2023; Cumming et al., 2017; Davies et al., 2023; Skinner & Brewer, 2002) by illustrating changes in psychological demands and resources over a longer time frame and in youth sport performers.

Stress Appraisals. Both perceived demands and (to a lesser extent) perceived resources increased over time, with players' stress appraisals displaying less challenge and more threat during a season. These changes replicate those found previously (Cumming et al., 2017; Nobari et al., 2020; Skinner & Brewer, 2002) and could be explained by the fact that objective demands within an academy football environment increase over the course of a season and over time (Verheijen, 2014). Indeed, more important events, such as tournaments and the communication of contract decisions occur towards the end of the season, which may intensify stress appraisals (Lazarus & Folkman, 1984). As these demands are experienced and supported is provided by coaches, players could generate more memories of approaching and overcoming such demands, contributing to increased perceived resources (Bandura, 1977; Eime et al., 2013; Jones et al., 2009).

Basic Psychological Needs. The decreases in BPNs during S2 likely reflects the impact of the COVID-19 lockdown occurring towards the end of this season. For most players, the academy was shut down and schools were closed at the time they provided data at T4. The nationwide lockdown had been imposed in the UK and consequently, opportunities to play and practice football (i.e., to develop competence) and to connect with friends, family, teammates, and coaches (i.e., to develop relatedness) was reduced. Autonomy over every aspect of the players lives was also removed thanks to the social distancing measures and rules implemented the government. Therefore, this confounding and uncontrollable factor likely influenced BPNs satisfaction in S2 (Costa et al., 2022).

Achievement Goals. The increases in achievement goal orientations for FP players suggests that FP players were increasingly behaviourally and emotionally engaged with their football throughout the season (see Mih et al., 2015). That FP players' achievement goal orientations changed unlike those of YDP and PDP players could reflect the different performance environments in these phases of development at the football academy. Alternatively, it could be an indication of FP players not fully understanding some of the questionnaire items, in particular the negatively worded items (Benson & Hocevar, 1985; Marsh, 1986). Indeed, other variables, such as perceived resources, at times showed very large change for FP players when for the other groups, there was no significant change. It is not possible to know whether these differences in the younger players' data were due to issues with question comprehension and understanding, or whether it reflects genuine differences between the groups, but is something to consider when interpreting the findings relating to FP players' data within this PhD.

The increase in mastery goal orientations over time and during a season may relate to the simultaneous increases in perceived demands. In a performance environment where players regularly participate in motivated performance situations to achieve their goal of becoming a professional player, where demands intensify and incremental challenges and development opportunities are provided, it seems logical that the desire to pursue mastery (i.e., to push and challenge oneself to improve one's own competence and skills) would be increasingly observed in the players. Players who desire to remain within the academy and earn their next contract know they must demonstrate improvement over time. Thus, they may be more likely to demonstrate effort and persistence in the face of the demands presented to them (Agbuga & Xiang, 2008; Sideris & Kaplan, 2011), reflected in their mastery goal orientation.

Mental Health. A football season typically begins in August/September and ends in approximately April/May. Throughout the season, cup competitions and tournaments occur, reaching their peak (i.e., knock out rounds and the finals take place) towards the end of a season. Within academy football environments, decisions regarding whether a player's contract will be renewed are generally communicated in the final months of the season. As well as this, for young people in the UK, the summer period is generally a time where more exams occur, particularly at the ages of 15 and 16. Taken together, the occurrence of these events towards the end of a season may have contributed to increases in perceived pressure, uncertainty and worry which could explain the observed increase in anxiety during a season (Putwain & Daly, 2014). This pattern of change also replicates previous research where the frequency of cognitive anxiety symptoms (intrusive anxious thoughts) increased as important events grew nearer (Jones & Swain, 1992; 1993), providing further support for this explanation of this finding.

That PDP players' mental health (anxiety and depression) tended to worsen during a season whilst FP players' mental health improved may reflect the differences in mental health observed at the population level; unlike childhood, adolescence is a time of increased risk and onset of mental health problems (Kessler et al., 2005; 2007). This pattern also resonates with previous findings where mental health worsened during the junior-to-senior transition in sport (Cronin et al., 2020; Küettel et al., 2021). At younger age groups, greater emphasis is placed on participation, development, and enjoyment (see aan het Rot et al., 2009; Brettschneider, 2001; Eime et al., 2013; Jewett et al., 2014; Larun et al., 2006; Swann et al., 2018) whilst at older ages, there is greater competition, expectation to perform, uncertainty, and there are more significant consequences for underperformance (Blakelock et al., 2019; Bruner et al., 2008; Grupe & Nitsche, 2013; Gustafsson et al., 2017). Thus, these changes and differences between groups may reflect the nature of the performance environments at these different stages of development (Smith et al., 2007).

Summary. Psychological demands, resources and mental health changed over time. The nature of this change differed between the variables and depended upon the particular change period being examined, and a player's stage (phase) of sporting development. The patterns of change in the study variables indicated some support for the TCTSA being extended to explain athlete mental health; low coping potential and less challenge (more threat) appeared to be related to more anxiety. Decreasing coping potential and decreasing challenge (i.e., movement towards threat) was observed alongside increasing anxiety symptom frequency. However, more detailed, and robust analysis of the data were required to substantiate these claims and illustrate relationships between changes in psychological demands and resources and mental health over time, which were subsequently conducted and reported within chapter four.

The change over time analyses presented within this PhD extend the extant literature in several ways. First, from a methodological point of view, insight into the changes in perceived demands and perceived resources both independently and in relation to each other (i.e., the ratio) are provided. This is a strength since changes to challenge and threat appraisals may reflect changes in only perceived demands, only perceived resources, or both perceived demands and resources. Thus, only reporting the challenge and threat ratio omits nuance and provides limited insight in to changing appraisals (e.g., Adie et al., 2008; 2010; Cumming et al., 2017; Dixon et al., 2019; Turner et al., 2013; 2014).

Second, the number of timepoints (i.e., six), sample size (i.e., 230), study timeframe (i.e., 32 months) and age range of participants within the present research (i.e., 8 to 17-years), furthers the extant literature consisting of predominantly cross-sectional (e.g., Moore et al., 2015; Turner et al., 2014) or shorter longitudinal studies (e.g., Chadha et al., 2023; Cumming et al., 2017; Davies et al., 2023; Faude et al., 2011; Nobari et al., 2020; 2021; Tabei et al., 2020) with considerably smaller sample sizes. Notwithstanding this, the different types of measures adapted (i.e., for context and age) and administered within this research enables a thorough investigation of important psychological constructs, building on previous research where fewer measures, lacking appropriate adaptation for youths, were used (e.g., Cumming et al., 2017; Turner et al., 2013). As a consequence, greater insight and knowledge is generated regarding how psychological demands, resources, and mental health change over time in youth athletes. As the largest and longest survey of youth athlete stress and mental health, this PhD offers novel contributions regarding how such variables change over time, and the extent to which change be influenced by external events and depend upon an individual's age and stage of sporting development.

5.2.2 Relationships Between Changes Over Time

The foundational theories on which the TCTSA was based made predictions regarding the mental health implications of differential stress processes (i.e., Dienstbier, 1989; Lazarus & Folkman, 1984; Selye, 1956), yet neither the TCTSA (Jones et al., 2009) nor the TCTSA-R (Meijen et al., 2020) posit such implications for athletes. This PhD extended the theory's predictions regarding acute performance to patterns of performance over prolonged periods, and to mental health markers in youth football players.

Support was lacking for the hypotheses relating to performance in chapter four; that challenge (not threat) states, greater BPN satisfaction and approach goal orientations, and lesser anxiety and depression symptom frequency and avoidance goal orientations would relate to superior performance, received little to no support. This may be because the TCTSA is a theory of acute sport performance (Jones et al., 2009; Meijen et al., 2020), and the measures of performance used within the analyses represented average performance ratings across periods of between 12 weeks and a full season. Thus, the theory may be better suited for predicting acute performance from acute appraisals, rather than patterns of performance over time from general appraisals. Moreover, that performance in youth athletes is often inconsistent (Lidor et al., 2009) and the development of sport expertise is dynamic and non-linear (Abbott et al., 2005), it could be that youth performance in particular is more difficult to predict than adult or more expert performers, especially from psychological variables such as psychometric measures of challenge and threat states, as found in previous research (see Dixon et al., 2019; Meijen et al., 2014; Turner et al., 2013; 2021). Still, the present research extended the findings from previous (e.g., Cumming et al., 2017; Turner et al., 2013; 2021) through the study of a larger, youth sample, competing in an open-skilled sport, over a prolonged period of time.

Chapter four extended the findings from chapter three by exploring whether similarities in how variables changed over time implicated a close association between the variables. In line with the TCTSA, the hypothesis that challenge (not threat) states, greater BPN satisfaction, and approach goal orientations, together with lesser avoidance goal orientations would relate to better mental health (less anxiety and depression symptom frequency), was largely supported. The percentage of variance in changes in mental health explained by the TCTSA model ranged from 8.1% and 54.3%, varying depending upon the measure of mental health used and the change period being examined. In addition, perceived autonomy, perceived competence, avoidance goal orientations and the challenge and threat ratio emerged as significant contributors to the models. Those variables which emerged as significant contributors at the final level varied by mental health marker and the analysed change period.

Both the anxiety (GAD-10) and depression (PHQ-8) regression models were consistently significant, with the challenge and threat ratio and BPNs (i.e., measures of individual resource appraisals) emerging as significant contributors to the models. Thus, it can be concluded that challenge and threat states are related to mental health; threat states are associated with worse mental health; more anxiety and depression symptoms. Conversely, challenge states and the satisfaction of BPNs are associated with better mental health; fewer anxiety and depression symptoms. This resonates with findings from previous research where threat states were associated with worse mental health outcomes relative to challenge states (Bakker & Demerouti, 2007; Behnke & Kaczmarek, 2018; Epel et al., 2018; Hase et al., 2020; Mayer et al., 2017; Raedeke & Smith, 2004; Salmelo-Aro & Turner et al., 2020; Upadyaya, 2014; Smith, 1986; Williams et al., 1991). Indeed, threat appraisals relate to more anxiety (Britton et al., 2011) and depression (Mak et al., 2004). Furthermore, previous research has shown that the satisfaction of BPNs was associated with better mental health and well-being outcomes (Gunnell et al., 2014; Ng et al., 2012; Stenling et al., 2015). That perceived competence in particular emerged as a common significant contributor to the models, resonates with previous research where high levels of self-efficacy were associated with more positive mental health outcomes (Agans et al., 2017; Chan, 2002; Chen et al., 2020; Endler et al., 2001; Grøtan et al., 2019; Gull, 2016; Takaki et al., 2003; Watson & Watson, 2016) and buffer against the negative effects of stress (Baumeister & Showers, 1986; Schönfeld et al., 2016; 2019; Thomas et al., 2011). Furthermore, lower perceived competence was associated with more depression (Uhrlass et al., 2007) and anxiety (Putwain & Symes, 2012; Smári et al., 2001), whilst greater perceived autonomy was associated with more positive affect (Nieboer et al., 2010; Van den Broeck et al., 2016), improved well-being (Ryan & Deci, 2017; Vansteenkiste et al., 2020) and mental health (Deci et al., 1989; Doré et al., 2020; Park & Searcy, 2012; Ryan & Deci, 2000; Schreurs et al., 2015; Schutte & Malouff, 2021; Vigoda-Gadot, 2007). Thus, chapter four and this thesis supports the applicability of the TCTSA to explain mental health outcomes in sport.

5.3 Limitations

In the previous two chapters, limitations were presented relating specifically to the analyses conducted. Here, limitations are discussed more broadly and in relation to the completion of the research project as a whole. Specifically, limitations relating to the scales, nature of the data, academy football context, nature of longitudinal research, and impact of COVID-19 on the research are discussed.

5.3.1 Scales

Challenge and Threat. Cronbach's alpha analyses for the adapted challenge and threat measure (see Appendix G, Appendix H) indicated less than acceptable levels for the demand subscale at every timepoint, and for the resource subscale at T2, T3 and T5 (Taber, 2018). This contrasts with acceptable and robust scores reported for the scale previously (e.g., Mendes et al., 2007; Turner et al., 2021). It is possible the adaptation of the questionnaire was inadequate, meaning the items were less internally consistent or related to each other than in the original scale (see Appendix F). However, the cognitive pre-testing procedures followed during preparation of the scale suggests this was likely not the case. Otherwise, since the original scale was focused on performance on an imminent acute task (i.e., a state measure of stress appraisals), it is possible that broadening the conditional statement to a longer-term performance endeavour (i.e., a general measure of stress appraisals relating to academy football) altered some of the relations between and interpretations of the items.

Alternatively, given the original challenge and threat questionnaire was used in the context of laboratory research or novel tasks, it is possible that when used within a real-world setting, the associations between the subscale items differ. In the present research, stress appraisals related to performance on an authentically important task for the participants, where important longer-term consequences depended on the quality of this performance (i.e., to earn a desirable contract renewal, players needed to perform well or show improving performance). In contrast, such appraisals are likely to be different when shared by a participant completing a novel task for which there are not such long-term, important consequences hanging in the balance. Thus, the items used in the present research may tap into different perceptions relative to when used in laboratory research, meaning they may relate differently to each other. Put another way, as mentioned in chapter two, the "performing well is important to me" resource item was likely high for every player in this performance environment, with the other resource items showing more variance between players. This could explain the lower internal consistency. In contrast, scores on the "performing well" item may vary more between participants completing a novel task for the purpose of research (i.e., for some it may be less important to perform well than for others), falling more into line with judgements on the other resource items, resulting in higher internal consistency in the scale (Mendes et al., 2007).

The decision was taken not to remove any items from the demand and resource subscales because each of the items tap into important dimensions of demand and resource appraisals respectively, as outlined within the TCTSA and BPSM (Blascovich & Tomaka, 1996; Jones et al., 2009; Meijen et al., 2020). Removing any of the items would have removed important judgements comprising overall appraisals of task demands and personal resources. Differences between item scores may reflect very valid and important differences in aspects of demand appraisals. For instance, a player may have rated academy football as highly demanding (one of the demand items), because it is physically challenging and achieving success is notoriously not an easy feat (i.e., Calvin, 2018). Still, that same player may have rated the uncertainty of his own performance low (another demand item), because he may be familiar with the context and have a good understanding of what to expect and how he will respond. Thus, these different scores on items within the same subscale may reflect very valid differences in appraisal, but which lower the Cronbach's alpha when assessed at a statistical level. This, taken together with the criticisms of the Cronbach's alpha statistic itself, such as that the alpha score is not related to the internal structure of a questionnaire (see Sijtsma, 2009) drove the decision to retain each of the items within the demand and resource subscales.

Basic Psychological Needs. Cronbach's alphas for the perceived competence scale indicated unacceptable levels at every timepoint (Taber, 2018). Whilst removing any competence item from the T1 and T2 data would have lowered the Cronbach's alpha score, from T4 to T6, removal of the negatively phrased item "I do not feel very capable at football sometimes" would have improved the score, resonating with the previous point about the negatively phrased demand item. Similarly, whilst the perceived relatedness scale was acceptable at every timepoint, removing the negatively phrased item "At football at [club name] I do not have many close friends" would have increased the internal consistency of the scale at each timepoint. In future, all questionnaire items completed by young people should be positively phrased to improve data reliability.

Of course, whilst there is conceptual overlap (Biddle, 1999; Hughes et al., 2011; Kremer et al., 2011), using BPNs as proxy measures of individual TCTSA resources is problematic due to the conceptual distinctions between perceived control and perceived autonomy (e.g., D'Ailly, 2003), self-efficacy and perceived competence (Rodgers et al., 2014), and perceived social support and perceived relatedness (Deci & Ryan, 2008; Shumaker & Brownell, 1984). As such, this weakens the support implied for the TCTSA within this body of research, because measures of self-efficacy, perceived control and perceived social support were not included in the questionnaire battery. Nevertheless, at the research outset, no such questionnaire measuring each TCTSA resource appraisal in children and young people was available (and this remains to be true). This, together with the conceptual overlap, meant a measure of BPNs satisfaction validated with children and young people was selected instead.

Achievement Goals. Cronbach's alphas were extremely low for the approach, avoidance, mastery and performance goal scales at every timepoint, as indicated in chapter two, potentially because only two items were used for each scale rather than six, as in the original AGQ (Conroy et al., 2003). Alternatively, the scores may be low due to how the scales were computed. For instance, the avoidance scale comprised measures of mastery avoidance and performance avoidance goal orientations (as per the approach taken in previous research, see Turner et al., 2020b). Mastery avoidance is a contentious measure within the extant literature, a goal orientation primarily held by individuals approaching retirement (see Senko & Freund, 2015). Indeed, mastery avoidance is often excluded from achievement goal measurement altogether (see Daniels et al., 2008). In contrast, the performance avoidance goal orientation is a more commonly researched construct with evidenced implications for mental health (e.g., Chen & Luo, 2015; Sideridis, 2005). Thus, combining performance avoidance goal orientations with mastery avoidance goal orientations may be problematic; they may not strongly relate to one another, particularly within youth samples. Consequently, the avoidance goal score used within the present research may "under report" the avoidance orientations of the sample; lower mastery avoidance goal orientation scores could lower the scale average relative to the performance avoidance goal orientation scores. Furthermore, mastery approach and performance approach goal orientations hold distinct implications for performance and well-being outcomes (see Daumiller et al., 2021), meaning they ought not be conflated into one approach goal measure. This problem with scale computation is especially true for the mastery and performance subscales used within chapter three; mastery approach goal orientations are distinct from mastery avoidance goal orientations. Performance approach goal orientations are distinct from performance avoidance goal orientations. Thus, to combine the data in this way to create a subscale score is limited.

The Cronbach's alpha low scores and thus limited reliability are problematic and may reflect why some of the anticipated hypotheses regarding achievement goals were either not supported or received little support within the present research. This might particularly be true for the influence of avoidance goals on mental health outcomes for example (see Chen & Luo, 2015; Daumiller et al., 2021; Elliot et al., 1977; Senko & Freund, 2015). Related to this, the avoidance goal items were negatively worded, meaning the youngest participants may have struggled to understand and interpret what was being asked, and thus struggled to communicate a valid response. Four items were selected to measure achievement goals because this approach has been taken previously (see Turner et al., 2013; 2021) and recommendations for conducting questionnaire research with children and young people advise keeping the total number of items to a minimum (Borgers et al., 2000; Holaday & Turner-Henson, 1989). In addition, since a greater number of items would have increased the time taken to complete the questionnaire, this would have been detrimental to the overall project since the research environment would not have allowed for a lengthier data collection procedure.

Mental Health. Some problems also arose regarding the measurement of mental health across the age ranges within the sample. It is a limitation that the older players did not complete the MHI-5 at the first two timepoints, as this meant less data were available for comparison across all three seasons. Older players did not complete the MHI-5 initially because the questionnaire served solely as a measure of mental health for children; the older players completed the more comprehensive GAD-10 and PHQ-8 instead and were saved from completing a further five items which tapped into similar concepts/perceptions. The original intention was to create a "common mental health score" across the entire sample using data from the different scales. When this attempt was made after the first season, such a score could not be reasonably calculated, and, as reported in chapter two, the correlations between the MHI-5 anxiety and depression scores and the GAD-10 and PHQ-8 scores respectively, were only moderate. This could have been because the scales asked responders to reflect over different time periods (i.e., the past month in the MHI-5 versus the past seven days for the GAD-10 and PHQ-8) or simply because the questionnaires measured slightly different phenomena. Indeed, children struggle to respond to questions which involve retrospection (Brainerd & Ornstein, 1991), adding further doubt regarding the reliability of the measure. Either way, the decision was subsequently made for older players to also complete the MHI-5 from T3 onwards, so that at least one shared measure of mental health was collected from the entire sample for the remaining four timepoints, allowing for a larger sample size in analyses of mental health data in S2 and S3.

A further limitation are the common anxiety and common depression scores, which were created to allow analysis of mental health data with a maximised sample size across every timepoint and using the most robust data available (i.e., the GAD-10 and PHQ-8 data). But the scores are flawed because the data from the younger players (borne from the MHI-5) do not necessarily corroborate with the data from older players (borne from the GAD-10 and PHQ-8). Because of the moderate correlations between the different mental health scales, the analyses using ‘common anxiety’ and ‘common depression’ data should be interpreted with caution. Still, this was the only way of maximising the sample size for analyses of mental health data, including every participant across all timepoints.

Finally, a more general limitation of the mental health data collected within this particular research environment (i.e., a male football academy) is the likely impact of stigma on players’ responses. For men and boys in particular, there is stigma surrounding openly discussing and seeking support for mental health problems (Pederson & Vogel, 2007; Storch et al., 2005), although this appears to be reducing within the UK more generally (TNS BMRB, 2015), in some regions more than others (Bhavsar et al., 2019). However, it is highly likely such stigma remains strong and prevalent within male football environments; based not only on the researcher's own observations, but also on the accounts of players who have experienced such environments (Bauman, 2016; Gulliver et al., 2012; Sothern & O'Gorman, 2021). Therefore, the true prevalence of anxiety and depression symptoms in the sample may be underrepresented due to players potentially fearing judgement for reporting higher scores, or subsequent implications for their academy status. Attempting to counteract this, completion of the questionnaire was discussed sensitively with the players, confidentiality was assured, and privacy (space away from coaches/academy staff) was sought during completion. Furthermore, that completing the questionnaire honestly was in the players' best interests was emphasised; should responses indicate a player would benefit from additional support, this could subsequently be provided.

Confounding Variables. The present research is limited by the failure to measure (and therefore control for in the analyses) certain variables which are known to influence challenge and threat appraisals, mental health, and performance outcomes, such as personality (Allen et al., 2012; Mak et al., 2004; Tomaka & Magoc, 2021; Kotov et al., 2010), irrational beliefs (Bridges & Harness, 2010; Chadha et al., 2019; Mansell & Turner, 2022; Turner & Barker, 2015; Turner et al., 2014) and cardiovascular challenge and threat states (Behnke & Kaczmarek, 2018; Dixon et al., 2019; Hase et al., 2019b; Turner et al., 2012; 2013; 2020). The reasons for not measuring these variables have been provided previously as rationale for other research decisions; the final questionnaire needed to be short, quick to complete, and use scales validated with children and adolescents. Children would likely have become bored before finishing the questions and provided poor data if all of these variables were measured. Data collection would have taken too long and there would have been negative implications for the research due to expectations of the applied environment; data collection should cause minimal disruption to normal proceedings. Indeed, had younger players been rushed to complete more questions in the same time frame, this would likely have produced poor, less reliable data (Kail, 1993). Furthermore, logistically it was not possible to collect players' CVR during this period of research meaning psychometric measures were the only viable option.

5.3.2 Academy Football Context

Children and adolescents are highly influenced by their peers (e.g., Berndt, 1979; Bishop & Beckman, 1971; Costanzo & Shaw, 1966) and thus, are renowned for responding to questionnaires in a socially desirable way (Borgers & Hox, 2001). Moreover, children are prone to susceptibility (Ceci & Bruck, 1993) which is a particularly relevant concern in the present PhD given the context where the research was conducted (i.e., a football academy). Furthermore, that the research protocol might have resemble a school setting given the requirement for reading and use of pens, this could have further increased the likelihood of the participants answering questions in a socially desirable way (La Greca, 1990) or generally opting to show agreement with the questionnaire items (Maccoby & Maccoby, 1954). All these factors mean the data collected may be unreliable. To counteract this, privacy was sought when arranging data collection procedures (e.g., van Hattum & De Leuuw, 1999); rooms were sourced where coaches were not in attendance and players were sat physically apart from each other. In addition, the questionnaire instructions stipulated there were no right or wrong answers, for players to not copy off each another, and reminded participants that no one other than the researcher/academy sport psychologist would view their responses. This was also conveyed verbally by the researcher to every player at every timepoint. Finally, it is of the researcher's personal opinion that, because a supportive and positive relationship was developed with the vast majority of the players in the research, thanks to their dual role and support provided to players (certainly those in the under-12 to under-16 age groups initially), this trust and respect would have also helped reduce the potential for these biases to impact player responses.

5.3.3 Longitudinal Research

Common within longitudinal research (Menard, 2002), the present research was limited by attrition, wave nonresponse, missing data, a small sample size (at times leading to issues of statistical power, Cohen, 1988), and the potential presence of cohort and period effects. Moreover, repeated completion of the questionnaire may have led to panel conditioning (e.g., Kalton et al., 1989) or change due to participation in the research, such as being more self-aware and introspective (e.g., Rubin & Mitchell, 1978), which could have influenced later responses. Finally, due to issues beyond the researcher's control, at times it was not possible to be identically replicate data collection procedures for each player at each timepoint.

Attrition. With 153 participants present at the first timepoint, 92 remained within the research by the time of the sixth timepoint. This equates to a loss of 61 players (39.9% of the original sample) over the 32-month study period and subsequent loss of statistical power in the analyses. Within the context of this research environment, attrition was both an entirely uncontrollable and inevitable factor given that at the end of every season, players were released from the academy. Consequently, the measurement of change within this research is confounded because, those who were lost largely represent players who were deemed unsuitable for further investment by the academy (Menard, 2002). In other words, they were mostly players who did not perform well and were deemed to have low potential (NB some players left the academy due to relocation, injury, or other reasons unrelated to performance/potential). It could be that those who were released had different average values on certain variables when they first provided a measurement, such as lower BPNs or perceived resources, which could have confounded the data and the nature of change observed. One solution to this could have been to continue collecting data from players once released from the academy. However, neither the University's ethical committee nor the academy were happy for this to occur. Indeed, it is doubtful that parents would have been willing for their released child to continue participating in research at a club that had released the. Furthermore, many of the questionnaire items would have lost relevance because they related specifically to appraisals towards football at the particular football academy. Thus, this limitation was unavoidable and reflects one of the challenges when conducting longitudinal research (Menard, 2002).

