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3          Investigating irrational beliefs, cognitive appraisals, challenge and threat, and

4                  affective states in golfers approaching competitive situations.

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1                                                    Abstract

2       On approach to competitive situations, affective states (emotions and anxiety) occur through

3       the complex interaction of cognitive antecedents. Researchers have intimated that irrational

4       beliefs might play an important role in the relationship between cognitive appraisals and

5       affective states, but has ignored challenge and threat. In the current research, we examine the

6       interaction between cognitive appraisals, irrational beliefs, and challenge and threat to predict

7       golfers' pre-competitive affective states. We adopted a cross-sectional atemporal design to

8       examine how golfers approached two different competitive situations: imagined imminent

9       golf competition (phase 1), and actual future golf competition (phase 2). Path analysis

10      revealed how cognitive appraisals, irrational beliefs, and challenge and threat interact to

11      predict affective states among golfers. Serial atemporal multiple mediation analysis indicated

12      that the relationships between cognitive appraisals and affective states were mediated by

13      irrational beliefs and challenge and threat. Further, some differences were revealed between

14      phase 1 and phase 2 in the serial multiple atemporal mediation results with regard to

15      challenge. That is, at phase 1 no significant serial mediation was found for any affective

16      outcomes, but at phase 2 significant serial mediation was found for all affective states,

17      showing that irrational beliefs and challenge serial mediated the associations between

18      cognitive appraisals and affective states. The finding that mediation and bivariate

19      associations differed across phase 1 and phase 2 is echoed in the phase 1-phase 2 tests of

20      differences. The current research makes a theoretical advancement by elucidating in more

21      detail the complex interaction between cognitive antecedents and mediators of affective

22      states. Specifically, the inclusion of challenge and threat alongside irrational beliefs and

23      cognitive appraisals is an important theoretical advancement that builds on work inside of

24      sport literature (e.g., Dixon et al., 2016) and outside of sport literature (e.g., David et al.,

1  2002; 2005), as this constellation of theoretically related antecedents of affective states has

2  not been examined together in the extant research.

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1           Investigating irrational beliefs, cognitive appraisals, challenge and threat, and

2           affective states in golfers approaching competitive situations.

3      For individuals taking part in sport, the anticipation time prior to stressful situations such as a

4      sporting competition (Neil, Hanton, Mellalieu, & Fletcher, 2011) is often daunting due to an

5      over emphasis on winning and uncertainty of the outcome (Folkman & Lazarus, 1985).

6      Athletes' pre-competitive anticipatory psychological states have been the focus of much

7      research, and competition anxiety is one of the most studied areas in the discipline of sport

8      psychology (Mellalieu, Hanton, & Fletcher, 2006). There are a number of frameworks that

9      attempt to explain the occurrence of pre-competitive emotions (Jones & Uphill, 2012), but

10     one underexplored framework that is growing in the sport literature (Turner, 2016) is

11     Rational Emotive Behavioral Therapy (REBT; Ellis, 1957).

12         REBT is considered to be the original cognitive behavioral therapy (CBT), and was

13     developed by Albert Ellis in 1955, inspired by ancient philosophers, particularly the Stoic

14     philosopher Epictetus (1948) who proclaimed in *The Enchiridion*: "men are not disturbed by

15     things, but by the view which they take of them". Ellis (1994) developed a framework for

16     understanding and treating psychological disturbance known as the GABC framework. In this

17     framework, individual goals, values, and desires (G), that are thwarted or obstructed by

18     events and situations (A), can trigger healthy or unhealthy emotional and behavioural

19     consequences (C), depending on one's beliefs (B) about the self, others, and the world in

20     relation to the situation (A). If an individual's beliefs are rational (flexible, logical, and non-

21     extreme) then healthy emotions and adaptive behaviours will occur. In contrast, if an

22     individual's beliefs are irrational (rigid, illogical, and extreme) then unhealthy emotions and

23     maladaptive behaviours will occur (Szentagotai & Jones, 2010). As such, irrational beliefs

24     have attracted much research attention (e.g., Visla, Fluckiger, Holtforth, & David, 2016).

1		Within REBT, irrational and rational beliefs are the core constructs that mediate

2	between what we experience, and our emotional responses. Since its inception in 1955 (Ellis,

3	1957), REBT has included irrational beliefs as the fundamental cognitions that determine

4	psychological ill-being. In sport and exercise literature, irrational beliefs as posited in REBT

5	have been the subject of enquiry more recently (Turner, Aspin, & Gillman, 2019), and data

6	indicates that irrational beliefs are a risk factor for mental illness in athletes (Turner, 2016).

7	In the current paper, we seek to gain a deeper and more complex understanding of how

8	irrational beliefs determine athlete affective states (emotions and anxiety).