Wave Nonresponse. Wave non-response refers to occasions within longitudinal research where no data is collected from a participant within a particular wave (or waves). Despite the fact that 92 participants were present at the first and final timepoints, only 78/79 participants provided data at all six timepoints. Wave nonresponse at timepoint four significantly impacted the research sample size; the COVID-19 lockdown was enforced within the UK in March/April 2020, and academy football shutdown entirely; thus essentially removing access to all players. To illustrate, of the initial 153 participants at T1, 119 of them provided data at T3. This reduced to 90 at T4, rising to 98 at T5.

On the 11th March 2020, five days before the start of T4 data collection for young players (see Table 3), the researcher anticipated the academy would imminently shut down and the country would enter a full lockdown, as was occurring elsewhere in Europe (British Broadcasting Company News, 2020a; 2020b; 2020c). This would have meant a potential complete loss of a data collection timepoint for these players. Wishing to maintain the sample size and consistency of data collection methodology as much as possible (i.e., pen and paper), an envelope was immediately prepared and subsequently sent to the house of every player. The envelope contained an age-appropriate questionnaire, a demographic questionnaire to be completed by a parent/guardian, an explanatory letter to a parent/guardian (see Appendix E), and a stamped envelope addressed to the researcher's home address. Returning the questionnaire to the researcher's home address allowed for the subsequent monitoring of questionnaire completions, and the chasing of nonresponses. On the 12th March 2020, the academy was shutdown to all staff and players working across the under-9 to under-16 age groups. As time passed and the two-week window for the timepoint was nearing its end, parents of players for whom a questionnaire had not been received were emailed and, where necessary, sent a link for their son to complete the questionnaire online. So, whilst wave nonresponse was an issue at T4, significant effort was made on behalf of the researcher to limit this effect.

Aside from the nonresponses at T4, to the best of the researcher's knowledge, only two nonresponses occurred at other points within the research; one player failed to attend the academy for a prolonged period, and it was not possible to collect their data within a reasonable time following the T2 data collection period. The second player's data was not collected due to the researcher's oversight; absent from the initial T5 data collection protocol, the player was erroneously coded on a checklist as having provided data. Only at the data analysis stage was the error spotted. Once again, wave nonresponse is a common limitation in longitudinal research (Menard, 2002), but thanks to the researcher's dual role within the research environment and efforts made to overcome unpredictable challenges, this problem was largely curtailed.

Missing Data. A common issue within survey research, and in particular survey research with children, is that of missing data (Borgers & Hox, 2001; Menard, 2002; Powney et al., 2014). This is different from wave nonresponse; missing data refers to instances where responses to an item within a questionnaire are missing. This issue was proactively minimised by the researcher firstly by limiting the total number of questionnaire items, and by developing age-appropriate questionnaires (Borgers & Hox, 2001). Furthermore, as players returned their completed questionnaire at each timepoint, they were quickly scanned by the researcher to check for missing responses. When a question had been missed, the questionnaire was returned to the player, who was directed to respond to the overlooked item. Missing data was particularly problematic at timepoint four because such monitoring was not feasible when many young participants completed their questionnaires at home. Still, only 0.21% of the data were missing across all six timepoints, which is deemed negligible and unproblematic (Schafer, 1999). Appropriate procedures were followed to impute missing data, where the missingness was deemed to be completely at random. Where data were not missing completely at random, alternative methods of computing scale scores were followed, as explained in chapter two. Thus, the problem of missing data was present within the research, but suitable action was taken to minimise this problem.

Sample Size. For some analyses, sample sizes for adequate statistical power were not reached. To some extent, this was unavoidable within the context of the present research, not just because of the issues of attrition and wave nonresponse inherent within longitudinal research (Menard, 2002), but also because of rules regarding the maximum number of players that could be registered within each age group at the academy. So, whilst the sample size is a limitation, in this particular applied environment, the sample could not have been much larger. Indeed, the parents of only two players throughout the entire 32-month study period denied consent for their child to participate in the research. Considerable effort was made to ensure every new player who signed at the academy following the first timepoint was enrolled into the research.

As a means of maximising the dataset, analyses were conducted over a range of change periods. For example, change over each separate season was analysed separately, and season data were combined to enable analysis of change over a composite season. Whilst, partitioning multi-wave data into two-wave analyses is problematic because it can introduce bias (Zumbo, 1994), doing so provided a larger sample size compared to the longitudinal analyses over all six timepoints. By providing this collection of analyses, greater insight into the data is provided, supporting the achievement of the PhD aims.

Cohort and Period Effects. It is plausible that, instead of reflecting true change over time, the change reported within chapter three reflects differences between points in time. Even though between group differences were explored, and age was controlled for in the analyses, cohort or period effects may have impacted the results. In each season players experienced a new coach, may have gained new and lost old teammates, experienced significant individual life events such as moving house or starting at a new school; each of these factors could have impacted data scores (Luhmann et al., 2012) and thus call into question whether the change is developmental or circumstantial. Indeed, the change occurring during seasons two and three appeared to be impacted by the events surrounding the COVID-19 lockdown, occurring between timepoints four and five.

Not only this, but the change reported here may merely reflect change occurring for players signed at this particular football academy only. Monitoring psychological demands and resources and mental health symptoms longitudinally and on a larger scale (i.e., across multiple football academies) may help to clarify whether the changes reported in chapter three reflect developmental change, period, or cohort effects.

Panel Conditioning. Panel conditioning is another limitation which impacts longitudinal research. This is where internal validity is reduced owed to participants repeatedly completing the questionnaire (Menard, 2002). To counteract this, players only completed the questionnaire on two occasions each season, with six-month gaps between completions. Consequently, whilst panel conditioning is a possibility, it is unlikely to have had a major impact on the data.

Replication. Finally, owed to the fact that this research was conducted in a real performance environment (i.e., ecologically valid setting) and during the time of COVID-19, there were some unavoidable issues relating to replication in the study methodology. As already mentioned, at timepoint four, some questionnaires were completed by players at home, without the supervision of the researcher, and some were completed online instead of via pen and paper method. Even though parents/guardians were advised not to influence their child's scores or monitor them as they answered the questions (see Appendix E) it is possible that this occurred. Furthermore, because different age groups trained at different times and locations during a week, there were inconsistencies in terms of the physical environment when data were provided (e.g., classrooms, training venues, dining areas) and proximity to games when data were provided (e.g., one, two or three days before a game). Still, matchdays were avoided entirely when seeking data collection to keep this consistent.

The vast amount of data collected for this PhD was logistically very challenging. As such, to allow some flexibility within a replicable protocol, two-week data collection windows were stuck to, to maximise the researcher's chances of collecting data from every participant available at each timepoint. Given the scale of the data collection task and to aid with the efficiency of data collection, age group teams generally completed their questionnaires on the same occasion. Where players were absent from this occasion (e.g., due to injury), they subsequently completed their questionnaire at a different point in time, and in a different contextual environment (e.g., the physiotherapy treatment room) but on most occasions, within the two-week window. The issues with replication alluded to here could not have been avoided, given the context where this research was conducted, and the challenges faced by the researcher in balancing this commitment with a full-time applied role at the academy. Nevertheless, questionnaires were presented to players in the same way on each occasion (unless they moved into an older age group and the age-appropriate questionnaire changed) and the same instructions were given each time by the researcher.

5.3.4 COVID-19 Confound

As already alluded to, the impact of COVID-19, occurring in the middle of the data 32-month study period, made for a number of logistical and methodological challenges. In addition to these, such unpredictable and potentially traumatic life event occurring in the middle of a research study tracking stress appraisals, BPNs and mental health data surely impacted the data, representing a major confound (e.g., Šakan et al., 2020). This is probably more problematic for the analyses in chapter three rather than chapter four (since chapter four examines relationships between changes rather than change itself). It was completely unforeseen, unpredictable, and responded to in as proactive and scientific a way as possible.

5.4 Implications

This thesis has many potential implications for both research and applied practice. Psychological demands and resources change over time in youth football academy players (as illustrated in chapter three) and can be used to predict markers of their mental health (as illustrated in chapter four). In this section, implications for both research and applied practice are put forth.

5.4.1 Research

The findings from this PhD bestow a number of implications for future research. The most salient implication is probably the finding that the TCTSA(-R) can be used to explain youth athlete mental health and thus potentially inform interventions. The TCTSA could be revised once more, drawing upon these findings and those from elsewhere (e.g., Aalberg et al., 2019; Agans et al., 2017; Daumiller et al., 2021; Grøtan et al., 2019; Kareshki et al., 2012; Kawachi & Berkman, 2001; Mayer et al., 2017; Raedeke & Smith, 2004; Schönfeld et al., 2016; 2019; Senko & Freund, 2015; Wang et al., 2009), considering that demand appraisals, resource appraisals, achievement goals, self-efficacy, perceived control, and social support implicate not just acute sporting performance but also, current and future mental health. To strengthen these claims, intervention studies and RCTs could explore whether increasing resource appraisals (i.e., increasing challenge states) leads to improvements in mental health.

Since the present research was conducted within a male, youth sample, the claims made within this PhD could also be strengthened by replication using samples of youth female athletes, adult athletes, and athletes across a range of sports. Indeed, conducting future research in sports where performance is easier to measure objectively in individuals (such as cricket, darts, or archery) could further the literature base and test the relationships between psychological demands and resources and performance with greater validity. However, this might restrict the theory in some ways because such sports are more closed-skilled in nature and thus, the capacity of the theory to explain open-skilled sport performance, or individuals' performance within teams could be questioned. It may, therefore, be a useful research endeavour to consider ways in which performance can be better measured in dynamic, open-skilled, team sports (such as rugby, football, hockey, and lacrosse). Nevertheless, there are likely a greater number of factors influencing performance in team/open-skilled rather than individual/closed-skilled sports. For instance, open-skilled sports performance might be influenced by the performance of teammates, the nature of the opposition, the weather and team dynamics, whilst closed-skilled sports may, in comparison, be less effected by such factors (Taylor, 1995). Thus, TCTSA research in team sports may benefit from the adoption of more robust measures of sport performance, and from measuring as many of the factors deemed to influence performance as possible, so that they can be controlled for, and the overall effect of psychological demands and resources can be seen.

Given some of the challenges associated with measurement within the present research, the extant sport and exercise psychology literature as a whole would benefit from more questionnaire measures being created specifically for youth athletes. Few questionnaires are formulated with children and young people in mind; most "validated" youth questionnaires are adapted from adult versions (e.g., De Leeuw & Hox, 2004). Existing questionnaire measures wishing to be adapted for youth audiences should be thoroughly cognitively pre-tested with children and young people or, preferably, questionnaire measures should be formulated "from scratch", with children and young people in mind, so that concepts can be researched within these samples with validity and reliability (De Leeuw, 2011). Based on the findings from this PhD, such questionnaires should utilise positively framed items only. Furthermore, the measurement of challenge and threat states in athletes could be improved through creation of a measure which taps into each of the demand and resource appraisals as identified within the TCTSA-R (Meijen et al., 2020). Thus, there is scope for considerable further research relating to stress appraisal measurement within youth sport psychology research.

Relatedly, the measurement of achievement goals, and the role of achievement goals more broadly within the TCTSA requires consideration and revision. At present, only a dichotomous consideration of approach versus avoidance goals is represented within the TCTSA and the predictions. Whilst focusing on approach versus avoidance goal orientations aligns with extant challenge and threat writing (see Folkman & Lazarus, 1985), this is outdated, and important nuance is missed regarding the differential impacts of the four achievement goals on performance and mental health outcomes (see Daumiller et al., 2021; Luo et al., 2011; Zhou et al., 2019). The conceptual distinctions between the four achievement goals ought to be more robustly represented within the TCTSA, with more specific predictions articulated in respect of this. Such revisions would lead to improved measurement of achievement goals in future research, helping to further not just the challenge and threat literature, but the robust achievement goal literature base too.

3Not only this, but it is also the researcher's opinion that the development of an instrument for measuring behaviours indicative of challenge and threat states in sports would help to further the extant literature whilst narrowing the research-practice gap (Keegan et al., 2017). Such an instrument would benefit research where an understanding of the impact of challenge and threat states on sporting performance (i.e., behaviour) is sought. This is because behavioural indicators of challenge and threat can be measured and monitored observationally, and the impact of stress appraisals on decision making, performance behaviours and performance outcomes could be identified (cf. McKay et al., 2023). Arguably, behaviour under pressure is a better measure of challenge and threat states than psychometrics since behaviour is real and objective; answers on a questionnaire are subjective and may not reflect athletes' true appraisals. Not only this but the tangible outcomes of appraisals (i.e., behaviour and decision making) are what practitioners, and sports people alike are interested in; behaviour is performance. Moreover, appraisals could fluctuate during performance as the context and task demands change, meaning any measure prior to performance could become obsolete once the game has started. Observations of behaviour provide live, real-time data which could provide both researchers and practitioners with the opportunity to monitor fluctuations in challenge and threat states. Of course, CVR measures provide objective insight into challenge and threat states, but these procedures are costly, time-consuming, and inconvenient, making them less feasible to administer in applied practice. Hence, a behavioural measure would encourage evidence-based practice and benefit applied practice through being easy and quick to administer.

Given the size and richness of the data set, there are many more ways the data could be analysed to further the extant literature. For example, confirmatory factor analysis could be run on the challenge and threat questionnaire items to establish whether the questionnaire is viable for use in further research or should be refined or adapted further (i.e., remove or reword items). Whether participants are in a challenge or threat state at each timepoint could be coded to highlight where players changed from one to the other, and to explore the role and contribution of each individual resource during such change. The data could also be amalgamated with acute data sets collected prior to significant motivated performance situations which occurred naturally during the 32-month study period, to explore whether general appraisals towards academy football were associated with state appraisals towards specific football matches within this sample (e.g., Cumming et al., 2017). Relatedly, whether the TCTSA explains acute sport performance in youths could be examined in this additional dataset.

5.4.2 Applied Practice

Based on the findings from this thesis, sport and exercise psychologists seeking to support (not treat) the mental health of those they work with could deliver tailored interventions targeted at increasing perceived resources to develop challenge states rather than threat states (e.g., Turner & Jones, 2018). These interventions would likely also benefit acute sporting performance and could involve goal setting (Schwerdtfeger et al., 2020), imagery (see Williams & Cumming, 2012a; 2012b; Williams et al., 2010; 2017; 2021), self-talk (see Hase et al., 2019a), reappraisal (see Beltzer et al., 2014; Jamieson et al., 2011; 2018; Slater et al., 2016), reframing (see Alter et al., 2010), or the use of think aloud strategies (see McGreary et al., 2020; Whitehead et al., 2015). Of course, in cases where more severe mental health issues are present, referrals should take place with support provided by a specialist mental health practitioner instead (Roberts et al., 2016; Van Raalte & Andersen, 2014).

Considering sport psychologists might also work at an environmental or organisational level (e.g., Dixon & Jones, 2020; Wagstaff & Quartiroli, 2023), the findings from this thesis indicate that athletes' perceived resources may increase through and alongside exposure to increasing demands. As such, strategies to increase athletes' demand appraisals should be employed. This could be achieved through the wording of task instructions (e.g., Turner et al., 2014), imagery interventions (e.g., Williams et al., 2010), the visual presence of important stakeholders at training and competition (e.g., Feinberg & Aiello, 2010), the nature of feedback (e.g., Shin et al., 2021) and other performance messages delivered by key stakeholders within the environment (e.g., Dixon et al., 2017). Specifically, the perceived importance of performance, the high level of difficulty and effort required could all be emphasised to increase demand appraisals. Of course, many of these methods for increasing demand appraisals may already be occurring in sport environments, without full awareness of their implications for athletes. Thus, the TCTSA could be used as a framework for educating and improving the awareness of how athletes' psychological demands and resources can be influenced by key stakeholders so that messages can be delivered more deliberately, with specific intentions in mind.

Not only this, but sport psychologists could work with coaches to influence training session designs to increase athletes' demand appraisals, with performance consequences applied to induce pressure (Bell et al., 2013; Low et al., 2021; 2023; Stoker et al., 2016; 2017; 2019). Moreover, restrictions (such as time) may be placed on athletes, and scoring conditions could be introduced to sessions (e.g., Croad &Vinson, 2018; Davids et al., 2008; Price et al., 2019; Robertson & Woods, 2021) to increase perceptions of difficulty and required effort. Observation of the psychological, behavioural and performance ramifications of these session design principles could prompt valuable psychologically informed conversations within multi-disciplinary teams, highlight athlete needs and feed into the delivery of interdisciplinary interventions (see also Wixey et al., 2023). Important to note is that athletes should also be educated and supported to develop advantageous approaches to such demands, so that personal resources or resource appraisals are likely to develop and strengthen alongside the exposure to increasing demands. The adoption of mastery and approach rather than avoidance goal pursuits (Lochbaum & Gottardy, 2015) and a rational approach to performance (e.g., Chadha et al., 2019) are just two ways athletes could be supported to successfully manage demands.

Furthermore, athletes' development plans ought to include exposure to ecologically valid (i.e., naturally occurring) pressure experiences as much as possible, such as competitive fixtures, tournaments with knockout stages, and performances in front of large crowds (e.g., Turner et al., 2021). This is because experiencing increased demands can support the development of perceived resources and adoption of mastery goal orientations. Practitioners operating within talent development environments and/or performance pathways might seek to ensure that the level of demand, difficulty, and uncertainty experienced by athletes is both monitored and increased over the course of a competitive season and throughout a developmental pathway. By doing so, the development of athletes' challenge states (or more broadly, advantageous performance mindsets) might become a more deliberate and interdisciplinary pursuit. Alongside this, a complementary curriculum of educational support targeted at equipping athletes with the self-knowledge and skills to successfully manage demands and develop their personal resources would be beneficial (e.g., Hobson & Dixon, 2023).

Where practitioners wish to measure psychometric variables in their clients, either as a form of needs assessment, intervention monitoring or evaluation, the age of the client and whether sufficient (i.e., age-appropriate) measures of those variables exist should be considered. In cases where such measures do not exist, the recommendations used in this PhD to inform the design of the questionnaires for children should be followed. Specifically, the total number of items should be kept to a minimum, conditional statements should be placed at the start of item wording, the language used should be simple and easy to comprehend (not vague or ambiguous), Likert-scale response options should be kept to a maximum of five, with each option clearly labelled to reduce ambiguity, and the questionnaires themselves should be made engaging through the use of pictures and colour, with a smaller number of questions provided on each page to reduce the likelihood of child clients becoming overwhelmed by the amount of text and number of items to complete (see Borgers et al., 2000; De Leeuw, 2011; Fargas-Malet et al., 2010; Khanum & Trivedi, 2012). Furthermore, based on previous recommendations and patterns emerging from the data in this PhD, negatively worded items should be avoided entirely with children and young people (Benson & Hocevar, 1985; Marsh, 1986; Patten, 1998).

Sport and exercise psychologists could focus their work on assessing and developing clients' perceived resources, BPNs, and the adoption of mastery and approach rather than avoidance goals, particularly when operating within talent development environments (e.g., Hobson & Dixon, 2023). It is likely this would benefit performance (e.g., Jones et al., 2009; Meijen et al., 2020; Turner et al., 2021), as well as mental health and well-being. Arguably, sport psychology support delivered to young people should focus on promoting positive mental health, well-being, and development (e.g., Holt et al., 2020) rather than performance. This is because youth sport performance is inconsistent (Abbott et al., 2005; Lidor et al., 2009), does not predict future success (i.e., whether an individual will reach elite level; Barreiros et al., 2014; Barreiros & Fonseca, 2012; Mann et al., 2017), and since adolescence and the junior-to-senior transition represent periods of increased risk for poor mental health (Bor et al., 2014; Collishaw, 2015; Cronin et al., 2020; Kessler et al., 2003; 2005; 2007; Küettel et al., 2021; Solmi et al., 2022) which will likely have implications for athletes' ongoing development and whether they reach their potential.

5.5 Practitioner-Researcher Reflections

To provide the reader with contextual insight surrounding the completion of this PhD, some of the challenges encountered are provided in this section in the form of reflections. Each reflection is written in the first person and begins with a short description of the challenge faced. A concise yet deep reflection follows (e.g., Anderson et al., 2004), drawing upon sport psychology professional practice literature and illuminating some of the implications of these challenges on the completion of the research.

5.5.1 Dual Role Conflict

At times during the study period, such as during data collection, I experienced a conflict due to holding two roles at the academy whilst completing my professional practice training (see The British Psychological Society, n.d.). During data collection, instead of playing the caring, supportive, educational role towards players, I became a "more serious", more direct researcher, seeking information from players regarding their psychological approach to football in a rather impersonal way (i.e., via questionnaire). Of course, I would not stop being "myself" and being supportive, but there was a change in my motivation, my manner, and what I considered most important, which was to collect accurate and honest data under controlled conditions… or at least, as controlled as the conditions could be within the environment.

This change in my style made me feel like I was being inauthentic, which is a core value of my professional philosophy (e.g., Poczwardowski et al., 2004). By caring so much about players' data responses and emphasising the importance of this data during collection, I felt like this was at odds with the impression I was trying to make through the season; that I cared about them as human beings. I also felt that this flexibility in style was at odds with the professional practice training I was completing, where an emphasis on developing a professional philosophy made me feel I should operate in a consistent manner across contexts. In attempts to resolve this conflict, I tried to convey my care about players' data at a personal level, which was true. But then I faced a secondary conflict; I couldn't keep this promise, so again I was being inauthentic, because I did not always have enough time to review their data in the level of detail I would prefer, and act on it as promised.

These conflicts, coming about due to holding two roles within the academy made me doubt myself and my worth in the academy. I felt like I wasn't doing either role well. That I was failing to meet my own expectations and those of others. I was collecting "imperfect" data, so I was failing as a researcher, and I wasn't acting on every piece of data to support player development, so I was failing as a trainee and a practitioner. I often questioned whether I was adding value to the club and players, which lowered my motivation and confidence both in relation to my PhD and my applied work.

I spoke to my applied practice supervisor and recognised how my high, and pretty unachievable expectations of myself were impacting my motivation and mood. Focusing on noticing small wins and "invisible" signs of success (e.g., coaches coming to find me to speak to me about a player or asking for me to observe them in a training session/game) is a strategy I sought to employ to help me feel more positive about the work I was engaging with. But it felt false and fraudulent to me, a pretty normal way for sport psychologists to feel (e.g., Jarrett, 2019). This internal battle never really left my mind, until I left the academy and began working with another team, without a "data agenda". I finally started to recognise my worth and the value I can bring from an applied sense; balancing the roles and the conflict they brought was a challenge I never truly mastered. Still, I believe this challenge impacted my applied work and practice more so than it did the research and process of data collection. Indeed, I wonder whether my applied and genuinely caring role towards the players may have facilitated more honest (and therefore reliable) responses to the questionnaire questions. By conveying the importance of the research *to me,* and with players having a degree of respect and care towards me too, players may have been more likely to take the questions seriously and complete them honestly and sensibly. Thus, whilst personally taxing to the practitioner side of the practitioner-researcher role, there are potential benefits to the researcher side, when conducting applied research in this way.

*5.5.2 Fit in or F**k Off*

When I started working at the academy, I became the sole female member of player facing staff. I was the only female person within my office of approximately 14 people. When I walked into offices, I observed a silencing of conversation. Initial multi-disciplinary meetings were uncomfortable, judgemental, confrontational. I received frosty receptions and a lack of willingness from many, to help me and work collaboratively. One senior member of staff was quite aggressive in our first meeting together and it was clear he saw my presence as a threat to his authority and relationships with those he line-managed. After this meeting, which was only two weeks into having started at the academy, I seriously considered quitting and giving up. Obviously, I didn't; I saw this as a challenge not a threat! But I wasn't myself at all; I was quiet and kept myself to myself as I absorbed everything around me. His unwelcome behaviour had the (likely) desired effect of quietening me, making me less of a hassle and "putting me in my place".

Over time, meetings became a little less confrontational, but new members of staff were rarely offered a warm welcome. They were judged, gossiped about after their first "performance" in a multi-disciplinary meeting. Predictions were made regarding how long they would "last" in their role. I wonder what they said about me behind closed doors when I first started, or whether I outlasted anyone's predictions about how long I'd stay. As and when staff (unsurprisingly) left the club, the motto of "fit in or f**k off" was thrown around; "fifo" for short. They didn't fit in, so they f**ked off or were encouraged to f**k off. No one was particularly bothered when a member left.

Eventually, within my office, I slowly opened myself up more to my colleagues; but never fully. I started to show my sense of humour, which appeared to be the social currency of the place. It took people by surprise at first, and I think, earned me some respect. I sat with the discomfort I felt whilst I was in the building and kept trying. Resisting the urge to indeed, f**k off. I hung out and made opportunities to spend time with colleagues on their own (e.g., Andersen, 2000). Eventually, the hushing of conversation as I entered the office decreased, occurring at the same rate as the crude tone of conversation increased. Eventually, I was sat with fully fledged "laddish behaviour"; my presence didn't seem to taper them anymore. This challenge to "fit in" was really hard, and was only made bearable by my persistence, being a patient person with a sense of humour. It hints further at some of the internal "baggage" that I was carrying, on top of the PhD, the applied role, and my status as trainee.

Interestingly, in one particular season, two female members of staff joined the team and therefore, the office. We made three. The behaviour in the office shifted again and maintained longer this time. There were fewer sexist and laddish jokes. There was much less flatulence. The guys in the office actually seemed to act nicely towards each other. There seemed to be less toxicity. I saw a completely different side to some members of staff, who showed they could be pleasant, kind, and supportive, even in front of each other! I sometimes felt frustration about the situation; these new girls were being treated way more pleasantly than I ever was! They didn't have to work hard to earn their way in! But still, I was intrigued to notice the changes.

My overall learning from this reflection relates to an appreciation for human social behaviour, and how the actions of many can be influenced massively, in many and varied ways, by slight changes, such as a shift in the balance of the genders. I strongly believe that the best teamwork and working environment is achieved when there is diversity and when there is a balance of gender and race and all manner of factors. I believe the men's game is limited by its “maleness”, and that toxic cultures are a by-product of all-male or heavily male dominated environments, which have been the norm for decades (see Afzal, 2022; Casey, 2023). I think male football academies would benefit greatly from employing more female, player facing staff members. Not only do I think this could make the environments less toxic and more pleasant places to work, but I think this would also support the development of players within these environments and make the UK academy system more productive thanks to greater cognitive diversity (Mitchell et al., 2017; Mohammed & Ringseis, 2001; Sauer et al, 2006) and a more supportive culture. But any women who start working in these environments need to be welcomed and accepted, not put through their paces and tested.

5.5.3 Looking Beyond the Data

In November 2018, not long after the first data collection timepoint, I received an email from the mother of a player I had supported briefly in the 2017/18 season. She informed me her son was self-harming (which was news to me), and asked if I could help him, because she knew I had spoken to him before, we had a good relationship, and he previously told her that he liked talking to me. Immediately, I panicked. It made me doubt myself and wonder, was this in the data? Have I missed it? Should I have known this was a risk based on his GAD-10 and PHQ-8 scores? Should I have kept the self-harm question in my questionnaire battery? I checked back through the data which showed no particular reason for concern, which was somewhat reassuring. But then I questioned the value in collecting the data, why bother if it wasn’t going to flag up those individuals who I needed to be aware of? I spent some time preparing for how I would respond to the email.

That self-doubt reflects the personal toll completing this PhD had on me. It probably also influenced my professional development. Sure, on this occasion I sought support from supervisors, I read up on self-harm and drew upon my training from the youth mental health first aid course I had completed in the summer of 2018, to help me feel more confident in my response (Bandura, 1997; McCormack et al., 2015). I followed up ethically, and I learnt a great deal from the experience. For instance, gaining valuable first-hand experience ethically contemplating “is this something I can and should support a person with, or is it beyond my boundary of practice?” contributed to my confidence massively and helped to highlight an advanced skillset in myself, which I had probably overlooked or been unaware of previously. But those negative thoughts and emotions I described reappeared regularly for me throughout the PhD, in particular around the times of data collection. I would worry about not having enough time to process players’ data, to code it in excel, calculate their anxiety and depression scores, interpret them, and then follow up accordingly (see Appendix QQ), before too much time had passed, and the data were no longer “up to date”. I would worry about not having the capacity to do this properly (or indeed, *perfectly*), about “missing” players who were at risk. I would worry that players would think I were useless or inauthentic, if they knew their scores indicated something was wrong and I did not follow up as promised. Worst case scenario, what would happen if something bad happened involving a player, and I had missed the signs within the data! I certainly perceived possessing players’ sensitive (i.e., mental health) data as a threat. I knew I did not have the resources needed to adequately monitor every player’s data. It made me feel like a failure, that I was letting players down.

This emotional burden hints at one of the many challenges I faced, and differences between completing this PhD research and “normal” PhD research. By normal I mean, completing a PhD in three years, full-time surrounded by fellow PhD students. To the reader, the data I have analysed and shared in these pages is just data. Numbers. Nameless. Anonymous. But to me, the data has never been that. It has always been “Tommy’s data” or “Charlie’s data”. That personal connection to the numbers made the “research” intriguing but also mentally draining, and probably influenced my practice by always wanting to put “numbers on things”. Whilst such a quantitative approach could be useful, such as to have baseline scores to aid monitoring, it is contentious (Anderson et al., 2002) and can lead to client perceptions of a less personable service (Keegan, 2016), potentially constraining relationships which are the most important thing (Petitpas et al., 1999; Sharp et al., 2015). The worry probably also reflects not just my own perfectionism and conscientiousness, but also the “blame culture” I experienced within the academy and hints at the need for high levels of support for PhD students completing similar applied research.

5.5.4 The Environment

At the academy I met and worked with an astonishing number of truly outstanding coaches, professionals, children, and young people and their parents. It was a joy and a privilege to get to know, earn the trust, and work with them. But, building on the theme of “was this PhD and applied practice endeavour ethical *for me?*”, over the course of my five years at the football academy, I witnessed and/or personally experienced racism, homophobia, transphobia, and sexism. These experiences ignited anger. In some cases, this enhanced my practice, because the anger motivated me to act and challenge others, when in other scenarios I might let things go. In other cases, it demoralised me and restricted my practice. I recognised my lack of ability to change the problems I was experiencing, since the culture of the environment was such that, to formally report an issue would only bring upon yourself criticism, distrust, and greater maltreatment. So, my anger turned into feeling helpless and demotivated and reduced my potential for positive impact.

Following one particular weekend’s away fixture, I offered to secure coffees for the academy staff who were also in attendance. The member of staff at the away ground who had offered coffees before the match explained the facilities were now closed, but she would endeavour to source the three coffees I was looking for. When she returned, I distributed the coffees (incidentally to two of the most powerful members of staff at the academy) and joked about the “trouble” I had gone to sourcing them. There was no “thank you”, just “you probably fluttered your eyelashes and that's why you got them, if we had gone asking for coffee, we definitely wouldn't have got one". This same individual seemed to have a penchant for blatant sexist remarks; upon having a conversation with a female coach I had been asked to support, this was referred to by this individual (the female coach's line manager at the time) as us "putting the world to rights" – to our faces. Whilst previous research has demonstrated that, relative to female athletes, male athletes are more likely to demonstrate ambivalent sexism (Schrödter et al., 2021), the issues I faced whilst working within the football academy came from members of staff who held positions of power. In my opinion and based on my observations, those individuals could be described as illustrating dark personality traits, resonating with findings in the extant literature (Schrödter et al., 2021). That individuals with dark personality traits reach high levels of leadership within sport is not unknown (e.g., Arnold et al., 2018) and, together with privileging masculinity and gender power differentials in sporting environments, collectively this could explain why female sport and exercise psychologists report experiencing sexism within the workplace (e.g., Curvey et al., 2023; Goldman & Gervis, 2021).

Following training on a typical day at the academy, I was stood outside talking to an injured under-23 player, whilst staff were returning to the building for their lunch. One member of staff, as they walked past the player and I, gesticulated towards the player in such a way which insinuated that he was up to mischief. "What are you up to ey?" he said with a wink, "I'm keeping an eye on you". I felt embarrassed, enraged, sick, anxious. It felt like the individual was insinuating the player and I, were at best, discussing something that was not professional and at worst, flirting. It felt like he was insinuating the latter. It also felt like I wasn't trusted that I wasn't taken seriously, that psychology wasn't taken seriously, and I felt belittled. My perception was probably primed by the fact that this same individual had previously behaved similarly towards an under-16 player who I was speaking to in the canteen. On that occasion, immediately after the staff member's behaviour and comments, the child asked me if I was single.

The Premier League's player monitoring platform, a website used to store all academy player data throughout the UK, received an update one year, whereby players' middle names were now included in the database. That a number of the academy's black players had multiple middle names, unfamiliar to the white British staff force, became quite a topic of discussion. "How many names does he need?" was probably the tamest of comments made, the worst were probably the feeble attempts to (mis)pronounce the names that staff were reading for the first time, and the ensuing laughter. This lack of cultural awareness was often complemented by black children being subject to adultification bias (Cooke & Halberstadt, 2021).

Another staff member loudly retold a story of his recent online dating encounters. He had been chatting to someone for a while and was close to meeting up before the other person clarified that they were a transgender woman. This was something the staff member had been unaware of, and the office was in hysterics, which I considered quite understandable in the context. But, seemingly ignited by the "positive feedback" this laughter provided, the staff member continued; "imagine if I had turned up, god knows what would've happened to me". The insinuation that meeting up with a transgender woman would have somehow represented a threat to his health and safety crossed a line that I quite fiercely pointed out was inappropriate. The laughter certainly stopped. Despite research suggesting transprejudice is on the decline within sports (Cunningham & Pickett, 2018), it is clearly still a severe issue.

These situations I have described here illustrate once again some of the emotional and psychological challenges that I experienced whilst completing this PhD, alongside completing my professional practice training, and whilst completing a full-time applied sport psychologist role at the academy. I felt responsible for the cultural environment of the academy, with that being the “on trend” topic within sport psychology (e.g., Cruikshank & Collins, 2012; Eubank et al., 2014; 2017), and I was ashamed of the behaviour of those I worked with. I read about the issues of being passive bystanders of such behaviour, and not calling things out and doing the right thing (David et al., 2019; Rosenthal, 2016; Yousuf & Adams, 2022). But I felt like such a lone wolf at times, I felt like I didn’t belong, couldn’t be myself. I often felt like I didn’t want to do the job anymore. This certainly did not help my own motivation for either my applied work or my PhD, and probably contributed largely to my need to take time off from work and PhD, for my own mental health and well-being.

5.5.5 Conducting Research in Applied Environments

When planning my PhD studies in early 2018, my supervisor and I agreed to build upon the work of Blascovich and colleagues (2004) and Dixon and colleagues (2019), collecting CVR data from young players (13- to 16-year-old) on two occasions, 12-months apart. One occasion prior to a football match (e.g., Dixon et al., 2019), and the other, prior to a social evaluative task. This task would have followed the Leiden public speaking task procedure (Westenberg et al., 2009), an ecologically valid and reliable protocol for inducing an acute stress response under experimentally controlled conditions. It incorporates social evaluation and unpredictability, by obliging the person to speak in front of an audience or video camera. A similar procedure, the Trier Social Stress Test has previously been adapted for children as young as seven (see Yim et al., 2015), so the speaking task was deemed suitable for the study purpose and sample. Players were asked to deliver a speech to camera, introducing themselves to a hypothetical new team and teammates, thus inducing social evaluative threat.

As the reader of this PhD might realise, the study did not take place. This is because, following introduction of the study to the players and collection of initial appraisals regarding the public speaking task, a large number refused to consent to participate in the research. The study protocol had certainly induced a threat response, but much earlier than anticipated and to the detriment of the research itself! The number of players who denied consent, combined with the likely attrition given the longitudinal study design, meant running the study was no longer viable. This scenario illuminates a significant barrier to studying stress within youth sport samples and speaks to a broader potential problem within stress research. Individuals who are most “threatened” by a potential stressful event may refuse to participate in research. This surely limits the spectrum of stress appraisals being studied since extreme threat appraisals may be unrepresented within datasets. A solution to this challenge is to study individuals in ecologically valid environments prior to facing ecologically valid stressors which the participants want to perform within (e.g., Dixon et al., 2019). But even in these cases, it is possible that the most threatened individuals might wish to mask their appraisals (i.e., they could lie on questionnaires) and avoid having their CVR data collected (which they cannot mask) and observed by others within their performance environment. So, the most threatened individuals could still refuse to consent in such research. This of course has ramifications for the breadth and quality of the stress in sport literature in general and is something that should be considered carefully both by stress researchers and consumers of stress research in future.

A related challenge I faced, associated with conducting research in applied environments, regards maintaining the confidentiality of the data collected and the associated implications for the practitioner “half” of me and my role. When I discussed my research with coaches and shared some insight regarding emerging patterns within different teams/age groups, I was often pressured for more information. I certainly believe some coaches felt I was harbouring their performance data; was the coach making training challenging enough for their players? Did players perceive sufficient support from their coach? Indeed, a senior coach expressed his frustration on one particular occasion because the data I collected could not be shared openly with coaches, thus reducing the potential opportunity for coaches to improve their understanding of individual players. Managing these conflicting expectations and boundaries was frustrating and made me feel once again like I was not really doing either of my two roles well. This challenge was not solely PhD related; one coach in particular would always ask "what did he say? How is he?" after I had a one-to-one conversation with one of his age-group players.

Regarding the PhD data though, I could tell certain individuals in the academy were growing sceptical of my research, wondering, what is the point in collecting this data if it cannot be shared with and used by coaches? The researcher in me understood the greater threat of social desirability bias on the data if players knew coaches would see their responses. Moreover, the ethical researcher and practitioner in me understood and of course adhered to the confidentiality restrictions. But still, the applied part of me agreed and still agrees with the coach, and I feel this negatively impacted my relationship with the PhD and question, what is the point? I did not feel very motivated towards, or inspired by the research I was conducting. I think the longitudinal nature added to this too, because I wasn't "figuring anything out". I didn't have any findings. I didn't experience any sense of accomplishment at any point. I was collecting all this data yet didn't have time to figure out what it was telling me in a "live" fashion, unlike the sport scientists who could share data on a daily basis within hours of collection. So, I couldn't act on all this data I was collecting, or make an impact informed by it. And I couldn't share the data with anyone even if I felt like it would help the player and the staff working with them. This cyclical negative thinking hung over me throughout the 32-months of study and made me feel like (even more of) an imposter. It contributed to making the one day per week I was allowed to work on my PhD very unproductive, because I was uninspired and demotivated. I believe that leaving the academy environment is the only reason why I have been able to make significant progress on my PhD lately and reach the point of submission. I have been able to let go of these unhelpful emotions and engage with a more helpful and productive work pattern. PhD supervisors may benefit from greater awareness of the potential psychological challenges longitudinal PhD researchers may face.

5.5.6 Doing Applied Work Whilst a Researcher

My dual role at the academy kept me very busy to say the least. One of my applied responsibilities was to deliver an age-appropriate educational sport psychology curriculum to the academy's players (aged 9- to 16-years), parents and coaches. I mostly worked with the under-12 to under-16 age groups, delivering interactive classroom sessions on either a weekly or fortnightly basis. Given the extent of my workload, I tried to make each role work for the other. For instance, I based the educational curriculum around the TCTSA. I planned engaging classroom sessions (see Appendix RR) based on a core component of the theory, such as self-efficacy, approach/avoidance thinking, perceived control, interpretation of emotions (for greater insight into how I used the TCTSA to inform the sport psychology curriculum, see Hobson & Dixon, 2023). Furthermore, I designed education programmes for parents and coaches/staff, based on the TCTSA. Collectively, this ensured players, parents, and multi-disciplinary staff received an evidence-based education of sport psychology, with complementary principles and strategies reaching each stakeholder and informing coaching practice. Focusing my reading for my PhD and applied work on the same general areas was efficient and helped to manage my workload whilst also ensuring a common sport psychology language throughout the academy, which I believe promoted buy-in over time.

On some occasions I used data from my PhD to inform areas I would target within the curriculum at certain age groups. For example, where one age group on average scored lower in perceived competence, I focussed more so on the "confidence" theme with them in the classroom sessions. These experiences working across different age groups (predominantly with players aged 12- to 16-years) provided me valuable insight into some of the metacognitive differences between the younger and older players (see Thrower et al., 2024).

Something I found particularly interesting was seeing the data "play out" in players' behaviour. For instance, there was one particular player who scored very highly on anxiety and his stress appraisal data indicated a consistently high threat state. During one classroom session, I had each player stand in front of the group and flip a coin a number of times, as part of a lesson about control and emotions. This player stood out as the only one to refuse to even try to flip a coin, and ultimately did not participate in the activity. He was too fearful of making a fool of himself in front of the group and being unable to flip and catch a coin. Noticing how his behaviour matched up so well with his questionnaire data gave me a boost; perhaps collecting all this data wasn't for nothing, and perhaps it was useful after all!

Of course, I was able to support this player and indeed, it was the ethical thing to do. But colleagues within the environment were seemingly frustrated by my decision to work with him. They believed I was wasting my time. Coaches would criticise the player for not being confident, for "losing his head", for being negative… they didn't want me to waste my time supporting him. "If he can't handle it now, he won't make it as a professional". They were probably right, and I was stretched thinly. But I couldn't *not* support him. So, I still did. Having the baseline data enabled me to monitor the progress of our work together, which was difficult to deliver consistently due to limited access to players. In the end, he chose to leave the academy, which I think was the right decision for him after all, but one that I was happy he made for himself.

5.5.7 Learnings of a Trainee

Within my applied role I predominantly worked with players aged 12+ and I was always sensitive to noticing how younger players reacted differently to components of my sessions and engaged with ideas in different ways compared to older players (Thrower et al., 2024). It helped me develop a deeper appreciation and understanding of how my style and approach should differ, depending on player age, although this is too categorical to judge people by; some players are significantly more socially and psychologically developed than others of the same age.

When I started at the club, I was fuelled with theory and, having done an MSc in sport psychology, self-determination theory predominated my thinking and approach (Ryan & Deci, 2000). So, I went into my sessions happy for players to have ownership and control, because this would motivate them, it would help them enjoy and engage in the sessions more; they would be more likely to learn. This strategy seemed to work well with the older players, who would go from silent, grumpy teenagers to more interactive and enthusiastic participators in group sessions. This strategy did not work very well with younger players.

When I was working with the under-12 group, I found the sessions frustrating and difficult to control. The players wouldn't listen to me and would regularly distract themselves from the planned activity. The timing of the session (straight after lunch) probably didn't help, but how I began my work with them probably didn't either. In our first few sessions, because I was eager for them to like me and to develop a good relationship (Sharp et al., 2015), and because I wanted them to find the sessions fun and engaging, I gave them ownership. I gave them quite a bit of control over what we did and how we did it. This ownership was often given to them ad hoc; I hadn't planned to, and the reason why there was regularly an opportunity to give them ownership, was because I hadn't planned my session with them thoroughly enough. For example, I could have planned my session activity, but I would not have thought through the exact rules and implications for winners and losers, if the activity was competitive. So, when I was asked a million questions by the players as I described the activity, I wouldn't always have an answer (because I hadn't thought about it beforehand). Thinking on my feet, I would ask for their ideas, to solve the problem at that moment. I think this lack of planning, and the amount of ownership I gave the players, meant I set the standards of our working relationship as quite loose (which isn't necessarily a bad thing because it might've meant that players were more likely to be open and honest with me and see me as less threatening). But I believe that from giving them such ownership early on, subsequent sessions with this group became difficult to manage, because they regularly wanted input, they wanted to control the session. They would push me, push the boundaries, and ask to do something different quite often, because I had probably led them to believe that this was something they could do in psychology. And this led to me regularly feeling frustrated which disrupted my delivery of my sessions too.

If I had more thoroughly planned my sessions and given more thought to the value and implications of giving players ownership, my work with the group may have been smoother. However, I wasn't to know the implications of my style beforehand, and I learnt a lot. Of course, not all players were disruptive at all, and my assessment of sessions was probably more heavily influenced by the behaviour of the disruptive players than by the better-behaved players. As a group, this age group was renowned for having a number of bubbly and challenging characters to work with; I benefitted from hearing other members of staff sharing their frustrations and difficulties when working with the same individuals.

I learnt that ownership and control for players is a component of a session that I should plan carefully beforehand, and have a rationale for how much ownership, and over what, that I should give the players. I should give more ownership to older players and retain control when working with younger players, to keep order and structure, and to maintain my authority. More broadly though, I learnt that principles of theory and the outcomes of research cannot always be directly applied in practice. Working in dynamic applied contexts is complex and very different from the world of controlled research. Theories should be used as a guide rather than an explicit map when practitioners seek to work in an "evidence-based" manner. Practitioners should remain open minded to being flexible with how much they "follow a theory" and not feel as if they are absolutely wedded to it.

5.6 Recommendations

Despite the various benefits of conducting applied, longitudinal research, such research is scant within the extant sport and exercise psychology literature. This is likely due to the scarcity of opportunities, and how challenging such research is to conduct. Still, more longitudinal research should be pursued within applied environments narrow the gap between research and practice (Keegan, 2017) and enhance the extant literature by offering an improved understanding of how psychological variables develop or change over time in children (see Harwood & Thrower, 2019) and the underlying mechanisms behind the impact of interventions (such as PST) on performance and well-being (Harwood & Thrower, 2019; Meggs & Chen, 2019; Thrower et al., 2023). Academics and practitioners who embark upon such research would benefit from the learnings of those with experience. Thus, in this final section, recommendations are provided for overcoming some of the practical challenges applied longitudinal researchers are likely to encounter.

5.6.1 Organising Data Storage

On a practical level, entering vast amounts of data into an excel file is challenging and requires clarity and organisation. Inconsistencies in the order of variables presented in an excel file can cause confusion and slow subsequent data analysis procedures. Thus, a data entry template should be created at the outset of research and used to enter data at every timepoint within the study.

A major challenge when conducting longitudinal research is to match up participants' data across timepoints whilst storing the data anonymously; participants' names cannot be provided alongside their data to protect confidentiality. In the present research, a code was created using the participants' date of birth and number of siblings; information collected on the front page of each questionnaire. This proved to be a problematic strategy for four reasons; participants (especially younger participants) regularly incorrectly reported their date of birth; participants were indecisive whether to include half- or stepsiblings in their count and made different decisions at different timepoints; participants gained new siblings within the study period; some participants in the study shared the same date of birth and number of siblings. This meant it became very challenging to keep the data organised and accurately match up the same participants' data at each timepoint. Luckily, in a secure, separate file to the data I had stored players' names and their player code from T1, and this helped to somewhat resolve these issues throughout the research. Still, it is recommended that an alternate method be employed when conducting such research in future. For example, participants could be labelled simply as "001" and "002" etc. so that each new participant added into the dataset would be certain to have a unique identifier. If these codes are stored securely alongside participants' names, data could be matched up across timepoints more parsimoniously.

For normality testing to be accurately computed within statistical software packages such as SPSS, a full dataset is required whereby there are no missing data. So firstly, non-response missing data (i.e., where items within a questionnaire were accidentally overlooked by participants) should be resolved (see Dempster et al., 1977; Graham, 2009; Hox, 1999; Little, 1988). Secondly, data from each timepoint should initially be stored in separate excel files (i.e., files without data from previous timepoints). This is because files with data across multiple timepoints will include wave non-response missing data which cannot be resolved (i.e., missing data from some participants who dropped out from the study). Timepoint data should only be combined into one master dataset once all screening and cleaning procedures have been completed on the timepoint's data. Furthermore, if, like in the present study, groups of participants complete different questions, then separate data files should also be created for these different groups. This is to allow any necessary transformation of the data (such as adapting data onto different Likert-scales), and for the separate storage of the unique questionnaires completed by them. For an illustration of the number of different files created at each timepoint within the present study, see Table 96.

5.6.2 Data Collection Procedures

Missing data is common within survey research, even more so in survey research with young people. Thus, when planning the data collection procedure, researchers should allow a time for checking over the questionnaires completed by their participants before dismissing them from the data collection session. This can be challenging when large numbers of participants provide data at once, when the questionnaire spans multiple pages, and when young participants are eager to leave the data collection area and immediately start a football training session. Thus, clear rules should be communicated to participants at the start of the data collection period to ensure questionnaires can be thoroughly checked and ideally, the researcher would have an assistant to help with these checking procedures.

The change analyses provided within chapter three indicated that participants' data appeared to be subject to reactive effects, most likely because of the novelty of questionnaire completion at the first timepoint (Campbell & Stanley, 1996). Thus, a full-scale pilot of the questionnaire with the entire sample should be planned for and embarked upon prior to the first data collection timepoint within applied longitudinal research, particularly perhaps when such research involves children and young people.

Within the present research and based on the researcher's observations, some of the youngest participants would sometimes seemingly only read part of a question. This was because the question text spanned two lines in the table, and the participants only read the first line. Thus, when creating questionnaire packages for completion by children, researchers should pay close attention to the visual layout of the questionnaire and ensure that items are

Table 96

Representation of the number of separate data files required at each timepoint.

Data File Number	Age Group Data	Questionnaire Data	Comment
1	Under-12 to under-23	GAD-10, PHQ-8	These questionnaires were not completed by under-9 to under-11 players, therefore a separate file was needed at each timepoint. Normality testing and Winsorizing was conducted on this dataset before being added into data file 6.
2	Under-9 to under-11	MHI-5	A separate file was needed for this data for T1 and T2 because this questionnaire was not completed by under-12 to under-23 players at these timepoints. Normality testing and Winsorizing was conducted on this dataset before being added into data file 6.
3	Under-13 to under-23	Stress Appraisals, Basic Psychological Needs, Achievement Goals	Whilst these questions were completed by all participants at every timepoint, the under-9 to under-12 players answered the questions on different Likert-scales compared to the under-13 to under-23 players. So, this common data were stored separately until the under-9 and under-12 data were transformed onto the 7-point Likert scales (see data file 4).
4	Under-9 to under-12	Stress Appraisals, Basic Psychological Needs, Achievement Goals	Data in this file represent participants' responses on a 5-point Likert scale, so here the raw scores were transformed onto a 7-point Likert scale. Once data were transformed, this was combined with data from file 3, creating file 5.
5	Under-9 to under-23	Stress Appraisals, Basic Psychological Needs, Achievement Goals	Data from files 3 and 4 were combined here once the data in file 4 had been transformed. Normality testing and Winsorizing was then conducted on this dataset before being added into data file 6.
6	Under-9 to under-23	All data	Once normality testing and Winsorizing procedures were completed, all data was combined into one master file for that given timepoint.

presented on one line.

A solution to the previous three points would be to utilise an online rather than pen-and-paper questionnaire to collect data. This would not only reduce the incidence of missing data but would also save the researcher from having to manually enter data into an excel sheet, which is a time-consuming process that could be subject to human error. Furthermore, such a questionnaire would be less of a drain on financial and physical resources, and likely be quicker to complete by participants. Research needs to adapt with the times and embrace online and digital methods. Such methods should ensure that the recommendations for questionnaire completion by children can still be delivered by the technology (such as to represent Likert-scale response options with colourful pictures rather than numbers and having only four or five items on the screen at any one time).

5.6.3 Managing Dual-Role Relationships

Longitudinal research conducted by dual-role practitioner-researchers bestows a unique emotional burden. Individuals considering completing such research should be aware of these hidden challenges, and consider their own health and well-being needs when planning the work. In the early stages of research planning, clear boundaries should be agreed upon regarding the time and resource made available to the practitioner-researcher over the course of the study period, to ensure adequate time and support is available to them. Furthermore, supervisors of practitioner-researchers should be made aware of some of the unique challenges and stressors presented by this work, and ensure sufficient support is provided to the practitioner-researcher throughout the study period.

5.7 Conclusion

The present PhD contributes a considerable number of novel theoretical findings from which applied practice recommendations can suitably be made. First, the present research builds on the extant cross-sectional (e.g., Androkikos et al., 2021; Dixon et al., 2019; Gerbert et al., 2021; Jensen et al., 2018; Küettel et al., 2022; Turner et al., 2013; 2021) and qualitative literature (e.g., Blakelock et al., 2019; McDonough et al., 2013; Sothern & O'Gorman, 2021), through illustrating that youth academy football players' psychological demands, resources, and mental health do change over time. Not only this, but as the largest and longest survey of youth athlete stress and mental health, including the youngest to be surveyed (i.e., 8-years-old), novel insights into youth athlete stress and mental health from a long-term/developmental perspective are provided. The findings presented here build on the extant longitudinal investigations into stress (e.g., Chadha et al., 2023; Cumming et al., 2017) and mental health in youth athletes (e.g., Davies et al., 2023; McDonough et al., 2013; Tamminen & Holt, 2010) through highlighting how appraisals and mental health change over longer time frames and during multiple competitive seasons.

Second, that the nature of changes in psychological demands, resources and mental health were shown to depend upon a player's stage of sporting development (i.e., which phase they were in), the present research both builds on the extant literature (e.g., Davies et al., 2023) and responds to recent calls for an improved understanding of the developmental needs of young athletes (Harwood & Thrower, 2019; Henriksen et al., 2014; Holland et al., 2010; Miller et al., 2011; Sothern & O'Gorman, 2021; Thrower et al., 2023).

Third, the present findings illustrate that the TCTSA model could be extended from explaining acute sporting performance to also explaining athlete mental health; the model accounted for significant proportions of the variance in changes in mental health markers. Whilst there are issues of reciprocity regarding the relationships observed in the present research, simply through elucidating the existence of these relationships between changes in psychological variables and changes in mental health, the present findings build on the work of Jensen et al (2018) and respond to the calls for sport psychologists to ethically (i.e., within their boundaries of practice) support the mental health of those they work with (e.g., Ayoagi et al., 2012; Coppel, 2020; Souter et al., 2018).

Finally, since changes in psychological demands, resources and mental health did not explain sporting performance, the present research contends that the TCTSA(-R) as a predictive model for sporting performance may be better suited when incorporating CVR measures of challenge and threat, or when explaining acute performance rather than long-term patterns of performance.

Regarding the contribution of this body of research to applied practice literature, firstly it is important to highlight the changes reported in youth athlete mental health were not massively meaningful; the effect sizes were small, and changes did not take players over meaningful cut offs scores. This is particularly salient considering the research context; academy football is a very demanding and stressful environment (Reeves et al., 2009; Sagar et al., 2010). Thus, in the face of high demands and exposure to psychological stress, academy environments themselves may not be harmful to players' mental health.

A second feature of the data to highlight is the seemingly non-autonomy supportive nature of the academy environment. Whilst this may be deemed an undesirable feature of a talent development environment (e.g., Hauser et al., 2022), there are many pragmatic and logistical benefits to withholding large degrees of autonomy from children/young people in such environments. For instance, should children be provided complete freedom within training sessions, this may lead to misbehaviour, lack of focus, and over the longer-term a lack of development within their sport. Whilst greater perceived autonomy was related to better mental health within this research, it may not always be realistic to provide young people with large degrees of autonomy within these environments.

Third, the fact that psychological demands, resources, and mental health did change over the study period, and malleable psychological demands and resources are related to mental health outcomes, this lends to the importance of monitoring these variables in youth athletes within talent development environments. Relatedly, the present research contributes valuable insights regarding how these variables can be measured in a developmentally and contextually appropriate manner (Harwood, 2002; Visek et al., 2009). Should these variables be suitably monitored in developing youth athletes, this could better inform practitioners' understanding of athlete needs and thus the delivery of suitable support (Harwood & Thrower, 2019; Holland et al., 2010). With appropriate measures in place offering baseline scores, interventions can be better monitored and evaluated against intervention goals.

Building on this, a fourth applied implication of this study relates to the fact that psychological demands, resources, and mental health changed differentially depending on the players' stage of development. The present research highlighted the differences in psychological needs across young athletes in different stages of developmental pathways (Mills et al., 2011), with the need to more closely monitor and support the mental health of players in the PDP phase of football academies apparent.

Finally, the present research contributes to the extant literature by offering a flexible theory which can be drawn upon to underpin applied sport psychology work with children and young people (Harwood & Thrower, 2019; Thrower et al., 2023, see also Hobson & Dixon, 2023), to support their holistic development, sporting performance and mental health (Ayoagi et al., 2012; Coppel, 2020; Hill et al., 2016; Schinke et al., 2017; Sothern & O'Gorman, 2021; Souter et al., 2018). Specifically, and for example, PST programs could be designed to develop psychological resources, (e.g., Hase et al., 2019a; Williams & Cumming, 2012a; 2012b; Williams et al., 2010; 2017; 2021) prompting the development and maintenance of challenge appraisals (e.g., Jensen et al., 2018) because this could bestow both acute performance and mental health benefits.

6.0 CHAPTER 6. REFERENCES.

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APPENDICES.

Appendix A. Questions administered to under-9 to under-12 players.

[Club Badge]

[Club Name]

March 2020 – U9s, U10s, U11s

Name:				
How old are you?	8	9	10	11
Which age group are you in?	U9	U10	U11	
Date of Birth:				
Today's Date:				
How many brothers do you have?				
How many sisters do you have?				
Are you injured right now?	Y	N		

These questions ask you what you think and how you feel about

- your football at [club name]
- life in general

You can't give a "wrong" answer to any of these questions, because everyone might want to give a different answer – and that is OK!

So, please don't copy off other people's answers.
They might think or feel something different to you, and that's normal.

When the questions ask about your football, think about you and your football at [club name].

Please circle one answer per row and answer every question.

These first questions ask you about your football at [club name].
Circle how much you agree with each sentence.

		Really Disagree	Disagree	Kind of Disagree	Kind of Agree	Agree	Really Agree
1	At football at [club name], I can choose for myself how to do things.						
2	At football at [club name], I feel like I can pretty much be myself.						
3	At football at [club name], I **do not** have many close friends.	(I do have a few close friends at football)					(I don't have many close friends at football)
4	After most training sessions at [club name], I feel like I have learnt something.						

		Really Disagree	Disagree	Kind of Disagree	Kind of Agree	Agree	Really Agree
5	I get along well with my coaches and teammates at [club name].						
6	I really like my coaches and teammates at [club name].						
7	My coaches and teammates are pretty friendly towards me.						
8	My coaches and teammates care about me.						

		Really Disagree	Disagree	Kind of Disagree	Kind of Agree	Agree	Really Agree
9	I am good at learning new things.						
10	I can do things I enjoy at football at [club name].						
11	I can plan my own training.						
12	I am free to make my own decisions in my football at [club name].						

		Really Disagree	Disagree	Kind of Disagree	Kind of Agree	Agree	Really Agree
13	People tell me I am good at football.						
14	Sometimes I **do not** feel like I am very good at football.	(I feel very good at football)					(I don't feel very good at football)
15	At [club name] this season I have learnt fun new things.						

		Really Disagree	Disagree	Kind of Agree	Agree	Really Agree
16	Football at [club name] is hard work.					
17	Football at [club name] is stressful.					
18	Football at [club name] is upsetting.					
19	Before games, I don't know how I will perform.	(I do know)				(I don't know)

		Really Disagree	Disagree	Kind of Agree	Agree	Really Agree
20	Football at [club name] takes a lot of effort.					
21	I have what it takes to perform well in matches.					
22	I think I will perform well in football matches.					
23	Performing as well as I can in football matches is important to me.					

		Really Disagree	Disagree	Kind of Agree	Agree	Really Agree
24	I do well in football matches.					
25	I can cope with the hard parts of football.					
26	At football at [club name], I worry that I may not perform as well as I can.	(I don't worry about my performance)				(I worry about my performance)
27	It is important to me to do better than other players.					
28	At football at [club name], I worry that I might perform worse than other players.	(I don't worry about being the worst)				(I worry about being the worst)

These questions as you how you have been feeling in general over the past month – think about how you've felt at home, at school, with family and at football.

		None of the Time	A Little Bit of the Time	Some of the Time	A Good Bit of the Time	Most of the Time	All of the Time
29	During the past month, how much of the time were you a happy person?						
30	During the past month, how much of the time have you felt calm and peaceful?						
31	During the past month, how much of the time have you been a very nervous person?						

		None of the Time	A Little Bit of the Time	Some of the Time	A Good Bit of the Time	Most of the Time	All of the Time
32	During the past month, how much of the time have you felt downhearted and blue?						
33	During the past month, how much of the time have you felt so down in the dumps that nothing could cheer you up?						

Thank you for answering these questions!

Appendix B. Additional questions administered to under-12 players.

[Club badge]

[Club name]

Date, U12s

Name:		
How old are you today?		
Today's Date:		
Date of Birth:		
How many brothers do you have?		
How many sisters do you have?		
Are you currently injured?	Yes	No
Have you been offered a scholarship?	Yes	No

These questions ask you what you think and how you feel about your football at [club name] and life in general.

There are no “right” or “wrong” answers to any of these questions, because everyone might want to give a different answer – and that is OK!

So, please don’t copy off other people’s answers.
They might think or feel something different to you, and that’s normal.

When the questions ask about your football, think about you and your football at [club name].

Please circle one answer per row and answer every question.

This first set of questions asks about thoughts, feelings, and behaviours, often tied to concerns about family, health, school and football.
Please think back over the last 7 days, and circle how much you have experienced each of the feelings described.

Over the past 7 days I have…							
1	Felt moments of sudden terror, fear or fright.	Never	Occasionally	Half of the time	Most of the time	All of the time
2	Felt anxious, worried or nervous.	Never	Occasionally	Half of the time	Most of the time	All of the time
3	Had thoughts of bad things happening, such as family tragedy, ill health, or accidents.	Never	Occasionally	Half of the time	Most of the time	All of the time
4	Felt a racing heart, sweaty, trouble breathing, faint or shaky. (Not to do with the normal effects of physical activity).	Never	Occasionally	Half of the time	Most of the time	All of the time
5	Felt tense muscles, felt on edge or restless, or had trouble relaxing or trouble sleeping.	Never	Occasionally	Half of the time	Most of the time	All of the time

Over the past 7 days I have…						
6	Stayed away from things and situations I worry about.	Never	Occasionally	Half of the time	Most of the time	All of the time
7	Stopped doing something, or didn't really try hard at it, because you were worried.	Never	Occasionally	Half of the time	Most of the time	All of the time
8	Spent lots of time making decisions, putting off making decisions, or preparing for situations, due to worries.	Never	Occasionally	Half of the time	Most of the time	All of the time
9	Looked for someone to make you feel better, because you were worried.	Never	Occasionally	Half of the time	Most of the time	All of the time
10	Needed help to cope with nerves / worries (e.g., from medication, superstitious objects, or other people).	Never	Occasionally	Half of the time	Most of the time	All of the time

For the next set of questions, please think about how often you have been bothered by each of the symptoms described:

Over the past 7 days I have experienced…					
11	Feeling down in the dumps, depressed, irritable, or hopeless?	Not at all	A few of the days	More than half of the days	Nearly every day
12	Little interest or pleasure in doing things	Not at all	A few of the days	More than half of the days	Nearly every day
13	Trouble falling asleep, staying asleep, or sleeping too much?	Not at all	A few of the days	More than half of the days	Nearly every day
14	Not wanting to eat much, weight loss, or eating too much?	Not at all	A few of the days	More than half of the days	Nearly every day

Over the past 7 days I have experienced…					
15	Feeling tired, or having little energy?	Not at all	A few of the days	More than half of the days	Nearly every day
16	Feeling bad about yourself – or feeling that you are a failure, or that you have let yourself or your family down?	Not at all	A few of the days	More than half of the days	Nearly every day
17	Trouble concentrating on things like schoolwork, reading, or watching TV?	Not at all	A few of the days	More than half of the days	Nearly every day
18	Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you were moving around a lot more than usual?	Not at all	A few of the days	More than half of the days	Nearly every day

Appendix C. Questionnaire administered to under-13 to under-16 players.

[Club badge]

[Club name]

Date – U13s-U17s

Name:					
How old are you today?					
Which age group are you?	U13	U14	U15	U16	U17
Today's Date:					
Date of Birth:					
Number of Brothers:					
Number of Sisters:					
Are you currently injured?	Y			N	
Have you been offered a scholarship?	Y			N	

These questions ask you what you think and how you feel about your football at [club name] and life in general.

There are no “right” or “wrong” answers to any of these questions, because everyone might want to give a different answer – and that is OK!

So, please don’t copy off other people’s answers.
They might think or feel something different to you, and that’s normal.

When the questions ask about your football, think about you and your football at [club name].

Please circle one answer per row and answer every question.

The first set of questions asks about your thoughts, feelings, and behaviours, often tied to concerns about **family, health, school and football.**

Please think back over the last 7 days, and circle how much you have experienced each of the feelings described.

Over the past 7 days I have…							
1	Felt moments of sudden terror, fear or fright.	Never	Occasionally	Half of the time	Most of the time	All of the time
2	Felt anxious, worried or nervous.	Never	Occasionally	Half of the time	Most of the time	All of the time
3	Had thoughts of bad things happening, such as family tragedy, ill health, or accidents.	Never	Occasionally	Half of the time	Most of the time	All of the time
4	Felt a racing heart, sweaty, trouble breathing, faint or shaky. (Not to do with the normal effects of physical activity).	Never	Occasionally	Half of the time	Most of the time	All of the time
5	Felt tense muscles, felt on edge or restless, or had trouble relaxing or trouble sleeping.	Never	Occasionally	Half of the time	Most of the time	All of the time
6	Avoided, or did not approach or enter, situations I worry about.	Never	Occasionally	Half of the time	Most of the time	All of the time
7	Left situations early or participated only minimally due to worries.	Never	Occasionally	Half of the time	Most of the time	All of the time
8	Spent lots of time making decisions, putting off making decisions, or preparing for situations, due to worries.	Never	Occasionally	Half of the time	Most of the time	All of the time
9	Looked for reassurance from others (for someone to make me feel better) due to worries.	Never	Occasionally	Half of the time	Most of the time	All of the time
10	Needed help to cope with anxiety (e.g., from medication, superstitious objects, or other people).	Never	Occasionally	Half of the time	Most of the time	All of the time

For the next set of questions, please think about how often you have been bothered by each of the symptoms described:

Over the past 7 days I have experienced…					
11	Feeling down, depressed, irritable, or hopeless?	Not at all	Several Days	More than half of the days	Nearly every day
12	Little interest or pleasure in doing things	Not at all	Several Days	More than half of the days	Nearly every day
13	Trouble falling asleep, staying asleep, or sleeping too much?	Not at all	Several Days	More than half of the days	Nearly every day
14	Poor appetite, weight loss, or overeating?	Not at all	Several Days	More than half of the days	Nearly every day
15	Feeling tired, or having little energy?	Not at all	Several Days	More than half of the days	Nearly every day
16	Feeling bad about yourself – or feeling that you are a failure, or that you have let yourself or your family down?	Not at all	Several Days	More than half of the days	Nearly every day
17	Trouble concentrating on things like school work, reading, or watching TV?	Not at all	Several Days	More than half of the days	Nearly every day
18	Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you were moving around a lot more than usual?	Not at all	Several Days	More than half of the days	Nearly every day

		None of the Time	A Little Bit of the Time	Some of the Time	A Good Bit of the Time	Most of the Time	All of the Time
19	During the past month, how much of the time were you a happy person?	1	2	3	4	5	6
20	During the past month, how much of the time have you felt calm and peaceful?	1	2	3	4	5	6
21	During the past month, how much of the time have you been a very nervous person?	1	2	3	4	5	6
22	During the past month, how much of the time have you felt downhearted and blue?	1	2	3	4	5	6
23	During the past month, how much of the time have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6

These next questions ask you about your football at [club name].
Circle how much you agree with each sentence.

		Really Disagree	Disagree	Kind of Disagree	Kind of Agree	Agree	Really Agree
24	I can decide for myself how to do things at football at [club name].	1	2	3	4	5	6
25	I feel like I can pretty much be myself at football at [club name].	1	2	3	4	5	6
26	I do not have many close friends at football at [club name].	1 (**I do** have a good number of close friends at football)	2	3	4	5	6 (**I do not** have many close friends at football)
27	Most days I feel like I have achieved something from training at [club name].	1	2	3	4	5	6
28	I get along well with my coaches and teammates at [club name].	1	2	3	4	5	6
29	I really like my coaches and teammates at [club name] .	1	2	3	4	5	6
30	Coaches and teammates are pretty friendly towards me at [club name].	1	2	3	4	5	6
31	Coaches and teammates care about me at [club name].	1	2	3	4	5	6

Please focus on your football at [club name].

		Really Disagree	Disagree	Kind of Disagree	Kind of Agree	Agree	Really Agree
32	I am capable of learning new knowledge at [club name].	1	2	3	4	5	6
33	I can do things I enjoy at football at [club name].	1	2	3	4	5	6
34	I can plan my own football training at [club name].	1	2	3	4	5	6
35	I am free to make my own decisions in my football at [club name].	1	2	3	4	5	6
36	People at [club name] tell me I am good at what I do.	1	2	3	4	5	6
37	I do not feel very capable at football sometimes.	1 (**I do** feel very capable at football)	2	3	4	5	6 (**I do not** feel very capable at football)
38	I have been able to learn interesting new things in my football at [club name] recently.	1	2	3	4	5	6

		Really Disagree	Disagree	Somewhat Disagree	Kind of Agree	Somewhat Agree	Agree	Really Agree
39	Academy football is demanding / hard work.	1	2	3	4	5	6	7
40	Academy football is stressful.	1	2	3	4	5	6	7
41	Academy football is distressing / upsetting.	1	2	3	4	5	6	7
42	Before games, I am uncertain how I will perform.	1 (I am **certain**)	2	3	4	5	6	7 (I am **uncertain**)
43	Academy football requires a lot of effort.	1	2	3	4	5	6	7
44	I have the abilities to perform well.	1	2	3	4	5	6	7
45	I have the expectations to perform well.	1	2	3	4	5	6	7
46	Performing well in matches is important to me.	1	2	3	4	5	6	7
47	I am the type of person who does well in football.	1	2	3	4	5	6	7
48	I can cope with the hard parts of football.	1	2	3	4	5	6	7
49	At football, I worry that I may not perform as well as I possibly can.	1 (I **don't** worry)	2	3	4	5	6	7 (I **do** worry)

		Really Disagree	Disagree	Somewhat Disagree	Kind of Agree	Somewhat Agree	Agree	Really Agree
50	At football, it is important to me to do well compared to others.	1	2	3	4	5	6	7
51	At football, I just want to avoid performing worse than others.	1	2	3	4	5	6	7

Thank you for answering these questions!

Appendix D. Questionnaire administered to under-18 and under-23 players.

[Club badge]

[Club name]

[Date] – U17s

Name:	
How old are you today?	
Date of Birth:	
Number of Brothers:	
Number of Sisters:	
Are you currently injured?	Y N
Have you been offered a scholarship?	Y N

These questions ask you what you think and how you feel about your football at [club name] and life in general.

There are no “right” or “wrong” answers to any of these questions. Please answer honestly and without being influenced by other people’s answers.

When the questions ask about your football, think about you and your football at [club name].

Please circle one answer per row and answer every question.

The first set of questions asks about your thoughts, feelings, and behaviours, often tied to concerns about **family, health, school and football.**
Please think back over the last 7 days, and circle how much you have experienced each of the feelings described.

Over the past 7 days I have…						
1	Felt moments of sudden terror, fear or fright.	Never	Occasionally	Half of the time	Most of the time	All of the time
2	Felt anxious, worried or nervous.	Never	Occasionally	Half of the time	Most of the time	All of the time
3	Had thoughts of bad things happening, such as family tragedy, ill health, or accidents.	Never	Occasionally	Half of the time	Most of the time	All of the time
4	Felt a racing heart, sweaty, trouble breathing, faint or shaky. (Not to do with the normal effects of physical activity).	Never	Occasionally	Half of the time	Most of the time	All of the time
5	Felt tense muscles, felt on edge or restless, or had trouble relaxing or trouble sleeping.	Never	Occasionally	Half of the time	Most of the time	All of the time
6	Avoided, or did not approach or enter, situations I worry about.	Never	Occasionally	Half of the time	Most of the time	All of the time
7	Left situations early or participated only minimally due to worries.	Never	Occasionally	Half of the time	Most of the time	All of the time
8	Spent lots of time making decisions, putting off making decisions, or preparing for situations, due to worries.	Never	Occasionally	Half of the time	Most of the time	All of the time
9	Looked for reassurance from others (for someone to make me feel better) due to worries.	Never	Occasionally	Half of the time	Most of the time	All of the time
10	Needed help to cope with anxiety (e.g., from medication, superstitious objects, or other people).	Never	Occasionally	Half of the time	Most of the time	All of the time

For the next set of questions, please think about how often you have been bothered by each of the symptoms described:

Over the past 7 days I have experienced…					
11	Feeling down, depressed, irritable, or hopeless?	Not at all	Several Days	More than half of the days	Nearly every day
12	Little interest or pleasure in doing things	Not at all	Several Days	More than half of the days	Nearly every day
13	Trouble falling asleep, staying asleep, or sleeping too much?	Not at all	Several Days	More than half of the days	Nearly every day
14	Poor appetite, weight loss, or overeating?	Not at all	Several Days	More than half of the days	Nearly every day
15	Feeling tired, or having little energy?	Not at all	Several Days	More than half of the days	Nearly every day
16	Feeling bad about yourself – or feeling that you are a failure, or that you have let yourself or your family down?	Not at all	Several Days	More than half of the days	Nearly every day
17	Trouble concentrating on things like school work, reading, or watching TV?	Not at all	Several Days	More than half of the days	Nearly every day
18	Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you were moving around a lot more than usual?	Not at all	Several Days	More than half of the days	Nearly every day

		None of the Time	A Little Bit of the Time	Some of the Time	A Good Bit of the Time	Most of the Time	All of the Time
19	During the past month, how much of the time were you a happy person?	1	2	3	4	5	6
20	During the past month, how much of the time have you felt calm and peaceful?	1	2	3	4	5	6
21	During the past month, how much of the time have you been a very nervous person?	1	2	3	4	5	6
22	During the past month, how much of the time have you felt downhearted and blue?	1	2	3	4	5	6
23	During the past month, how much of the time have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6

These next questions ask you about your football at club.
Please circle how much you agree with each sentence.

		Really Disagree	Disagree	Kind of Disagree	Kind of Agree	Agree	Really Agree
24	I can decide for myself how to do things at football at [club name].	1	2	3	4	5	6
25	I feel like I can pretty much be myself at football at [club name].	1	2	3	4	5	6
26	I do not have many close friends at football at [club name].	1 (**I do** have a good number of close friends at football)	2	3	4	5	6 (**I do not** have many close friends at football)
27	Most days I feel like I have achieved something from training at [club name].	1	2	3	4	5	6
28	I get along well with my coaches and teammates at [club name].	1	2	3	4	5	6
29	I really like my coaches and teammates at [club name].	1	2	3	4	5	6
30	Coaches and teammates are pretty friendly towards me at [club name].	1	2	3	4	5	6
31	Coaches and teammates care about me at [club name].	1	2	3	4	5	6
32	I am capable of learning new knowledge at [club name].	1	2	3	4	5	6
33	I can do things I enjoy at football at [club name].	1	2	3	4	5	6
34	I can plan my own football training at [club name].	1	2	3	4	5	6
35	I am free to make my own decisions in my football at [club name].	1	2	3	4	5	6
36	People at [club name]tell me I am good at what I do.	1	2	3	4	5	6
37	I do not feel very capable at football sometimes.	1 (**I do** feel very capable at football)	2	3	4	5	6 (**I do not** feel very capable at football)
38	I have been able to learn interesting new things in my football at [club name]recently.	1	2	3	4	5	6

		Really Disagree	Disagree	Somewhat Disagree	Kind of Agree	Somewhat Agree	Agree	Really Agree
39	Academy football is demanding / hard work.	1	2	3	4	5	6	7
40	Academy football is stressful.	1	2	3	4	5	6	7
41	Academy football is distressing / upsetting.	1	2	3	4	5	6	7
42	Before games, I am uncertain how I will perform.	1	2	3	4	5	6	7
43	Academy football requires a lot of effort.	1	2	3	4	5	6	7
44	I have the abilities to perform well.	1	2	3	4	5	6	7
45	I have the expectations to perform well.	1	2	3	4	5	6	7
46	Performing well in matches is important to me.	1	2	3	4	5	6	7
47	I am the type of person who does well in football.	1	2	3	4	5	6	7
48	I can cope with the hard parts of football.	1	2	3	4	5	6	7
49	At football, I worry that I may not perform as well as I possibly can.	1	2	3	4	5	6	7
50	At football, it is important to me to do well compared to others.	1	2	3	4	5	6	7
51	At football, I just want to avoid performing worse than others.	1	2	3	4	5	6	7

Appendix E. Letter to parents sent with questionnaires at T4.

Dear Parent / Guardian,
I hope you are well and managing OK in these challenging times.

You are receiving this paperwork through the post as I seek your help to collect data for my PhD research at the academy.

For one of my studies, I require questionnaire data to be collected at an exact time frame during the season, and that just so happens to have coincided with the COVID-19 outbreak! So, I have been challenged to be adaptable when collecting this data and it means I have to ask for your help.

I have enclosed some documents which I would really appreciate your help with having them completed and returned to me – an addressed and stamped envelope is enclosed for your convenience.

- First, there is a "Player Demographic Information" booklet – A4 size. Please could you (as parent / guardian) complete this about your child. This information will be incorporated into my data analysis and will be kept confidential; it won't be shared with the academy.
- Second, there is a questionnaire booklet – A5 size. Please could you ask your child to complete this ***independently***, ideally on their own in a quiet room. If they need help with understanding a question then of course please do help them.
- Finally, there may also be some information sheets and consent forms – this will be because I have either not received information from you yet about whether you consent, or you may be a new signing and this research may be new to you. Either way, please could you complete the documentation and return to me.

I really appreciate your help and support with this matter. Collecting this data is really important to me and for my PhD. If you have any questions or concerns at all, please don't hesitate to contact me:

Email: jennifer.hobson@research.staffs.ac.uk or [club email address]

Phone: [researcher phone number]

The return address is my home address, purely because I will be working from home over the next few weeks, and I won't be able to track which questionnaires have been returned if they are sent to the club.

That being said if you would prefer to send the paperwork to the club, please change the address on the return envelope to the academy's address:

[Club address]

Many thanks and kind regards,

Jennifer Hobson

[Club name] Academy Psychologist

Appendix F. Original Challenge and Threat Scale (Mendes et al., 2007).

Appraisal	**Question**	**Strongly Disagree**						**Strongly Agree**
Demand	This task is demanding.	1	2	3	4	5	6	7
Demand	This task is stressful.	1	2	3	4	5	6	7
Demand	This task is distressing.	1	2	3	4	5	6	7
Demand	This task is threatening.	1	2	3	4	5	6	7
Demand	I am uncertain how I will perform.	1	2	3	4	5	6	7
Demand	This task requires a lot of effort.	1	2	3	4	5	6	7
Resource	I have the abilities to perform well.	1	2	3	4	5	6	7
Resource	I have the expectations to perform well.	1	2	3	4	5	6	7
Resource	Performing well is important to me.	1	2	3	4	5	6	7
Resource	This task is a positive challenge.	1	2	3	4	5	6	7
Resource	I am the type of person who does well on these tasks.	1	2	3	4	5	6	7

Appendix G. Challenge and Threat Scale – Adapted for Football and Adolescents (U13-U23).

Appraisal	Question	Really Disagree	Disagree	Somewhat Disagree	Kind of Agree	Somewhat Agree	Agree	Really Agree
Demand	Academy football is demanding / hard work.	1	2	3	4	5	6	7
Demand	Academy football is stressful.	1	2	3	4	5	6	7
Demand	Academy football is distressing / upsetting.	1	2	3	4	5	6	7
Demand	Before games, I am uncertain how I will perform.	1 (I am **certain**)	2	3	4	5	6	7 (I am **uncertain**)
Demand	Academy football requires a lot of effort.	1	2	3	4	5	6	7
Resource	I have the abilities to perform well.	1	2	3	4	5	6	7
Resource	I have the expectations to perform well.	1	2	3	4	5	6	7
Resource	Performing well in matches is important to me.	1	2	3	4	5	6	7
Resource	I am the type of person who does well in football.	1	2	3	4	5	6	7

Appendix H. Challenge and Threat Scale – Adapted for Football and Children (U9-U12).

Appraisal	Question	Really Disagree	Disagree	Kind of Agree	Agree	Really Agree
Demand	Football at [club name] is hard work.	1	2	3	4	5
Demand	Football at [club name] is stressful.	1	2	3	4	5
Demand	Football at [club name] is upsetting.	1	2	3	4	5
Demand	Before games, I don’t know how I will perform.	1 (I do know)	2	3	4	5 (I don’t know)
Demand	Football at [club name] takes a lot of effort.	1	2	3	4	5
Resource	I have what it takes to perform well in matches.	1	2	3	4	5
Resource	I think I will perform well in football matches.	1	2	3	4	5
Resource	Performing as well as I can in football matches is important to me.	1	2	3	4	5
Resource	I do well in football matches.	1	2	3	4	5

Appendix I. Notes from cognitive pre-testing of challenge and threat and mental health questionnaires with child football players in under-9 age group.

needs more conditions to be clearer when & how asking

Player Code Number: 0047

These questions ask you how you feel about football. understood.
Remember there are no right or wrong answers.
Please read each statement out loud.
Then, pick the best answer to how much you agree or disagree.

wants 5-options.

1	Football is tough (Mentality compared to leisure) opponents, other teams	Disagree	Don't Agree or Disagree	Agree
2	Football is stressful It's not the end of the world if you let a goal in	Disagree	Don't Agree or Disagree	Agree
3	Football is upsetting same.	Disagree	Don't Agree or Disagree	Agree
4	Football is threatening ? People don't threaten me	Disagree	Don't Agree or Disagree	Agree
5	I don't know how I will perform "before a game"	Disagree	Don't Agree or Disagree	Agree
6	Football takes a lot of effort You can't be a pro footballer w/out working hard	Disagree	Don't Agree or Disagree	Agree
7	I have the abilities to perform well	Disagree	Don't Agree or Disagree	Agree
8	I think I will perform well	Disagree	Don't Agree or Disagree	Agree
9	Performing well is important to me You want to win but it's about the team.	Disagree	Don't Agree or Disagree	Agree
10	Football is a positive challenge	Disagree	Don't Agree or Disagree	Agree
11	I am the type of person who does well in football	Disagree	Don't Agree or Disagree	Agree

"It depends" very clearly understood

uncertainty

don't know until I've played here

no, other people do well! in football, not just me.

The item of discussion; I or Football need to be clearer. Explicit.

Player Code Number: 001

didn't know whether to circle

could read out well.

These questions ask you how you feel about football.
Remember there are no right or wrong answers.
Please read each statement out loud.
Then, ~~pick~~ circle the best answer to how much you agree or disagree.

"hardwork" closer to what we want?

sometimes.

1	Football is tough — too hard, opponent should be tough	~~Strongly~~ really Disagree 1	~~Slightly~~ kind of Disagree 2	Don't Agree or Disagree 3	~~Slightly~~ kind of Agree 4	~~Strongly~~ really Agree 5
2	Football is stressful — if make mistake, frust @ self	Strongly Disagree	Slightly Disagree	Don't Agree or Disagree	Slightly Agree	Strongly Agree
3	Football is upsetting — sad.	Strongly Disagree	Slightly Disagree	Don't Agree or Disagree	Slightly Agree	Strongly Agree
4	what does this mean? Football is threatening	Strongly Disagree	Slightly Disagree	Don't Agree or Disagree	Slightly Agree	Strongly Agree
5	I don't know how I will perform — I dunno how I'll perform	Strongly Disagree	Slightly Disagree	Don't Agree or Disagree	Slightly Agree	Strongly Agree
6	Football takes a lot of effort	Strongly Disagree	Slightly Disagree	Don't Agree or Disagree	Slightly Agree	Strongly Agree
7	I have the abilities to perform well	Strongly Disagree	Slightly Disagree	Don't Agree or Disagree	Slightly Agree	Strongly Agree
8	In general at football, I think I will perform well — when? add a condition.	Strongly Disagree	Slightly Disagree	Don't Agree or Disagree	Slightly Agree	Strongly Agree
9	Performing well is important to me	Strongly Disagree	Slightly Disagree	Don't Agree or Disagree	Slightly Agree	Strongly Agree
10	Football is a positive challenge	Strongly Disagree	Slightly Disagree	Don't Agree or Disagree	Slightly Agree	Strongly Agree
11	I am the type of person who does well in football	Strongly Disagree	Slightly Disagree	Don't Agree or Disagree	Slightly Agree	Strongly Agree

negatively worded

positively worded

? what does this mean. struggled.

11/06/18

Player Code Number: 002

These questions ask how you've been feeling in general recently.
Please read each statement out loud, and circle on the scale how much you have been feeling this way over the last 7 days. Circle one answer per row.
Please answer these questions truthfully and on your own.
Remember, answers can't be right or wrong.

struggled to read

quite slow reading

Over the last 7 days...

14

some difficulty

→ about football or in general?

1	I have felt cheerful, in good spirits				
2	I have felt calm, relaxed				
3	I have felt active, full of energy				
4	I woke up feeling fresh, rested				
5	My days have been filled with things that interest me				

missed out this word when reading

→ Interpreted as strength of feeling, rather than how often

* Preferred visual scale, not words.

mainly thinking about when at home, resting.

11/06/18

Player Code Number: 006.

These questions ask how you've been feeling in general recently.
Please read each statement out loud, and circle on the scale how much you have been feeling this way over the last 7 days. Circle one answer per row.
Please answer these questions truthfully and on your own.
Remember, answers can't be right or wrong.

harder to read aloud.

Over the last 7 days…

hard to do. Thinking about me, in general
Not necessarily last 7 days.

does it include at home?

1	I have felt cheerful, in good spirits	Always	Mostly	Sometimes	Never
2	I have felt calm, relaxed	Always	Mostly	Sometimes	Never
3	I have felt active, full of energy	Always	Mostly	Sometimes	Never
4	I woke up feeling fresh, rested	Always	Mostly	Sometimes	Never
5	My days have been filled with things that interest me	Always	Mostly	Sometimes	Never

get boring after visited a few time.

because sometimes I don't feel awake enough for school.

Appendix J. Original DRES (Tomaka et al., 1993).

Appraisal	Question	Not at all					Extremely
Demand	How demanding do you expect the task to be?	1	2	3	4	5	6
Coping	How able are you to cope with the demands of the task?	1	2	3	4	5	6

Appendix K. DRES – Adapted for Football and Adolescents (U13-U23).

Appraisal	Question	Really Disagree	Disagree	Somewhat Disagree	Kind of Agree	Somewhat Agree	Agree	Really Agree
Demand	Academy football is demanding / hard work.	1	2	3	4	5	6	7
Coping	I can cope with the hard parts of football.	1	2	3	4	5	6	7

Appendix L. DRES – Adapted for Football and Children (U9-U12).

Appraisal	Question	Really Disagree	Disagree	Kind of Agree	Agree	Really Agree
Demand	Football at [club name] is hard work.	1	2	3	4	5
Coping	I can cope with the hard parts of football.	1	2	3	4	5

Appendix M. Original Adolescent Students' Basic Psychological Needs Satisfaction Scale (ASBPNSS; Tian et al., 2014).

Need	Question	Strongly Disagree					Strongly Agree
Autonomy	I can decide for myself how to do things at school.	1	2	3	4	5	6
Autonomy	I feel like I can pretty much be myself at school.	1	2	3	4	5	6
Autonomy	I am free to arrange my studies and extracurricular activities at school.	1	2	3	4	5	6
Autonomy	I am free to make my own decisions at school.	1	2	3	4	5	6
Autonomy	I can do things I enjoy at school.	1	2	3	4	5	6
Relatedness	Teachers and classmates are pretty friendly towards me at school.	1	2	3	4	5	6
Relatedness	Teachers and classmates care about me at school.	1	2	3	4	5	6
Relatedness	I really like my teachers and classmates at school	1	2	3	4	5	6
Relatedness	I get along well with my teachers and classmates at school	1	2	3	4	5	6
Relatedness	I have few close friends at school.	1	2	3	4	5	6
Competence	I have been able to learn interesting new skills at school recently.	1	2	3	4	5	6
Competence	I am capable of learning new knowledge at school.	1	2	3	4	5	6
Competence	People at school tell me I am good at what I do.	1	2	3	4	5	6
Competence	Most days I feel a sense of accomplishment from studying at school.	1	2	3	4	5	6
Competence	I do not feel very capable at school sometimes.	1	2	3	4	5	6

Appendix N. Adapted ASBPNSS – Football

Need	Question	Really Disagree	Disagree	Kind of Disagree	Kind of Agree	Agree	Really Agree
Autonomy	I can decide for myself how to do things at football at [club].	1	2	3	4	5	6
Autonomy	I feel like I can pretty much be myself at football at [club].	1	2	3	4	5	6
Relatedness	I do not have many close friends at football at [club].	1 (**I do** have a few close friends at football)	2	3	4	5	6 (**I do not** have many close friends at football)
Competence	Most days I feel like I have achieved something from training at [club name].	1	2	3	4	5	6
Relatedness	I get along well with my coaches and teammates at [club].	1	2	3	4	5	6
Relatedness	I really like my coaches and teammates at [club].	1	2	3	4	5	6
Relatedness	Coaches and teammates are pretty friendly towards me at [club].	1	2	3	4	5	6
Relatedness	Coaches and teammates care about me at [club name].	1	2	3	4	5	6
Competence	I am capable of learning new knowledge at [club].	1	2	3	4	5	6
Autonomy	I can do things I enjoy at football at [club].	1	2	3	4	5	6
Autonomy	I can plan my own football training at [club].	1	2	3	4	5	6
Autonomy	I am free to make my own decisions in my football at [club].	1	2	3	4	5	6
Competence	People at [club] tell me I am good at what I do.	1	2	3	4	5	6
Competence	I do not feel very capable at football sometimes.	1 (I **do** feel very capable at football)	2	3	4	5	6 (**I do not** feel very capable at football)
Competence	I have been able to learn interesting new things in my football at [club] recently.	1	2	3	4	5	6

Appendix O. Adapted ASBPNSS – Children (U9-U12).

Psychological Need	Question	Really Disagree	Disagree	Kind of Disagree	Kind of Agree	Agree	Really Agree
Autonomy	At football at [club], I can decide for myself how to do things.	1	2	3	4	5	6
Autonomy	At football at [club], I feel like I can pretty much be myself.	1	2	3	4	5	6
Relatedness	At football at [club], I do not have many close friends.	1 (**I do** have a few close friends at football)	2	3	4	5	6 (**I do** not have many close friends at football)
Competence	After most training sessions at [club], I feel like I have achieved something.	1	2	3	4	5	6
Relatedness	I get along well with my coaches and teammates at [club].	1	2	3	4	5	6
Relatedness	I really like my coaches and teammates at [club].	1	2	3	4	5	6
Relatedness	My coaches and teammates are pretty friendly towards me at [club].	1	2	3	4	5	6
Relatedness	My coaches and teammates care about me at [club].	1	2	3	4	5	6
Competence	I am good at learning new things at [club].	1	2	3	4	5	6
Autonomy	At football at [club]I can do things I enjoy.	1	2	3	4	5	6
Autonomy	At football at [club]I can plan my own training.	1	2	3	4	5	6
Autonomy	At football at [club]I am free to make my own decisions.	1	2	3	4	5	6
Competence	People at [club]tell me I am good at what I do.	1	2	3	4	5	6
Competence	Sometimes I do not feel very good at football.	1 (I feel very good at football)	2	3	4	5	6 (**I do not** feel very good at football)
Competence	At football this season I have learnt fun new things.	1	2	3	4	5	6

Appendix P. Original Achievement Goal Questions (Conroy et al., 2003).

Achievement Goal	Question	Not at all like me						Completely like me
Mastery Approach	It is important to me to perform as well as I possibly can.	1	2	3	4	5	6	7
Mastery Avoidance	I worry that I may not perform as well as I possibly can.	1	2	3	4	5	6	7
Mastery Approach	It is important to me to do well compared to others.	1	2	3	4	5	6	7
Mastery Avoidance	I just want to avoid performing worse than others.	1	2	3	4	5	6	7

Appendix Q. Achievement Goal Questions – Adapted for Football and Adolescents (U13-U23).

Achievement Goal	Question	Really Disagree	Disagree	Somewhat Disagree	Kind of Agree	Somewhat Agree	Agree	Really Agree
Mastery Approach	Performing well in matches is important to me (perceived resources question).	1	2	3	4	5	6	7
Mastery Avoidance	At football, I worry that I may not perform as well as I possibly can.	1 (I don't worry)	2	3	4	5	6	7 (I do worry)
Mastery Approach	At football, it is important to me to do well compared to others.	1	2	3	4	5	6	7
Mastery Avoidance	At football, I just want to avoid performing worse than others.	1	2	3	4	5	6	7

Appendix R. Achievement Goal Questions – Adapted for Football and Children (U9-U12).

Achievement Goal	**Question**	**Really Disagree**	**Disagree**	**Kind of Agree**	**Agree**	**Really Agree**
Mastery Approach	Performing as well as I can in football matches is important to me (perceived resources question).	1	2	3	4	5
Mastery Avoidance	At football at [club], I worry that I may not perform as well as I can.	1 (**I don't** worry about my performance)	2	3	4	5 (I do worry about my performance)
Mastery Approach	At football at [club], it is important to me to do better than other players.	1	2	3	4	5
Mastery Avoidance	At football at [club], I worry that I might perform worse than other players.	1 (**I don't** worry about being the worst)	2	3	4	5 (I do worry about being the worst)

Appendix S. Original - Severity Measure for Generalized Anxiety Disorder—Child Age 11–17 / 'GAD-10' (Craske et al., 2013).

The following questions ask about thoughts, feelings, and behaviours, often tied to concerns about family, health, finances, school and work.
Please respond to each item by marking (x) one box per row.

During the **PAST 7 DAYS,** I have…	Never	Occasionally	Half of the time	Most of the time	All of the time
Felt moments of sudden terror, fear or fright	◻ 0	◻ 1	◻ 2	◻ 3	◻ 4
Felt anxious, worried or nervous	◻ 0	◻ 1	◻ 2	◻ 3	◻ 4
Had thoughts of bad things happening, such as family tragedy, ill health, loss of a job, or accidents	◻ 0	◻ 1	◻ 2	◻ 3	◻ 4
Felt a racing heart, sweaty, trouble breathing, faint or shaky	◻ 0	◻ 1	◻ 2	◻ 3	◻ 4
Felt tense muscles, felt on edge or restless, or had trouble relaxing or trouble sleeping	◻ 0	◻ 1	◻ 2	◻ 3	◻ 4
Avoided, or did not approach or enter, situations about which I worry	◻ 0	◻ 1	◻ 2	◻ 3	◻ 4
Left situations early or participated only minimally due to worries	◻ 0	◻ 1	◻ 2	◻ 3	◻ 4
Spent lots of time making decisions, putting off making decisions, or preparing for situations, due to worries	◻ 0	◻ 1	◻ 2	◻ 3	◻ 4
Sought reassurance from others due to worries	◻ 0	◻ 1	◻ 2	◻ 3	◻ 4
Needed help to cope with anxiety (e.g., medication, superstitious objects, or other people)	◻ 0	◻ 1	◻ 2	◻ 3	◻ 4

Appendix T. Adapted - Severity Measure for Generalized Anxiety Disorder—Child Age 11–17 / 'GAD-10' (Craske et al., 2013).

The first set of questions asks about your thoughts, feelings, and behaviours, often tied to concerns about **family, health, school and football.** Please think back over the last 7 days, and circle how much you have experienced each of the feelings described.

During the past 7 days I have…					
Felt moments of sudden terror, fear or fright.	Never	Occasionally	Half of the time	Most of the time	All of the time
Felt anxious, worried or nervous.	Never	Occasionally	Half of the time	Most of the time	All of the time
Had thoughts of bad things happening, such as family tragedy, ill health, loss of a job, or accidents.	Never	Occasionally	Half of the time	Most of the time	All of the time
Felt a racing heart, sweaty, trouble breathing, faint or shaky (not to do with the normal effects of physical activity).	Never	Occasionally	Half of the time	Most of the time	All of the time
Felt tense muscles, felt on edge or restless, or had trouble relaxing or trouble sleeping.	Never	Occasionally	Half of the time	Most of the time	All of the time
Avoided, or did not approach or enter, situations about which I worry.	Never	Occasionally	Half of the time	Most of the time	All of the time
Left situations early or participated only minimally due to worries.	Never	Occasionally	Half of the time	Most of the time	All of the time
Spent lots of time making decisions, putting off making decisions, or preparing for situations, due to worries.	Never	Occasionally	Half of the time	Most of the time	All of the time
Sought reassurance from others due to worries.	Never	Occasionally	Half of the time	Most of the time	All of the time
Needed help to cope with anxiety (e.g., medication, superstitious objects, or other people).	Never	Occasionally	Half of the time	Most of the time	All of the time

Appendix U. Original - Patient Health Questionnaire-9 ‘PHQ-9’ (Spitzer et al., 2006).

How often have you been bothered by each of the following symptoms over the past **two weeks?**
For each symptom, put an (x) in the box beneath the answer that best describes how you have been feeling.

	(0) Not at all	(1) Several Days	(2) More than half of the days	(3) Nearly every day
Feeling down, depressed, irritable, or hopeless?				
Little interest or pleasure in doing things?				
Trouble falling asleep, staying asleep, or sleeping too much?				
Poor appetite, weight loss, or overeating?				
Feeling tired, or having little energy?				
Feeling bad about yourself – or feeling that you are a failure, or that you have let yourself or your family down?				
Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you were moving around a lot more than usual?				
Thoughts that you would be better off dead, or of hurting yourself in some way?				

Appendix V. Adapted - PHQ-8 (Kroenke et al., 2009).

For the next set of questions, please think about how often you have been bothered by each of the following symptoms described:

Over the past 7 days I have experienced…				
Feeling down, depressed, irritable, or hopeless?	Not at all	Several Days	More than half of the days	Nearly every day
Little interest or pleasure in doing things?	Not at all	Several Days	More than half of the days	Nearly every day
Trouble falling asleep, staying asleep, or sleeping too much?	Not at all	Several Days	More than half of the days	Nearly every day
Poor appetite, weight loss, or overeating?	Not at all	Several Days	More than half of the days	Nearly every day
Feeling tired, or having little energy?	Not at all	Several Days	More than half of the days	Nearly every day
Feeling bad about yourself – or feeling that you are a failure, or that you have let yourself or your family down?	Not at all	Several Days	More than half of the days	Nearly every day
Moving or speaking so slowly that other people could have noticed? Or the opposite – being so fidgety or restless that you were moving around a lot more than usual?	Not at all	Several Days	More than half of the days	Nearly every day

Appendix W. Original Mental Health Inventoy-5 (MHI-5, Berwick et al., 1991).

Instructions:

Please read each question and tick the box by the **ONE** statement that best describes how things have been FOR YOU during the past month.

There are no right or wrong answers.

1. During the past month, how much of the time were you a happy person?

All of the time	Some of the time
Most of the time	A little of the time
A good bit of the time	None of the time

2. How much of the time, during the past month, have you felt calm and peaceful?

All of the time	Some of the time
Most of the time	A little of the time
A good bit of the time	None of the time

3. How much of the time, during the past month, have you been a very nervous person?

All of the time	Some of the time
Most of the time	A little of the time
A good bit of the time	None of the time

4. How much of the time, during the past month, have you felt downhearted and blue?

All of the time	Some of the time
Most of the time	A little of the time
A good bit of the time	None of the time

5. How much of the time, during the past month, have you felt so down in the dumps that nothing could cheer you up?

All of the time	Some of the time
Most of the time	A little of the time
A good bit of the time	None of the time

Appendix X. Mental Health Inventory-5 (MHI-5) as presented to adolescents.

These questions ask you how you have been feeling in general over the past month – think about how you've felt at home, school, with family and at football.

Question	All of the time	Most of the time	A good bit of the time	Some of the time	A little bit of the time	All of the time
During the past month, how much of the time were you a happy person?	1	2	3	4	5	6
How much of the time, during the past month, have you felt calm and peaceful?	1	2	3	4	5	6
How much of the time, during the past month, have you been a very nervous person?	1	2	3	4	5	6
How much of the time, during the past month, have you felt downhearted and blue?	1	2	3	4	5	6
How much of the time, during the past month, have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6

Appendix Y. Demographics questionnaire completed by players.

Finally, please answer the following questions about yourself.
Football Details:

Playing Position:		Number of Different Clubs Played For (at all levels):	
Total Number of Years Playing Football (at any level):		Age Group You Currently Play with Most Often:	
Total Number of Years in Academy Football (include time here and at other academies):		Number of Family Members Who Are (or were) Pro-Footballers:	
Number of Different Football Coaches in Lifetime:			
Number of Injuries Which Stopped You From Playing 2 or More Consecutive Games:			
Other Hobbies / Interests (please list):			

Personal Details:

Postcode Where You Live:		Please Report Number of Known Medical Conditions:	
Number of People You Live With:		Your Race:	
Name of Town/City/Village Where You Have Lived For Most of Your Lifetime:		Number of life events you have personally found difficult, challenging, threatening, or life changing	
Name of Secondary School: (If multiple, write the school you spent the most time at).		Total Number of Schools Attended in Lifetime: (Include Primary and Secondary Schools)	
Number of Times You Have Moved House:			
Have You Ever Been Excluded at School?	Yes Number of Times:	No	

Family Details (Please don't guess, if you don't know, put a ?):

Mother's Age:							
Mother's Current Job:							
Mother's Race:							
Mother's Marital Status (please circle one):	Single	Divorced		Married (to my Biological Father)	Married (not to my Biological Father)		Widowed
Mother's Highest Level of Education (please circle one):	Primary School	Secondary School	College	University Foundation Degree	University BSc	University MSc	University PhD
Father's Age:							
Father's Current Job:							
Father's Race:							
Father's Marital Status (please circle one):	Single	Divorced		Married (to my Mother)	Married (not to my Mother)		Widowed
Father's Highest Level of Education (please circle one):	Primary School	Secondary School	College	University Foundation Degree	University BSc	University MSc	University PhD

Number of Grandparents:		
Number of Aunties:		
Number of Uncles:		
Number of Cousins:		
Number of Family Members with a Mental Health Condition (if known):		
Your religion (tick one):	Christian	
	Muslim	
	Jewish	
	Hindu	
	Atheist	
	Other (please state)	

Appendix Z. Demographics questionnaire completed by parents.

[Club badge]

[Club name]
Player Demographic Information
Sport Psychology Research

Please complete and return in the envelope provided.

Child's Name:	
Child's Date of Birth:	
Child's Number of Siblings:	
Name of Person Completing This Questionnaire:	
Your Relationship to the Child:	
Today's Date:	

Participant Code:______________ (leave blank)

Football Details:

Position he predominantly plays in (please tick one):	Goal Keeper	
	Outfield Defence	
	Midfield	
	Forward	
How many different football clubs has your child played for?		
Total number of years your child has played football (all levels).		
Total number of years and months your son has played academy football. Please include combined years here at [club name] and any other academies. For example if your son has been at [club name] for 1 year and before that he was at [another club] for 2 years, then the answer would be 3 years.		
Number of different football coaches your child has had throughout his time playing football (all levels of football combined).		
Number of occasions where injury has prevented your child from playing 2 or more consecutive games.		
Age group your son currently plays with most often:		
Has your son played in an older age group whilst at [club name]?	Yes	No
Number of family members who are or were pro-footballers:		
Please list your child's other hobbies / interests (please list):		

Personal Details:

Post code where your child currently lives/spends the majority of his time living.		
Name of the city/town/village where your child has lived for the majority of his life.		
Including your child, how many people live in the house where he spends most of his time living?		
Number of times your child has moved house.		
Number of primary schools your child has attended.		
Number of secondary schools your child has attended.		
Has your child ever been excluded from school?	Yes	No
If your child has been excluded, how many times has he been excluded from school?		
Your child's race.		
Name of Secondary School: (If multiple, report the school your son has spent the most time at).		
Your child's religion (please tick one):	Christian	
	Muslim	
	Jewish	
	Hindu	
	Atheist	
	Agnostic	
	Other (please state)	
	Prefer not to say:	
Your child's number of known medical conditions:		
The number of life events your child has found difficult, challenging, threatening and/or life changing.		

Family Details:
If any questions are not applicable, please write N/A

Mother’s date of birth:								
Mother’s current job title:								
Mother’s race:								
Mother’s current marital Status (please circle one):	Single	Divorced		Married (to my Biological Father)	Married (not to my Biological Father)		Widowed	
Mother’s highest level of education (please circle one):	Primary School	Secondary School	College	University Foundation Degree	University BSc	University MSc	University PhD	N/A
Father’s date of birth:								
Father’s current job title:								
Father’s race:								
Father’s current marital status (please circle one):	Single	Divorced		Married (to my Mother)	Married (not to my Mother)		Widowed	
Father’s highest level of education (please circle one):	Primary School	Secondary School	College	University Foundation Degree	University BSc	University MSc	University PhD	N/A

Your child's number of Grandparents:		
Number of Aunties:		
Number of Uncles:		
Number of Cousins:		
Finally, please report the number of family members with a known mental health problem. This might refer to an anxiety disorder, depression, bipolar disorder, schizophrenia etc. For more information, see https://www.mind.org.uk/information-support/types-of-mental-health-problems/		

Appendix AA. Signed letter of study approval from the football academy.

2nd July 2018

Dear Sir / Madam,

On behalf of [Club name] we confirm the club's support for Jennifer Hobson to conduct her PhD research at the club.

In particular, the club supports the following longitudinal research project, with data collection starting at the beginning of the 2018/19 season:

"Investigating Challenge and Threat States in Youth Elite Academy Footballers"

We understand that the study involves collecting demographic, performance and questionnaire data from parents / guardians, coaches and players from U9 through to U18 squads, and that all participants in the project will not be identifiable within either the final report write up or any published papers. We are aware that only Jennifer Hobson, Joe Dixon and Dr. Martin Turner will have access to the data.

Yours Sincerely,

Gareth Jennings
Academy Director
[Club name]

Dr. Andrew Dent
Head of Medicine
[Club name]

[Club address]

[club identifiers]

Appendix BB. Institutional ethical approval for research.

STAFFORDSHIRE UNIVERSITY

Health Sciences

ETHICAL APPROVAL FEEDBACK

Researcher name:	Jennifer Hobson
Title of Study:	Investigating Challenge and Threat States in Youth Elite Academy Footballers
Status of approval:	Approved

Thank you for addressing the committee's comments. Your research proposal has now been approved by the Ethics Panel and you may commence the implementation phase of your study. You should note that any divergence from the approved procedures and research method will invalidate any insurance and liability cover from the University. You should, therefore, notify the Panel of any significant divergence from this approved proposal.

You should arrange to meet with your supervisor for support during the process of completing your study and writing your dissertation.

When your study is complete, please send the ethics committee an end of study report. A template can be found on the ethics BlackBoard site.

Signed: Dr Roozbeh Naemi **Date: 23.07.2018**

Chair of the Health Sciences Ethics Panel

Appendix CC. Information sheet for parents.

The theory of challenge and threat states suggests that sports performers approach competition in either a challenge or a threat state. A challenge state is considered more beneficial than a threat state for performance, because the performer believes they are capable of meeting the demands of the task, instead of feeling overwhelmed by the demands, and that they cannot cope. A footballer in a threat state might fear making a mistake, but a footballer in a challenge state looks forward to playing well.

This theory has been explored mainly in adult samples, and very little research has explored challenge and threat states in young footballers, which makes research into this area valuable. The academy psychologist (Jennifer Hobson) is completing professional training at the British Psychological Society, and a PhD at Staffordshire University which will explore challenge and threat states in [club name] academy players.

What's going to happen?

Information will be collected from players, parents / guardians and coaches over the next 2-3 seasons, for players in every squad, from the U9s through to the U16s. This will help to show how mental approaches differ between age groups, how approaches change over time, and what causes any changes or differences. The results from this research will help with understanding how children and adolescents develop mental approaches to competition, and which approaches are most beneficial for performance. The research may end up being published in journals, or presented at conferences. In such cases, the players, parents / guardians and coaches will not be identifiable from the content.

What data is collected?

- Personal and family details
- Player performance data (e.g., minutes played, number of games, coach ratings, number of injuries, number of days injured, player self-ratings* etc.)
- Player questionnaire data at the start, during* and at the end of each season. The questionnaires will measure mental approaches to football, emotions, sleep*, perceived competence, ownership and support and well-being
- Parents' / guardians' perceptions of their child

*This data will be collected from players in the U12s, U13s, U14s, U15s, and U16s only.

Whilst unlikely, it is possible that your child may become upset or anxious when answering some of the questions. Should this occur, your child will be supported by Jennifer and given the option to stop answering the questions.

If players' answers highlight any well-being concerns, they will be offered support accordingly.

How is the data stored?

Where: Securely at Staffordshire University, on a password protected and encrypted laptop, and a password protected and encrypted USB pen for back-up purposes.

How long: For an initial period of 10 years. If the data is used in a published piece of research, the data will be kept for a further 10 years from the date of publication.

Who has access: Only Jennifer Hobson, Joe Dixon and Martin Turner will have access to the data. It will be stored in a coded fashion; players' names will be replaced with a code, so that data is stored anonymously. Coaches will be provided with group patterns, but will not be provided data on individual players.

Consent

If you are happy to be involved with this research, and for any findings to be published in academic journals in the future, please complete and return the consent form.

If you provide consent now, but wish to withdraw consent at a later point, please email Jennifer Hobson to do so. All data collected up until the point of withdrawal will be retained, but no further data will be collected. Failure to provide consent will not have any impact on your child's reviews or status at the club.

If you have any questions about the research, please contact one of the individuals below.

Jennifer Hobson, Academy Psychologist & Lead Researcher	[club email address]
Joe Dixon, 1st Team & Academy Psychologist	[club email address]
Dr. Martin Turner, PhD Supervisor	M.Turner@MMU.ac.uk

If you are concerned about your child's well-being, and would like to seek support, please speak to either Jennifer, Joe, or the club's safe guarding officer:

Stephanie Wakelin, Academy Safeguarding Officer	[club email address] 01782 592112

If you wish to seek support beyond the club, below are contact details of suitable organisations:

YoungMinds www.youngminds.org.uk parents@youngminds.org.uk 0808 802 5544	UK's leading charity committed to improving emotional wellbeing and mental health of children and young people, and empowering their parents and carers.
Mind www.mind.org.uk info@mind.org 0300 123 3393	National mental health charity, which offers an excellent range of materials. It also lists details of local mind associations.
Anxiety UK www.anxiety.org.uk 0844 967 4848	Self-help leaflets and contact lists, self-help groups, counselling, phone self-help groups, email support.
ChildLine www.childline.org.uk 0800 1111	A counselling service for parents, children and young people. It also offers multilingual services to South Asian communities living in the UK. Languages include Bengali/Sylheti, Gujurati, Hindi, Punjabi, Urdu and English. Help and advice is free and confidential.

Appendix DD. Consent form for parents.

Please read this consent form, and the research information sheet.

If you are happy to participate, and for your child to participate in this research, please tick the boxes and sign below:

Player's Name:	
Player's Age Group:	

Please tick all that apply below:	[√]
The purpose and details of this study have been explained to me. I understand that this research is designed to further scientific knowledge, and that all procedures have been approved by the Research Ethics Committee at Staffordshire University.	
I understand that I am under no obligation to take part in the study, and neither is my child.	
I have had an opportunity to ask questions about my child's and my own participation.	
I understand that all information provided will be treated in strict confidence and will be kept anonymous and confidential to the researchers (under the statutory obligations of the agencies which the researchers are working with).	
I am happy for the findings of this research project to be published in an academic journal, delivered at conferences and used in teaching.	
I understand that I have the right to withdraw myself and my child from this study at any point; that if I do this, all data already collected will be retained, and no further data will be collected. I understand that I will not be required to explain my reasons for withdrawing, and this will not impact my child's status at the club.	
I have read and understood the information sheet and this consent form. I am happy to participate, and for my son to participate in this study.	

Parent / Guardian Name: ____________________ Signed ______________________

Appendix EE. Study information sheet for players.

The theory of challenge and threat states suggests that sports performers approach competition in either a challenge or a threat state. A challenge state is considered more beneficial than a threat state for performance, because the performer believes they are capable of meeting the demands of the task, instead of feeling overwhelmed by the demands, and that they cannot cope. A footballer in a threat state might fear making a mistake, but a footballer in a challenge state looks forward to playing well.

This theory has been explored mainly in adult samples, and very little research has explored challenge and threat states in young footballers, which makes this piece of research valuable.

What's going to happen?

Information is collected from players and coaches of every squad, from the U9s through to the U23s. This will help to show how mental approaches differ between age groups, how approaches change over time, and what causes any changes or differences. The results from this research will help our understanding of how mental approaches to competition develop. The research may end up being published in journals, or presented at conferences. In such cases, the players and coaches will not be identifiable from the content.

What data is collected?

- Personal and family details
- Player performance data (e.g., minutes played, number of games, coach ratings, number of injuries, number of days injured, player self-ratings etc.)
- Player questionnaire data towards the start and the end of each season. The questionnaires will measure mental approaches to football, emotions, competence, autonomy, relatedness and well-being

Whilst unlikely, it is possible that you may become distressed or anxious when answering some of the questions. Should this occur, you will be supported by Jen and given the option to stop answering the questions.

If your answers highlight any well-being concerns, you will be offered support accordingly.

How is the data stored?

Where: Securely at Staffordshire University, on a password protected and encrypted laptop, and a password protected and encrypted USB pen for back-up purposes.

How long: For an initial period of 10 years. If the data is used in a published piece of research, the data will be kept for a further 10 years from the date of publication.

Who has access: Only Jennifer Hobson, Joe Dixon and Martin Turner will have access to the data. It will be stored in a coded fashion; players' names will be replaced with a code, so that data is stored anonymously. Coaches will be provided with group patterns, but will not be provided data on individual players.

Consent

If you are happy to be involved with this research, and for any findings to be published in academic journals in the future, please complete and return the consent form.

If you provide consent now, but wish to withdraw consent at a later point, please email Jennifer Hobson to do so. All data collected up until the point of withdrawal will be retained, but no further data will be collected. Failure to provide consent will not have any impact on your reviews or status at the club.

If you have any questions about the research, please contact one of the individuals below.

Jennifer Hobson, Academy Psychologist & Lead Researcher	[club email address]
Joe Dixon, 1st Team & Academy Psychologist	[club email address]
Dr. Martin Turner, PhD Supervisor School of Life Sciences and Education, Sport and Exercise, Staffordshire University, Brindley Building, Leek Road, Stoke-on-Trent, ST4 2DF	M.Turner@mmu.ac.uk 01782 294295

If you need any additional support, please speak to either Jennifer, Joe, or the club's safe guarding officer:

Stephanie Wakelin, Academy Safeguarding Officer	[club email address] 01782 592112

If you wish to seek support beyond the club, below are a list of contact details of suitable organisations:

YoungMinds www.youngminds.org.uk parents@youngminds.org.uk 0808 802 5544	UK's leading charity committed to improving emotional wellbeing and mental health of children and young people, and empowering their parents and carers.
Mind www.mind.org.uk info@mind.org 0300 123 3393	National mental health charity, which offers an excellent range of materials. It also lists details of local mind associations.
Anxiety UK www.anxiety.org.uk 0844 967 4848	Self-help leaflets and contact lists, self-help groups, counselling, phone self-help groups, email support.
ChildLine www.childline.org.uk 0800 1111	A counselling service for parents, children and young people. It also offers multilingual services to South Asian communities living in the UK. Languages include Bengali/Sylheti, Gujurati, Hindi, Punjabi, Urdu and English. Help and advice is free and confidential.

Appendix FF. Consent form for players.

Please read this consent form, and the information sheet.
If you are happy to participate, please tick the boxes and sign below:

Player's Name:	
Age Group:	

Please tick all that apply below:	**[√]**
The purpose and details of this study have been explained to me. I understand that this research is designed to further scientific knowledge and that all procedures have been approved by the Research Ethics Committee at Staffordshire University.	
I understand that I am volunteering to take part in this study.	
I have had an opportunity to ask questions about my participation.	
I understand that all the information I provide will be treated in strict confidence and will be kept anonymous and confidential to the researchers (under the statutory obligations of the agencies which the researchers are working with).	
I am happy for the findings of this research project to be published in an academic journal, delivered at conferences and used in teaching.	
I understand that I have the right to withdraw from this study at any point; that if I do this, all data already collected will be retained, and no further data will be collected. I understand that I will not be required to explain my reasons for withdrawing, and this will not impact my status at the club.	
I have read and understood the information sheet and this consent form and agree to participate in this study.	

Signed: _________________________

Date: _________________________

Appendix GG. Email to Coaches.

Jennifer is completing a PhD at Staffordshire University, exploring academy players' mental approaches to football. Very little research has been conducted on the mentalities of young footballers, which makes this research very important and valuable.

The findings from this research will benefit [club name] academy players by:

1. Helping to enhance and protect their well-being
2. Developing mental approaches to football which help enhance performance

What's going to happen?
Information will be collected from players, parents and coaches over the next 2-3 seasons, for players in the U9s squad through to the U18s. This will help to show:

- How mental approaches differ between age groups
- How approaches change over time
- What causes any changes or differences observed

As coaches, you will be asked to provide the performance data for the players. This will involve:

- Providing your predictions of who will be the "top 5" players in your group at the end of the season
- Providing a performance rating for each of your players after matches (already done /10)

The data you provide will help to show any links between the player characteristics being measured, and performance.

Consent
If you are happy to participate and contribute this data to the research then you don't need to take action, and I will be in touch at the start of the season to collect the first bits of data.

If you are not happy to participate, please complete a refusal form.

The information gained from this piece of research will provide more knowledge on the best mental approaches in youth footballers. Implications for how the club supports and develops its players will be made, to enhance well-being and performance in [club name] academy players. If you have any questions, please contact one of the individuals below.

- Jennifer Hobson, Academy Psychologist & Lead Researcher
  [club email address]
- Joe Dixon, 1st Team & Academy Psychologist
  [club email address]
- Paul White, Head of Academy Sport Science
  [club email address]
- Dr. Martin Turner, PhD Supervisor
  M.Turner@Staffs.ac.uk

Appendix HH. Email to parents of new signings.

Dear ____,

My name is Jennifer Hobson and I am the academy psychologist at [club name]. I work with the U12s-U16s when they come in for their day release days at the academy, supporting players and delivering educational psychology sessions to the teams. I also support the coaches, and will be running some parent workshops throughout the season.

Part of my role also includes the completion of PhD research; I have attached a document with information about this. The research involves asking all academy players to complete a questionnaire twice a season (in October and again in March / April), and for parents / guardians to provide some insight into who their sons are as people.

Please could I ask that you have a read over the information sheet attached (PDF), and complete and return the consent form to me if you are happy for your son's questionnaire data to be included in my research.

The attached word document is how I am collecting the data from parents, so if you are happy to, please could you complete and return to me – over email is fine if that's the most convenient method for you.

If you have any questions about this or about my role, please don't hesitate to ask me.

Many thanks and kind regards,

Jennifer Hobson
Academy Psychologist
[Club name]

Appendix II. Player study information leaflet.

Sport Psychology

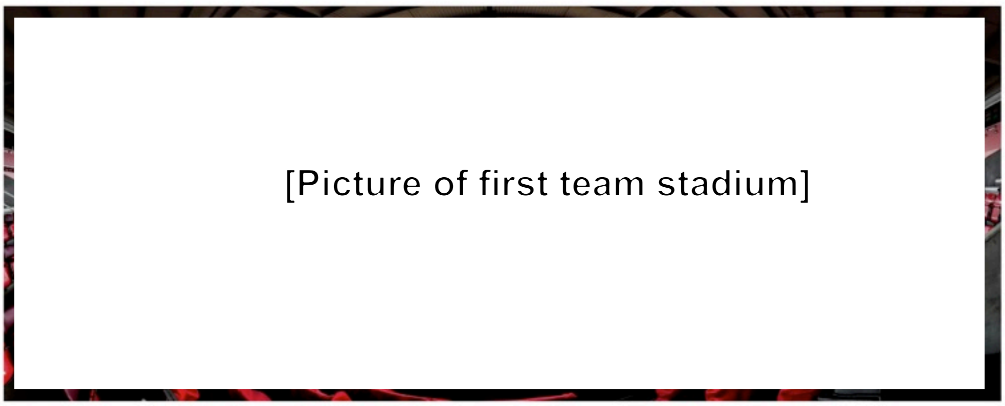
From this season onwards, [Club Name] are going to be asking all players to answer some questions.

These questions will ask you about your opinions on how you feel, and what you think - in general and about your football.

These questions are **not a test;** because there are no right or wrong answers. Your answers should just be what *you personally* think and feel.

Your personal answers will only be seen by Jen - your coaches won't get to know what you have put.

Answering these questions will help the club and Jen to support you throughout your football career.



Appendix JJ. Description of the significant correlations amongst study variables at each timepoint.

Basic Psychological Needs

Autonomy

Regarding the correlations between perceptions of autonomy and the other basic psychological needs, autonomy significantly positively correlated with competence at T1, T2, T3, T4, T5 and T6 ($p<.01$); greater perceptions of autonomy were associated with greater perceptions of competence at these timepoints. Autonomy significantly positively correlated with relatedness at T2, T3 and T4 ($p<.01$); greater perceptions of autonomy were associated with greater perceptions of relatedness at these timepoints.

Regarding the correlations between perceptions of autonomy and stress appraisals, autonomy significantly positively correlated with resource appraisals at T1, T2, T3, T4, T5 and T6 ($p<.01$); greater perceptions of autonomy were associated with greater resource appraisals at these timepoints. Autonomy significantly negatively correlated with the challenge and threat ratio and at T2, T3 ($p<.01$), T5 ($p<.05$), and T6 ($p<.01$); greater perceptions of autonomy were associated with more challenge and less threat appraisals at these timepoints. Autonomy significantly positively correlated with the challenge and threat discrepancy at T1 ($p<.05$), T2, T3 ($p<.01$), T4 ($p<.05$), T5 and T6 ($p<.01$); greater perceptions of autonomy were associated with more challenge and less threat appraisals at these timepoints. Autonomy significantly positively correlated with coping potential at T2, T3 ($p<.01$), T5 ($p<.05$), and T6 ($p<.01$); greater perceptions of autonomy were associated with greater coping potential at these timepoints.

Regarding the correlations between perceptions of autonomy and achievement goals, autonomy significantly positively correlated with approach goals at T1 ($p<.01$), T3 and T6 ($p<.05$); greater perceptions of autonomy were associated with greater pursuit of approach goals at these timepoints. Autonomy significantly positively correlated with mastery goals at T1 ($p<.05$) and significantly negatively correlated with mastery goals at T4 ($p<.05$); greater perceptions of autonomy were associated with greater pursuit of mastery goals at T1 and lesser pursuit of mastery goals at T4.

Finally, regarding the correlations between perceptions of autonomy and mental health, autonomy significantly negatively correlated with anxiety symptoms at T2, T3, T4 ($p<.01$), T5 ($p<.05$) and T6 ($p<.01$); greater perceptions of autonomy were associated with lesser anxiety symptoms at these timepoints. Autonomy significantly negatively correlated with depression symptoms at T2, T3, T4 ($p<.01$), T5 ($p<.05$) and T6 ($p<.01$); greater perceptions of autonomy were associated with lesser depression symptoms at these timepoints. Autonomy significantly positively correlated with the mental health inventory at T3, T4 ($p<.01$), T5 and T6 ($p<.05$); greater perceptions of autonomy were associated with greater (better) mental health at these timepoints. Autonomy significantly negatively correlated with common anxiety at T2, T3, T4, and T6 ($p<.01$); greater perceptions of autonomy were associated with lesser anxiety at these timepoints. Autonomy significantly negatively correlated with common depression at T2 and T4 ($p<.05$); greater perceptions of autonomy were associated with lesser depression at these timepoints.

Competence

Regarding the correlations between perceptions of competence and the other basic psychological needs, competence significantly positively correlated with relatedness at T1, T2, T3, T4, T5 an T6 ($p<.01$); greater perceptions of competence were associated with greater perceptions of relatedness at these timepoints.

Regarding the correlations between perceptions of competence and stress appraisals, competence significantly negatively correlated with demand appraisals at T1, T2, T3, T5 an T6 ($p<.01$); greater perceptions of competence were associated with lesser demand appraisals at these timepoints. Competence significantly positively correlated with resource appraisals at T2, T3, T4, T5 an T6 ($p<.01$); greater perceptions of competence were associated with greater resource appraisals at these timepoints. Competence significantly negatively correlated with the challenge and threat ratio at T1, T2, T3, T4, T5 an T6 ($p<.01$); greater perceptions of competence were associated with more challenge and less threat appraisals at these timepoints. Competence significantly positively correlated with the challenge and threat discrepancy at T1, T2, T3, T4, T5 an T6 ($p<.01$), greater perceptions of competence were associated with more challenge and less threat appraisals at these timepoints. Competence significantly positively correlated with coping potential at T2 ($p<.01$), T3, T5 ($p<.05$), and T6 ($p<.01$); greater perceptions of competence were associated with greater coping potential at these timepoints.

Regarding the correlations between perceptions of competence and achievement goals, competence significantly positively correlated with approach goals at T2 ($p<.01$) and T6 ($p<.05$); greater perceptions of competence were associated with greater pursuit of approach goals at these timepoints. Competence significantly negatively correlated with avoidance goals at T1, T2, T3 ($p<.01$), T4 ($p<.05$), T5 and T6 ($p<.01$); greater perceptions of competence were associated with lesser pursuit of avoidance goals at these timepoints. Competence significantly negatively correlated with mastery goals at T1, T3, T5 and T6 ($p<.01$); greater perceptions of competence were associated with lesser pursuit of mastery goals at these timepoints. Competence significantly negatively correlated with performance goals at T1 ($p<.01$); greater perceptions of competence were associated with lesser pursuit of performance goals at these timepoints.

Regarding the correlations between perceptions of competence and mental health, competence significantly negatively correlated with anxiety symptoms at T1 ($p<.05$), T2, T3, T4, T5 and T6 ($p<.01$); greater perceptions of competence were associated with lesser anxiety symptoms at these timepoints. Competence significantly negatively correlated with depression symptoms at T1, T2, T3, T4, T5 and T6 ($p<.01$); greater perceptions of competence were associated with lesser depression symptoms at these timepoints.

Competence significantly positively correlated with the mental health inventory at T1 ($p<.05$), T2, T3, T4, T5 and T6 ($p<.01$); greater perceptions of competence were associated with greater (better) mental health at these timepoints. Competence significantly negatively correlated with common anxiety at T2, T3 ($p<.01$), T4 and T6 ($p<.05$); greater perceptions of competence were associated with lesser anxiety at these timepoints. Competence significantly negatively correlated with common depression at T2, T4, T5 and T6 ($p<.01$); greater perceptions of competence were associated with lesser depression at these timepoints.

Finally, regarding the correlations between perceptions of competence and performance, competence at T5 ($p<.05$) significantly positively correlated with performance during the S3P1 performance period; greater perceptions of competence at T5 were associated with greater performance during the S3P1 performance period. Competence at T4 significantly negatively correlated with performance during the S2P2 performance period ($p<.01$), greater perceptions of competence at T4 were associated with lesser performance during the S2P2 performance period. Competence at T6 ($p<.01$) significantly positively correlated with performance during the S3P2 performance period; greater perceptions of competence at T6 were associated with greater performance during the S3P2 performance period.

Relatedness

Regarding the correlations between perceptions of relatedness and stress appraisals, relatedness significantly negatively correlated with demand appraisals at T1, T2, T3 ($p<.01$), T4 ($p<.05$), T5, and T6 ($p<.01$); greater perceptions of relatedness were associated with lesser demand appraisals at these timepoints. Relatedness significantly positively correlated with resource appraisals at T2, T3, T4, T5, and T6 ($p<.01$); greater perceptions of relatedness were associated with greater resource appraisals at these timepoints. Relatedness significantly negatively correlated with the challenge and threat ratio at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater perceptions of relatedness were associated with more challenge and less threat appraisals at these timepoints. Relatedness significantly positively correlated with the challenge and threat discrepancy at T1 ($p<.05$), T2, T3, T4, T5, and T6 ($p<.01$); greater perceptions of relatedness were associated with more challenge and less threat appraisals at these timepoints. Relatedness significantly positively correlated with coping potential at T2 ($p<.01$); greater perceptions of relatedness were associated with greater coping potential at these timepoints.

Regarding the correlations between perceptions of relatedness and achievement goals, relatedness significantly negatively correlated with approach goals at T1 ($p<.05$); greater perceptions of relatedness were associated with lesser pursuit of approach goals at T1. Relatedness significantly negatively correlated with avoidance goals at T4, T5 and T6 ($p<.01$); greater perceptions of relatedness were associated with lesser pursuit of avoidance goals at these timepoints. Relatedness significantly negatively correlated with mastery goals at T1 ($p<.01$), T4 ($p<.05$), and T6 ($p<.01$); greater perceptions of relatedness were associated with lesser pursuit of mastery goals at these timepoints.

Regarding the correlations between perceptions of relatedness and mental health, relatedness significantly negatively correlated with anxiety symptoms at T2, T3, T4 ($p<.01$), T5 ($p<.05$), and T6 ($p<.01$); greater perceptions of relatedness were associated with lesser anxiety symptoms at these timepoints. Relatedness significantly negatively correlated with depression symptoms at T2, T3, T4 ($p<.01$), T5 and T6 ($p<.05$); greater perceptions of relatedness were associated with lesser depression symptoms at these timepoints. Relatedness significantly positively correlated with the mental health inventory at T2 ($p<.05$), T3, T4, T5 and T6 (p<.01); greater perceptions of relatedness were associated with greater (better) mental health at these timepoints. Relatedness significantly negatively correlated with common anxiety at T2, T3 (p<.05), and T4 (p<.01); greater perceptions of relatedness were associated with lesser anxiety at these timepoints. Relatedness significantly negatively correlated with common depression at T3 (p<.05), and T4 (p<.01); greater perceptions of relatedness were associated with lesser depression at these timepoints.

Finally, regarding the correlations between perceptions of relatedness and performance, relatedness at T3 significantly positively correlated with performance during the S2P1 performance period (p<.01); greater perceptions of relatedness at T3 were associated with greater performance during the S2P1 performance period. Relatedness at T3 (p<.01) and T4 (p<.05) significantly positively correlated with performance during the S2P2 performance period greater perceptions of relatedness at T3 and T4 were associated with greater performance during the S2P2 performance period. Similarly, relatedness at T5 and T6 (p<.01) significantly positively correlated with performance during the S3P2 performance period; greater perceptions of relatedness at T5 and T6 were associated with greater performance during the S3P2 performance period. Relatedness at T6 (p<.01) significantly positively correlated with performance during the S3P3 performance period; greater perceptions of relatedness at T6 were associated with greater performance during the S3P3 performance period.

Stress Appraisals

Demand Appraisals

Regarding the correlations between demand appraisals and the other measures of stress appraisals, demand appraisals significantly positively correlated with resource appraisals at T1 (p<.01); greater demand appraisals were associated with greater resource appraisals at T1. Demand appraisals significantly positively correlated with the challenge and threat ratio at T1, T2, T3, T4, T5 and T6 ($p<.01$); greater demand appraisals were associated with less challenge and more threat appraisals at these timepoints. Demand appraisals significantly negatively correlated with the challenge and threat discrepancy at T1, T2, T3, T4, T5 and T6 ($p<.01$); greater demand appraisals were associated with less challenge and more threat appraisals at these timepoints. Demand appraisals significantly negatively correlated with coping potential at T1, T2, T3, T4, T5 and T6 ($p<.01$); greater demand appraisals were associated with lesser coping potential at these timepoints.

Regarding the correlations between demand appraisals and achievement goals, demand appraisals significantly positively correlated with approach goals at T1 ($p<.01$); greater demand appraisals were associated with greater pursuit of approach goals at T1. Demand appraisals significantly positively correlated with avoidance goals at T1, T2, T3, T4, T5 and T6 ($p<.01$); greater demand appraisals were associated with greater pursuit of avoidance goals at these timepoints. Demand appraisals significantly positively correlated with mastery goals at T1, T2, T3, T4, T5 and T6 ($p<.01$); greater demand appraisals were associated with greater pursuit of mastery goals at these timepoints. Demand appraisals significantly positively correlated with performance goals at T1, T2, T4 ($p<.01$), T5 ($p<.05$), and T6 ($p<.01$); greater demand appraisals were associated with greater pursuit of performance goals at these timepoints.

Finally, regarding the correlations between demand appraisals and mental health, demand appraisals significantly positively correlated with anxiety symptoms at T1 ($p<.05$), T2, T3, T5 and T6 ($p<.01$); greater demand appraisals were associated with greater anxiety symptoms at these timepoints. Demand appraisals significantly positively correlated with depression symptoms at T1, T2, T3, T4, T5 and T6 ($p<.01$); greater demand appraisals were associated with greater depression symptoms at these timepoints. Demand appraisals significantly negatively correlated with the mental health inventory at T1, T2 ($p<.05$), T3, T4, T5 and T6 (p<.01); lesser demand appraisals were associated with greater (better) mental health at these timepoints. Demand appraisals significantly negatively correlated with common anxiety at T1 (p<.01); greater demand appraisals were associated with lesser anxiety at T1. Demand appraisals significantly positively correlated with common depression at T2, T3 (p<.05), T5 and T6 (p<.01); greater demand appraisals were associated with greater depression at these timepoints.

Resource Appraisals

Regarding the correlations between resource appraisals and the other measures of stress appraisals, resource appraisals significantly negatively correlated with the challenge and threat ratio at T1, T2, T3, T4, T5 and T6 (p<.01); greater resource appraisals were associated with more challenge and less threat appraisals at these timepoints. Resource appraisals significantly positively correlated with the challenge and threat discrepancy at T1, T2, T3, T4, T5 and T6 (p<.01); greater resource appraisals were associated with more challenge and less threat appraisals at these timepoints. Resource appraisals significantly positively correlated with coping potential at T2, T3, T4, T5 and T6 (p<.01); greater resource appraisals were associated with greater coping potential at these timepoints.

Regarding the correlations between resource appraisals and achievement goals, resource appraisals significantly positively correlated with approach goals at T1, T2, T3, T4, T5 and T6 (p<.01); greater resource appraisals were associated with greater pursuit of approach goals at these timepoints. Resource appraisals significantly negatively correlated with avoidance goals at T2 (p<.01), T3, T4, and T6 (p<.05); greater resource appraisals were associated with lesser pursuit of avoidance goals at these timepoints. Resource appraisals significantly positively correlated with mastery goals at T1 (p<.01); greater resource appraisals were associated with greater pursuit of mastery goals at T1. Resource appraisals significantly positively correlated with performance goals at T1 ($p<.01$); greater resource appraisals were associated with greater pursuit of performance goals at T1.

Finally, regarding the correlations between resource appraisals and mental health, resource appraisals significantly negatively correlated with anxiety symptoms at T1, T2 ($p<.01$), T3 ($p<.05$), T5 and T6 ($p<.01$); greater resource appraisals were associated with lesser anxiety symptoms at these timepoints. Resource appraisals significantly negatively correlated with depression symptoms at T1, T2, T5 ($p<.01$) and T6 ($p<.05$); greater resource appraisals were associated with lesser depression symptoms at these timepoints. Resource appraisals significantly positively correlated with the mental health inventory at T1 ($p<.05$), T2, T3, T4, T5 and T6 ($p<.01$); greater resource appraisals were associated with greater (better) mental health at these timepoints. Resource appraisals significantly negatively correlated with common anxiety at T1, T2 ($p<.01$), T4 ($p<.05$), and T6 ($p<.01$); greater resource appraisals were associated with lesser anxiety at these timepoints. Resource appraisals significantly negatively correlated with common depression at T1, T2 ($p<.01$), T4 ($p<.05$), and T6 ($p<.01$); greater resource appraisals were associated with lesser depression at these timepoints.

Challenge and Threat Ratio

Regarding the correlations between the challenge and threat ratio and the other measures of stress appraisals, the challenge and threat ratio significantly negatively correlated with the challenge and threat discrepancy at T1, T2, T3, T4, T5, and T6 ($p<.01$), which is unsurprising because the two scales provide an indication of the same thing (i.e., demand appraisals against resource appraisals) in different ways and are borne from the data. The challenge and threat ratio significantly negatively correlated with coping potential at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater challenge and lesser threat appraisals were associated with greater coping potential at these timepoints.

Regarding the correlations between the challenge and threat ratio and achievement goals, the challenge and threat ratio significantly positively correlated with avoidance goals at T1, T2, T3, T4, T5, and T6 ($p<.01$); lesser challenge and greater threat appraisals were associated with greater pursuit of avoidance goals at these timepoints. The challenge and threat ratio significantly positively correlated with mastery goals at T1, T2, T3, T4, T5, and T6 ($p<.01$); lesser challenge and greater threat appraisals were associated with greater pursuit of mastery goals at these timepoints. The challenge and threat ratio significantly positively correlated with performance goals at T2, T4 ($p<.01$), and T6 ($p<.05$); lesser challenge and greater threat appraisals were associated with greater pursuit of performance goals at these timepoints.

Finally, regarding the correlations between the challenge and threat ratio and mental health, the challenge and threat ratio significantly positively correlated with anxiety symptoms at T1, T2, T3 ($p<.01$), T4 ($p<.05$), T5, and T6 ($p<.01$); lesser challenge and greater threat appraisals were associated with greater anxiety symptoms at these timepoints. The challenge and threat ratio significantly positively correlated with depression symptoms at T1, T2, T3, T4, T5, and T6 ($p<.01$); lesser challenge and greater threat appraisals were associated with greater depression symptoms at these timepoints. The challenge and threat ratio significantly negatively correlated with the mental health inventory at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater challenge and lesser threat appraisals were associated with greater (better) mental health at these timepoints. The challenge and threat ratio significantly positively correlated with common anxiety at T1 ($p<.01$), T2 and T6 ($p<.05$); lesser challenge and greater threat appraisals were associated with greater anxiety at these timepoints. The challenge and threat ratio significantly positively correlated with common depression at T1, T2, T4, T5, and T6 ($p<.01$); lesser challenge and greater threat appraisals were associated with greater depression at these timepoints.

Challenge and Threat Discrepancy

Regarding the correlations between the challenge and threat discrepancy and the other measures of stress appraisals, the challenge and threat discrepancy significantly positively correlated with coping potential at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater challenge and lesser threat appraisals were associated with greater coping potential at these timepoints.

Regarding the correlations between the challenge and threat discrepancy and achievement goals, the challenge and threat discrepancy significantly positively correlated with approach goals at T1 ($p<.01$); greater challenge and lesser threat appraisals were associated with greater pursuit of approach goals at T1. The challenge and threat discrepancy significantly negatively correlated with avoidance goals at T1, T2, T3, T4, T5, and T6 ($p<.01$); lesser challenge and greater threat appraisals were associated with greater pursuit of avoidance goals at these timepoints. The challenge and threat discrepancy significantly negatively correlated with mastery goals at T2 ($p<.05$), T3, T4, T5, and T6 ($p<.01$); lesser challenge and greater threat appraisals were associated with greater pursuit of mastery goals at these timepoints. The challenge and threat discrepancy significantly negatively correlated with performance goals at T2 ($p<.01$), and T4 ($p<.05$) lesser challenge and greater threat appraisals were associated with greater pursuit of performance goals at these timepoints.

Finally, regarding the correlations between the challenge and threat discrepancy and mental health, the challenge and threat discrepancy significantly negatively correlated with anxiety symptoms at T1, T2, T3 ($p<.01$), T4 ($p<.05$), T5, and T6 ($p<.01$); lesser challenge and greater threat appraisals were associated with greater anxiety symptoms at these timepoints. The challenge and threat discrepancy significantly negatively correlated with depression symptoms at T1, T2, T3, T4, T5, and T6 ($p<.01$); lesser challenge and greater threat appraisals were associated with greater depression symptoms at these timepoints. The challenge and threat discrepancy significantly positively correlated with the mental health inventory at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater challenge and lesser threat appraisals were associated with greater (better) mental health at these timepoints. The challenge and threat discrepancy significantly negatively correlated with common anxiety at T1, T2, and T6 ($p<.01$); lesser challenge and greater threat appraisals were associated with greater anxiety at these timepoints. The challenge and threat discrepancy significantly negatively correlated with common depression at T1, T2, T4, T5, and T6 ($p<.01$); lesser challenge and greater threat appraisals were associated with greater depression at these timepoints.

Coping Potential

Regarding the correlations between coping potential and achievement goals, coping potential significantly negatively correlated with avoidance goals at T1, T2 ($p<.01$), T3 ($p<.05$), T4, T5, and T6 ($p<.01$); greater coping potential was associated with lesser pursuit of avoidance goals at these timepoints. Coping potential significantly negatively correlated with mastery goals at T2 ($p<.05$), T4 ($p<.01$), T5 ($p<.05$), and T6 ($p<.01$); greater coping potential was associated with lesser pursuit of mastery goals at these timepoints. Coping potential significantly negatively correlated with performance goals at T1 and T4 ($p<.05$); greater coping potential was associated with lesser pursuit of performance goals at these timepoints.

Regarding the correlations between coping potential and mental health, coping potential significantly negatively correlated with anxiety symptoms at T2, T3, T5 and T6 ($p<.01$); greater coping potential was associated with lesser anxiety symptoms at these timepoints. Coping potential significantly negatively correlated with depression symptoms at T1 ($p<.05$), T2, T5 and T6 ($p<.01$); greater coping potential was associated with lesser depression symptoms at these timepoints. Coping potential significantly positively correlated with the mental health inventory at T2, T4 ($p<.05$), T5 and T6 ($p<.01$); greater coping potential was associated with greater (better) mental health at these timepoints. Coping potential significantly negatively correlated with common anxiety at T2 ($p<.05$) and T6 ($p<.01$); greater coping potential was associated with lesser anxiety at these timepoints. Coping potential significantly negatively correlated with common depression at T1 ($p<.05$), T2 ($p<.01$), T5, and T6 ($p<.05$); greater coping potential was associated with lesser depression at these timepoints.

Finally, regarding the correlations between coping potential and achievement goals and performance, coping potential at T3 significantly positively correlated with performance during the S2P2 performance period ($p<.05$); greater coping potential at T3 was associated with greater performance during the S2P2 performance period.

Achievement Goals

Approach Goals

Regarding the correlations between approach goals and the other achievement goals, approach goals significantly positively correlated with avoidance goals at T1, T2 ($p<.01$), T3 ($p<.05$), T5 and T6 ($p<.01$); greater pursuit of approach goals were associated with greater pursuit of avoidance goals at these timepoints. Approach goals significantly positively correlated with mastery goals at T1, T2 ($p<.01$), T3 ($p<.05$), T4, T5, and T6 ($p<.01$); greater pursuit of approach goals was associated with greater pursuit of mastery goals at these timepoints. Approach goals significantly positively correlated with performance goals at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater pursuit of approach goals was associated with greater pursuit of performance goals at these timepoints.

Finally, regarding the correlations between approach goals and mental health, approach goals significantly negatively correlated with common anxiety at T1, T2 ($p<.01$), and T4 ($p<.05$); greater pursuit of approach goals were associated with lesser anxiety at these timepoints.

Avoidance Goals

Regarding the correlations between avoidance goals and the other achievement goals, avoidance goals significantly positively correlated with mastery goals at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater pursuit of avoidance goals was associated with greater pursuit of mastery goals at these timepoints. Avoidance goals significantly positively correlated with performance goals at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater pursuit of avoidance goals was associated with greater pursuit of performance goals at these timepoints.

Regarding the correlations between avoidance goals and mental health, avoidance goals significantly positively correlated with anxiety symptoms at T1, T2, T3 ($p<.01$), T4 ($p<.05$), and T6 ($p<.01$); greater pursuit of avoidance goals was associated with greater anxiety symptoms at these timepoints. Avoidance goals significantly positively correlated with depression symptoms at T1, T2, T3, T4 ($p<.01$), T5, and T6 ($p<.05$); greater pursuit of avoidance goals was associated with greater depression symptoms at these timepoints. Avoidance goals significantly negatively correlated with the mental health inventory at T2 ($p<.05$), T3, T4, T5, and T6 ($p<.01$); greater pursuit of avoidance goals was associated with lesser (worse) mental health at these timepoints. Avoidance goals significantly positively correlated with common anxiety at T2 and T4 ($p<.05$); greater pursuit of avoidance goals was associated with greater anxiety at these timepoints. Avoidance goals significantly positively correlated with common depression at T2 ($p<.01$), T3 ($p<.05$), T4 ($p<.01$), T5 ($p<.05$), and T6 ($p<.01$); greater pursuit of avoidance goals was associated with greater depression at these timepoints.

Finally, regarding the correlations between avoidance goals and performance, avoidance goals at T2 ($p<.01$) significantly negatively correlated with performance during the S2P1 performance period; greater pursuit of avoidance goals was associated with lesser performance during the S2P1 performance period. Avoidance goals at T5 and T6 ($p<.05$), significantly negatively correlated with performance during the S3P1 performance period;

greater pursuit of avoidance goals was associated with lesser performance during the S3P1 performance period.

Mastery Goals

Regarding the correlations between mastery goals and the other achievement goals, mastery goals significantly positively correlated with performance goals at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater pursuit of mastery goals was associated with greater pursuit of performance goals at these timepoints.

Regarding the correlations between mastery goals and mental health, mastery goals significantly positively correlated with anxiety symptoms at T2 ($p<.05$), T3 ($p<.01$), T5 ($p<.05$), and T6 ($p<.01$); greater pursuit of mastery goals was associated with greater anxiety symptoms at these timepoints. Mastery goals significantly positively correlated with depression symptoms at T1 ($p<.01$), T2 ($p<.05$), T3 ($p<.01$), T4 ($p<.05$), T5, and T6 ($p<.01$); greater pursuit of mastery goals was associated with greater depression symptoms at these timepoints. Mastery goals significantly negatively correlated with the mental health inventory at T3, T4, T5, and T6 ($p<.01$); greater pursuit of mastery goals was associated with lesser (worse) mental health at these timepoints. Mastery goals significantly negatively correlated with common anxiety at T1 ($p<.01$); greater pursuit of mastery goals was associated with lesser anxiety at T1. Mastery goals significantly positively correlated with common anxiety at T6 ($p<.05$); greater pursuit of mastery goals was associated with greater anxiety at T6. Mastery goals significantly positively correlated with common depression at T3 ($p<.01$), T4, T5 ($p<.05$), and T6 ($p<.01$); greater pursuit of mastery goals was associated with greater depression at these timepoints.

Finally, regarding the correlations between mastery goals and performance, mastery goals at T5 ($p<.01$) significantly negatively correlated with performance during the S3P1 performance period; greater pursuit of mastery goals at T5 was associated with lesser performance during the S3P1 performance period. Mastery goals at T1 ($p<.05$) significantly negatively correlated with performance during the S1P3 performance period at T1; greater pursuit of mastery goals at T1 was associated with lesser performance during the S1P3 performance period.

Performance Goals

Regarding the correlations between performance goals and mental health, performance goals significantly positively correlated with depression symptoms at T1 ($p<.05$). Performance goals significantly positively correlated with common depression at T3 and T4 ($p<.05$).

Finally, regarding the correlations between performance goals and performance, performance goals significantly negatively correlated with performance during the P1 performance period at T2 and T3 ($p<.01$).

Mental Health

Anxiety Symptoms

Regarding the correlations between anxiety symptoms and other measures of mental health, anxiety symptoms significantly positively correlated with depression symptoms at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater anxiety symptoms were associated with greater depression symptoms at these timepoints. Anxiety symptoms significantly negatively correlated with the mental health inventory at T3, T4, T5, and T6 ($p<.01$); greater anxiety symptoms were associated with lesser (worse) mental health at these timepoints. Anxiety symptoms significantly positively correlated with common anxiety at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater anxiety symptoms were associated with greater anxiety at these timepoints. Anxiety symptoms significantly positively correlated with common depression at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater anxiety symptoms were associated with greater depression at these timepoints.

Finally, regarding the correlations between anxiety symptoms and performance, anxiety symptoms at T5 and T6 ($p<.01$) significantly negatively correlated with performance during the S3P1 performance period; greater anxiety symptoms at T5 and T6 were associated with lesser performance during the S3P1 performance period. Anxiety symptoms at T1 ($p<.05$) significantly negatively correlated with performance during the S1P2 performance period at T1; greater anxiety symptoms at T1 were associated with lesser performance during the S1P2 performance period.

Depression Symptoms

Regarding the correlations between depression symptoms and other measures of mental health, depression symptoms significantly negatively correlated with the mental health inventory at T3, T4, T5, and T6 ($p<.01$); greater depression symptoms were associated with lesser (worse) mental health at these timepoints. Depression symptoms significantly positively correlated with common anxiety at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater depression symptoms were associated with greater anxiety at these timepoints. Depression symptoms significantly positively correlated with common depression at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater depression symptoms were associated with greater depression at these timepoints.

Finally, regarding the correlations between depression symptoms and performance, depression symptoms at T5 ($p<.05$) and T6 ($p<.01$) significantly negatively correlated with performance during the S3P1 performance period; greater depression symptoms were associated with lesser performance during the S3P1 performance period. Depression symptoms at T1 ($p<.05$) significantly negatively correlated with performance during the S1P2 performance period; greater depression symptoms were associated with lesser performance during the S1P2 performance period.

Mental Health Inventory

Regarding the correlations between the mental health inventory and other measures of mental health, the mental health inventory significantly negatively correlated with common anxiety at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater mental health was associated with lesser anxiety at these timepoints. The mental health inventory significantly negatively correlated with common depression at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater mental health was associated with lesser depression at these timepoints.

Finally, regarding the correlations between the mental health inventory and performance, the mental health inventory at T2 ($p<.05$) significantly positively correlated with performance during the S1P1 performance period; greater (better) mental health at T2 was associated with greater performance during the S1P1 performance period. The mental health inventory at T3 ($p<.05$) significantly positively correlated with performance during the S2P1 performance period; greater (better) mental health at T3 was associated with greater performance during the S2P1 performance period. The mental health inventory at T5 ($p<.05$) significantly positively correlated with performance during the S3P1 performance period; greater (better) mental health at T5 was associated with greater performance during the S3P1 performance period. The mental health inventory at T2 ($p<.05$) was significantly positively correlated with performance during the S1P2 performance period; greater (better) mental health at T2 was associated with greater performance during the S1P2 performance period. The mental health inventory at T3 ($p<.05$) was significantly positively correlated with performance during the S2P2 performance period; greater (better) mental health at T3 was associated with greater performance during the S2P2 performance period.

Common Anxiety

Regarding the correlations between common anxiety and other measures of mental health, common anxiety significantly positively correlated with common depression at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater anxiety was associated with greater depression at these timepoints.

Common Depression

Regarding the correlations between common depression and performance, common depression at T3 ($p<.05$) significantly negatively correlated with performance during the S2P1 performance period; greater depression at T3 was associated with lesser performance during the S2P1 performance period. Common depression at T6 ($p<.01$) was significantly positively correlated with performance during the S3P1 performance period; greater depression at T6 was associated with greater performance during the S3P1 performance period. Common depression at T3 and T4 ($p<.01$) significantly negatively correlated with performance during the S2P2 performance period; greater depression at T3 and T4 was associated with lesser performance during the S2P2 performance period.

Performance

Regarding the correlations between measures of performance, performance during the P1 performance period significantly positively correlated with performance during the P2 performance period at T1, T2, T3, T4, T5, and T6 ($p<.01$); greater performance during the first performance period of each season was associated with greater performance during the second performance period of each season. Performance during the P1 performance period significantly positively correlated with performance during the P3 performance period at T1, T2, T4, T5, and T6 ($p<.01$); greater performance during the first performance period of each season was associated with greater performance during the third performance period of each season. Performance during the P2 performance period significantly positively correlated with performance during the P3 performance period at T1, T2, T4, T5, and T6 ($p<.01$); greater performance during the second performance period of each season was associated with greater performance during the third performance period of each season.

Appendix KK. Descriptive statistics for perceived demands, perceived resources and the challenge and threat ratio at each timepoint.

Statistic	Variable																	
	Demands						Resources						Challenge and Threat Ratio					
	Timepoint																	
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6
Range	4.60	4.20	3.80	4.20	4.70	4.35	3.75	2.50	2.50	2.25	2.00	2.00	0.89	0.77	0.81	0.84	0.83	0.83
Minimum	2.00	2.50	2.80	2.30	1.90	2.05	3.25	4.50	4.50	4.75	5.00	5.00	0.37	0.45	0.44	0.34	0.27	0.29
Maximum	6.60	6.70	6.60	6.50	6.60	6.40	7.00	7.00	7.00	7.00	7.00	7.00	1.26	1.22	1.26	1.18	1.10	1.13
Mean	3.86	4.43	4.44	4.34	4.21	4.35	5.61	6.12	6.32	6.27	6.35	6.31	0.70	0.73	0.71	0.70	0.67	0.70
Std. Error	0.07	0.07	0.06	0.08	0.07	0.07	0.08	0.05	0.04	0.05	0.04	0.05	0.01	0.01	0.01	0.01	0.01	0.01
SD	0.93	0.79	0.74	0.87	0.89	0.86	0.99	0.58	0.57	0.57	0.49	0.57	0.15	0.16	0.14	0.16	0.16	0.16
Variance	0.86	0.62	0.55	0.76	0.79	0.74	0.97	0.34	0.33	0.33	0.24	0.32	0.02	0.03	0.02	0.03	0.02	0.03
Skewness	0.46	0.36	0.29	0.20	0.04	0.19	-0.23	-0.62	-0.98	-0.69	-0.37	-0.37	0.48	0.65	0.86	0.44	0.30	0.26
Std. Error	0.20	0.20	0.19	0.21	0.19	0.20	0.20	0.20	0.19	0.21	0.19	0.20	0.20	0.20	0.19	0.21	0.19	0.20
Kurtosis	0.08	-0.13	-0.39	-0.25	0.12	-0.30	-1.25	-0.05	0.79	-0.18	-0.46	-0.82	0.64	0.20	1.51	0.22	0.30	0.05
Std. Error	0.39	0.41	0.38	0.42	0.37	0.39	0.39	0.41	0.38	0.42	0.37	0.39	0.39	0.41	0.38	0.42	0.37	0.39
Median	3.80	4.40	4.40	4.30	4.20	4.30	5.75	6.25	6.50	6.25	6.25	6.25	0.68	0.71	0.69	0.68	0.65	0.70
Mode	3.40	4.00	4.60	3.70	4.00	3.40	4.75	6.25	6.25	6.75	6.25	7.00	0.59	0.68a	0.74	0.56	0.57	0.57

a = multiple modes exist, smallest shown

Appendix LL. Descriptive statistics for coping potential at each timepoint.

Statistic	Variable Coping Potential Timepoint					
	T1	T2	T3	T4	T5	T6
Range	7.00	7.00	6.00	7.00	8.50	6.00
Minimum	-4.00	-4.00	-3.00	-4.00	-4.00	-3.00
Maximum	3.00	3.00	3.00	3.00	4.50	3.00
Mean	-0.09	-0.41	-0.15	-0.16	0.08	-0.16
Std. Error	0.10	0.11	0.09	0.11	0.11	0.09
SD	1.29	1.31	1.18	1.22	1.50	1.09
Variance	1.68	1.72	1.39	1.50	2.26	1.19
Skewness	0.03	-0.05	0.40	0.18	0.37	0.21
Std. Error	0.20	0.20	0.19	0.21	0.19	0.20
Kurtosis	0.84	-0.06	0.63	0.62	1.05	1.31
Std. Error	0.39	0.41	0.38	0.42	0.37	0.39
Median	0.00	0.00	0.00	0.00	0.00	0.00
Mode	0.00	0.00	0.00	0.00	0.00	0.00

Appendix MM. Descriptive statistics for perceived autonomy, perceived competence, and perceived relatedness at each timepoint.

Statistic	Autonomy						Competence						Relatedness					
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6
Range	3.40	3.40	3.40	3.40	3.80	3.60	2.60	2.60	2.60	2.80	2.40	2.60	3.00	2.60	2.50	2.40	2.20	2.30
Minimum	2.60	2.60	2.60	2.60	2.20	2.40	3.40	3.40	3.40	3.20	3.60	3.40	3.00	3.40	3.50	3.60	3.80	3.70
Maximum	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Mean	4.70	4.58	4.69	4.58	4.48	4.46	5.03	4.98	5.08	4.90	5.07	5.06	5.23	5.30	5.37	5.31	5.37	5.35
Std. Error	0.06	0.06	0.05	0.06	0.06	0.06	0.05	0.05	0.04	0.05	0.04	0.05	0.06	0.05	0.05	0.05	0.04	0.05
SD	0.72	0.71	0.67	0.67	0.76	0.80	0.60	0.53	0.55	0.58	0.58	0.57	0.68	0.60	0.61	0.58	0.57	0.59
Variance	0.51	0.50	0.46	0.45	0.57	0.65	0.36	0.29	0.30	0.34	0.34	0.32	0.47	0.36	0.37	0.33	0.32	0.35
Skewness	-0.23	-0.39	-0.41	-0.37	-0.48	-0.22	-0.58	-0.62	-0.73	-0.55	-0.19	-0.19	-0.95	-0.88	-0.89	-0.70	-0.66	-0.75
Std. Error	0.20	0.20	0.19	0.21	0.19	0.20	0.20	0.20	0.19	0.21	0.19	0.20	0.20	0.20	0.19	0.21	0.19	0.20
Kurtosis	-0.43	-0.42	0.37	-0.02	-0.06	-0.46	-0.19	0.43	0.49	0.23	-0.46	-0.33	0.49	0.58	-0.03	0.21	-0.32	-0.18
Std. Error	0.39	0.41	0.38	0.42	0.37	0.39	0.39	0.41	0.38	0.42	0.37	0.39	0.39	0.41	0.38	0.42	0.37	0.39
Median	4.80	4.60	4.80	4.60	4.60	4.54	5.20	5.00	5.20	5.00	5.00	5.00	5.40	5.40	5.60	5.40	5.40	5.40
Mode	4.80	4.60	4.80	4.40	5.20	4.80	5.20a	5.00	5.20	5.00	5.00	5.20	6.00	6.00	6.00	6.00	6.00	6.00

a = multiple modes exist, smallest shown

Appendix NN. Descriptive statistics for approach and avoidance goals at each timepoint.

Statistic	Variable											
	Approach Goals						Avoidance Goals					
	Timepoint											
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6
Range	4.00	3.75	3.00	3.00	3.00	3.75	6.00	6.00	6.00	6.00	6.00	6.00
Minimum	3.00	3.25	4.00	4.00	4.00	3.25	1.00	1.00	1.00	1.00	1.00	1.00
Maximum	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Mean	5.61	6.13	6.34	6.21	6.21	6.17	3.39	4.07	3.65	3.73	3.63	3.56
Std. Error	0.09	0.08	0.06	0.07	0.07	0.07	0.11	0.11	0.11	0.12	0.11	0.12
SD	1.08	0.91	0.75	0.84	0.88	0.90	1.42	1.31	1.42	1.37	1.46	1.45
Variance	1.16	0.82	0.57	0.71	0.77	0.81	2.00	1.72	2.02	1.87	2.12	2.11
Skewness	-0.16	-0.87	-1.13	-0.94	-1.03	-0.98	0.28	0.08	0.16	-0.03	0.16	0.19
Std. Error	0.20	0.20	0.19	0.21	0.19	0.20	0.20	0.20	0.19	0.21	0.19	0.20
Kurtosis	-1.17	-0.14	0.67	0.09	0.17	0.30	-0.74	-0.41	-0.66	-0.29	-0.65	-0.80
Std. Error	0.39	0.41	0.38	0.42	0.37	0.39	0.39	0.41	0.38	0.42	0.37	0.39
Median	5.50	6.50	6.50	6.25	6.50	6.50	3.50	4.00	3.50	4.00	3.50	3.50
Mode	5.00	7.00	7.00	7.00	7.00	7.00	2.50	4.00	4.00	4.00	4.00	2.50

Appendix OO. Descriptive statistics for mastery and performance goals at each timepoint.

Statistic	Mastery Goals						Performance Goals					
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6
Range	4.50	3.75	3.00	3.75	3.75	3.75	6.00	6.00	5.50	6.00	6.00	6.00
Minimum	2.50	3.25	4.00	3.25	3.25	3.25	1.00	1.00	1.50	1.00	1.00	1.00
Maximum	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Mean	4.86	5.60	5.35	5.37	5.27	5.23	4.14	4.60	4.64	4.56	4.56	4.50
Std. Error	.08	.07	.07	.07	.07	.07	.11	.11	.10	.11	.11	.12
SD	1.04	.85	.87	.85	.92	.88	1.36	1.26	1.27	1.25	1.44	1.43
Variance	1.09	.73	.77	.72	.85	.78	1.84	1.59	1.62	1.55	2.09	2.03
Skewness	.10	-.35	.13	-.09	.01	.13	.16	-.24	.17	-.03	-.19	-.08
Std. Error	.20	.20	.19	.21	.19	.20	.20	.20	.19	.21	.19	.20
Kurtosis	-.67	-.28	-.92	-.60	-.83	-.63	-.50	-.17	-.43	.27	-.39	-.37
Std. Error	.39	.41	.38	.42	.37	.39	.39	.41	.38	.42	.37	.39
Median	4.75	5.50	5.50	5.50	5.50	5.50	4.00	4.75	4.50	4.50	4.50	4.00
Mode	4.50	5.50	5.50	5.50	5.50	5.50	4.00	4.00	4.00	4.00	4.00	4.00

Appendix A. Descriptive statistics for anxiety symptoms, depression symptoms and mental health at each timepoint.

Statistic	Anxiety (GAD-10)						Depression (PHQ-8)						Mental Health (MHI-5)					
	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6	T1	T2	T3	T4	T5	T6
Range	1.80	1.20	1.30	1.30	.60	1.10	1.25	1.38	1.00	1.00	.94	.88	56.00	44.00	52.00	56.00	50.00	48.00
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	44.00	56.00	48.00	44.00	50.00	52.00
Maximum	1.80	1.20	1.30	1.30	.60	1.10	1.25	1.38	1.00	1.00	.94	.88	100.00	100.00	100	100.00	100.00	100.00
Mean	.37	.38	.36	.36	.14	.23	.34	.33	.28	.29	.18	.22	78.22	76.51	79.83	80.67	81.84	83.30
Std. Error	.03	.03	.03	.03	.01	.03	.03	.04	.02	.03	.02	.02	1.91	1.41	.87	1.05	.84	.86
SD	.34	.31	.31	.32	.16	.27	.31	.33	.26	.27	.24	.23	14.07	10.44	11.11	12.03	10.99	10.59
Variance	.11	.09	.10	.10	.03	.07	.10	.11	.07	.07	.06	.05	197.84	109.07	123.50	144.78	120.72	112.14
Skewness	1.74	.94	.90	.98	1.10	1.36	.85	1.44	1.00	.94	1.56	.99	-.86	-.15	-.79	-1.11	-.81	-.89
Std. Error	.24	.26	.23	.26	.22	.23	.24	.26	.23	.26	.22	.23	.33	.32	.19	.21	.19	.20
Kurtosis	3.60	.36	.33	.44	.29	1.41	.22	2.27	.38	.27	1.93	.40	.31	-.45	.28	1.30	.25	.48
Std. Error	.48	.51	.46	.51	.44	.46	.48	.51	.46	.51	.44	.46	.64	.63	.38	.42	.37	.39
Median	.30	.30	.30	.30	.10	.10	.25	.25	.25	.25	.13	.13	82.00	76.00	84.00	84.00	84.00	84.00
Mode	.20	.20	.20	0	0	0	0	0	.13	0	0	0	84.00	72.00a	88.00	88.00	88.00	88.00

a = multiple modes exist, smallest shown

Appendix QQ. Protocol designed for following up on GAD-10 and PHQ-8 data scores.

For all players, complete a "steps taken" document – see template.

GAD: Mild

1. Find the player's name	What else do we know about this player?
2. Find out which questions are scored highly and look for patterns a. Q5: Sleep question. Compare to sleep q on PHQ, and mention to sport science / physio. b. Q6 & Q7: Avoidance question. c. Q8: Indecisive question. d. Q9 & Q10: Reassurance question.	How many players in an age group score highly on these questions? If more than 3 players, consider prioritising the corresponding topics in the curriculum.
3. Comment on whether there's any information I know about that player which might explain their higher score a. Based on this, decide if they need to recomplete b. If they do recomplete, check interpretation of questions during recompletion	If they do re-complete, do so in the same format as initial completion. Highlight as a positive thing, for tracking, and that multiple players have been asked to re-complete.
4. If they don't recomplete, monitor their score at the next completion	

GAD: Moderate

1. Find the player's name	What else do we know about this player?
2. Find out which questions are scored highly and look for patterns a. Q5: Sleep question. Compare to sleep q on PHQ, and mention to sport science / physio. b. Q6 & Q7: Avoidance question. c. Q8: Indecisive question. d. Q9 & Q10: Reassurance question.	How many players in an age group score highly on these questions? If more than 3 players, consider prioritising the corresponding topics in the curriculum.
3. Comment on whether there's any information I know about that player which might explain their higher score	
4. Player re-completes questionnaire a. Check interpretation of questions b. Re-start checking process based on outcome of recompletion	Re-complete in the same format as initial completion Highlight as a positive thing, for tracking, and that multiple players have been asked to re-complete.

Note. Topics covered in the curriculum and delivered to teams will support with Q5-Q10…
Q5: Sleep, Q6 & Q7: Approach vs. Avoidance Thoughts, Q8: Confidence, Q9 & Q10: Social support / Coping & Team Building

GAD: Moderately Severe

1. Find the player's name	What else do we know about this player?
2. Find out which questions are scored highly and look for patterns a. Q5: Sleep question. Compare to sleep q on PHQ, and mention to sport science / physio. b. Q6 & Q7: Avoidance question. a. Q8: Indecisive question. b. Q9 & Q10: Reassurance question.	How many players in an age group score highly on these questions? If more than 3 players, consider prioritising the corresponding topics in the curriculum.
3. Comment on whether there's any information I know about that player which might explain their higher score	
4. Have 1-1 conversation & player recompletes questionnaire a. Check interpretation of questions b. If still high, provide 1-1 support accordingly c. Monitor with questionnaire recompletions d. If scores remain high or if they escalate higher, mention to safe guarding, consider referral	Re-complete in the same format as initial completion Highlight as a positive thing, for tracking, and that multiple players have been asked to re-complete. In discussion, focus on the topic areas highlighted as more important in step 2.

GAD: Severe

1. Find the player's name	What else do we know about this player?
2. Have 1-1 conversation & player recompletes questionnaire a. Check interpretation of questions b. If still severe, mention to Joe / safeguarding / involve parents c. Support accordingly, referral	Re-complete in the same format as initial completion Highlight as a positive thing, for tracking, and that multiple players have been asked to re-complete. In discussion, focus on the topic areas highlighted as more important in step 2.

For all players, complete a "steps taken" document – see template.

PHQ – Possible Diagnosis of Depression if…

1. Scores of 2+ question 11 **AND/OR** 12
2. **AND** Scores of 2+ for 4 or 5 other questions (4 or 5 because guidance of 5 refers to PHQ-9 and we are using 8 items not 9)

PHQ: Mild

1. Find the player's name	What else do we know about this player?
2. Find out which questions are scored highly and look for patterns a. Q13 & 15: Sleep. Compare to sleep qs on GAD, and mention to sport science / physio. b. Q14: Appetite / weight loss. Speak to sport science / physio / nutrition c. Q16: Negative thoughts about self.	How many players in an age group score highly on these questions? If more than 3 players, consider prioritising the corresponding topics in the curriculum.
3. Comment on whether there's any information I know about that player, which might explain their higher score a. Based on this, decide if they need to recomplete b. If they do recomplete, check interpretation of questions during recompletion	If they do re-complete, do so in the same format as initial completion. Highlight as a positive thing, for tracking, and that multiple players have been asked to re-complete.
4. If they don't recomplete, monitor their score at the next completion	

PHQ: Moderate

1. Find the player's name	What else do we know about this player?
2. Find out which questions are scored highly and look for patterns d. Q13 & 15: Sleep. Compare to sleep qs on GAD, and mention to sport science / physio. e. Q14: Appetite / weight loss. Speak to sport science / physio / nutrition f. Q16: Negative thoughts about self.	How many players in an age group score highly on these questions? If more than 3 players, consider prioritising the corresponding topics in the curriculum.
3. Comment on whether there's any information I know about that player, which might explain their higher score	
4. Player re-completes questionnaire a. Check interpretation of questions b. Re-start checking process based on outcome of recompletion c. If still moderate or higher, have 1-1 conversation d. Support and monitor with further completions	Re-complete in the same format as initial completion Highlight as a positive thing, for tracking, and that multiple players have been asked to re-complete.

PHQ: Moderately Severe – Diagnosis Possible

1. Find the player's name	What else do we know about this player?
2. Check scores against depression diagnosis criteria	
√ Diagnosis Criteria Met	**X Diagnosis Criteria Not Met**
3. Comment on whether there's any information I know about that player which might explain their higher score 4. Have 1-1 conversation & player recompletes questionnaire a. Check interpretation of questions b. If scores remain high or if they escalate higher, mention to Joe / safe guarding, consider referral c. Support accordingly, monitor with recompletions	3. Comment on whether there's any information I know about that player which might explain their higher score 4. Find out which questions are scored highly and look for patterns a. Q13&15: Sleep question. Compare to sleep qs on GAD, and mention to sport science / physio b. Q14: Appetite / weight loss. Speak to sport science / physio / nutrition c. Q16: Negative thoughts about self. 5. Have 1-1 conversation & player recompletes questionnaire a. Check interpretation of questions b. Discuss topics scored highly as per point 4. c. If still moderate, without meeting diagnosis criteria, support accordingly and monitor with recompletions d. If scores remain high or if they escalate higher and diagnosis criteria are met, mention to Joe / safe guarding & consider referral

PHQ: Severe – Diagnosis Likely

1. Find the player's name	What else do we know about this player?
2. Check score against depression diagnosis criteria	Be aware that diagnosis criteria will likely be met
3. Have 1-1 conversation & player recompletes questionnaire a. Check interpretation of questions b. If less severe, support accordingly, mention to Joe / safeguarding, monitor, consider referral c. If still severe, mention to Joe / safeguarding, referral	Re-complete in the same format as initial completion Highlight as a positive thing, for tracking, and that multiple players have been asked to re-complete.

Appendix RR. Psychoeducation Session Plan and Reflection

Session name: Power of control – Game of chance

Session type: Classroom (with ideas for transferring to other dept's sessions?) **Date:** 07/01/19

Key Message(s)

* Focusing on what we can control helps us feel better
* Focusing on what we can't control, & realising when things don't go the way we'd like = makes us feel worse

Beginning:

Energiser?
- FIFA game of higher or lower?
- quick fire charades?

Deliver Introduce idea of control, split into 2 groups & ask each to come up with as many things to do with football that they can control / can't control / can only influence.

CONTROLLABLE	UNCONTROLLABLE	CAN INFLUENCE

Middle:

Game to illustrate control / lack of control

5 coin flips per player.

Heads = player name moves up 1.

Tails = player name moves down 1.

5 possible outcomes; 3 positive and 2 negative.

See where each player ends up.

Vary according to age.

U14s
- released at 16
- offered early scholar
- released at end of season
- renewal at end of season
- offered ~~early~~ scholar at 16
- released at 16
- offered early scholar

RS 1 2 3 4 5

End:

* Control of flipping coin, but not what it lands on

* Didn't have any control at any point, but how did it feel at diff. points? → more nervous in later flips? Closer to time.

* These outcomes may not be 100% controllable, but you can influence them. You can influence them from point 1.
 → What can you control / do now, to ↑ your chances of getting what you want in the future?

* when negative things happen, which are beyond our control, accepting what is beyond our control, & focusing on our next plan of action = our best bet.

Summary Questions, Link to Football:

When things don't go to plan
- feelings
- helpful to focus on

Where you end up is not down to chance / flip of a coin. What can you do/control from now that could help you get what you want

If-then progression ideas:

Create a grid on A3 to show flips + consequences

Rule – on coin flip, coin has to go above your head. (No cheating)

Notes:

✓ - Create some posters / a worksheet for players to list controllables, uncontrollables & influencables. Pens

✓ Print 3 copies of controllable / uncontrollable table.

✓ Get blue tack to use on board to move players across

✓ Have a coin

✓ Have paper to allow players to write name & draw a quick self-portrait.

Heads ↑+→					
Start 					?
Tails ↓+→					

Psych Theory Covered:
Control, confidence, nerves.

Personal Reflections: → U14s session.

Being interrupted half way through the session by colleagues collecting chairs from around the outside of the room, to be used in a ~~[illegible]~~ staff meeting because the first team manager had just been sacked. Ironic given the session content. In the planning phase, I was conscious of the outcomes / consequences being something players wouldn't be bothered about avoiding. Talking about my session with other sport science staff and asking for their advice, & them showing genuine interest in finding out more about my session, meant I was able to benefit from their help, their mind, and ~~[illegible]~~ their ideas, which improved the session. Evidence of me settling in, integrating, perceiving support from my ~~[illegible]~~ colleagues.

Can control = ☺ + confidence
Can't control = ☹
Influence

Luck? 50:50 chance.
No control
Coin must go above head on flick. *

How did you feel on flip 1/2? Did this change on flip 5?
- How? why? Can't control any flip but each does impact what you end up on
- Where you end up isn't down to luck. There's things you can do/control/influence from now - what are these?

A

Age Group 1: U14s 08/01/19.

Went Well:
Warm up activity / trivia quiz was effective in initiating player engagement. Piggybacked that enthusiasm onto the recall of what we'd covered before Christmas. Players mentioned quite a lot of things, especially Player 1, Player 2, Player 3. The game at the end went well – players engaged well, & the lessons mapped onto game components quite well; hopefully the messages are memorable / we can check in with this next time. Session was timed well, aided by players arriving in good time, giving us a full 40 something mins.

Even Better If:
I had been more vague & less restrictive with my activity worksheet. If I'd left it blank, some may have come up with the 'influence' part themselves. My dichotomous table was probably restrictive, but some ~~no~~ players did put words in the middle on the line. A ⟷ may have been better, with the central part representing 'influence'. The consequences could have been more motivational, eg. ear flicks or a positive thing → could've been 'don't have to collect kit' if I'd liaised with coaches. Could've just had 2 consequences. Although this would have reduced the football motivational aspect, ie take control, earn your renewal.

Observations:
Player 4, Player 5 quiet. Group went a bit awkwardly quiet at the end when Player 4 had his go; socially awkward in the group. Player 7 was less engaged. Player 6 too, don't seem to have buy in but that makes sense, given that they're new to the system. Respect will come over time.

Unexpected Links / Implications / Changes:
I ended up asking the players how they felt they'd applied what they've learnt so far this season to their football. The answer was not a lot – only thing was Player 1 saying about how they walk out on match days. Helps me realise I should be more practical – talk about clear strategies.