9		In REBT, it is suggested that individuals often adopt irrational beliefs in situations

10	that are of utmost importance to them. Irrational beliefs have been consistently associated

11	with various types of emotional distress (Visla et al., 2016), with the positive relationship

12	between irrational beliefs and anxiety being particularly strong ($r = .41$). Importantly, the

13	association between irrational beliefs and anxiety is stronger when a stressful event is real,

14	actually present, and is personally relevant, as opposed to being experimentally induced,

15	absent, and not personally relevant. In sport, higher irrational beliefs have been found to be

16	related to greater emotional and physical exhaustion (Turner & Moore, 2015), and anxiety,

17	anger, and depression (Turner, Carrington, & Miller, 2019). Also, irrational beliefs have been

18	targeted for intervention in athletes experiencing heightened anxiety (Turner & Barker, 2013;

19	Turner, Ewen, & Barker, 2018b).

20		Although in the extant literature irrational beliefs have been found to be associated

21	with dysfunctional emotions and maladaptive behaviours (see Turner, 2016 for a review), the

22	precise mechanisms that explain how irrational beliefs lead to emotional and behavioral

23	dysfunction has not yet been fully elucidated. Over the years REBT has grown into a well-

24	established CBT, but it remains less visible in the mainstream study of emotion due to lack of

25	experimental rigour (David, Schnur, & Belloiu, 2002; Padesky & Beck, 2003; Still, 2001).

1    There is a growing body of research that places irrational beliefs within the conceptual

2    framework of cognitive appraisal theory (CAT; David, Ghinea, Macavei, & Kallay, 2005;

3    David et al., 2002; Lazarus, 1991) in order to advance Ellis's cognitive theory of emotion.

4    Therefore, the main purpose of the current study is to examine irrational beliefs as part of

5    cognitive appraisals in the prediction of pre-competitive affective states.

6            Past literature has intimated that irrational beliefs might play an important role in

7    cognitive appraisals (David et al., 2002, 2005). According to Lazarus' CAT (Lazarus &

8    Folkman, 1984; Lazarus, 1991; Smith & Lazarus, 1993), information processing includes a

9    transaction between the goals of the individual and the representation of environmental

10   encounters. This transaction can be appraised as harmful, beneficial, threatening or

11   challenging. The CAT comprises primary appraisals, which are concerned with the extent to

12   which the encounter is relevant to one's well-being, and secondary appraisals which concerns

13   one's resources and options for coping with the encounter (Smith & Lazarus, 1993).

14   Specifically, primary appraisal includes motivational relevance (MR; evaluation of the extent

15   to which the encounter is relevant to one's goals) and motivational congruence (MC;

16   evaluation of the extent to which the encounter is consistent with one's goals). In anticipation

17   of stressors, the components of secondary appraisal are problem-focused coping potential

18   (PFC; evaluations of one's ability to act directly on the situation to bring it in accord with

19   one's goals), and emotion focused coping potential (EFC; evaluations of one's ability to

20   psychologically adjust to the situation by altering one's interpretations, desires, or beliefs;

21   Smith & Lazarus, 1993). The primary and secondary appraisals combine to form different

22   core-relational themes that result in emotions. For anxiety, the core relational theme is

23   uncertain, existential threat (Lazarus, 1991) where primary appraisals of high MR and low

24   MC combine with secondary appraisals of low EFC (Smith & Lazarus, 1993).

1    Researchers have explored the links between irrational beliefs and cognitive appraisals,

2    finding that anxiety is most effectively predicted by a combination of high MR, low MC, low

3    EFC, and irrational beliefs (David et al., 2002; 2005). Clearly, there are some demonstrable

4    relationships between the concepts of irrational beliefs proposed by Ellis, and CAT proposed

5    by Lazarus. Ellis and Lazarus recognized this potential relationship in their works, with Ellis

6    recognizing the influence of Lazarus on his thinking (Ellis, 1994), and with Lazarus explicitly

7    addressing the overlap between REBT and the Lazarusian CAT (Lazarus, 1989). To explain

8    the potential links between REBT and the CAT, Ziegler (2001) suggests that cognitive

9    appraisals (both primary and secondary) are thoroughly couched in, and interconnected with,

10   beliefs in the GABC model. For example, a golfer is anticipating the tee-off for an important

11   competition with a lucrative reward (reflecting G in the REBT model, and MR in the CAT).

12   The golfer has not competed in such a prestigious event before and is unsure whether he will

13   perform well (reflecting A in the REBT model, and low MC in the CAT) and believes that he

14   absolutely must perform well and he could not tolerate underperforming (reflecting irrational

15   beliefs in the REBT model). Because the prospect of underperforming (A) is rendered highly

16   dangerous to his goals (G) by the irrational beliefs, the golfer is likely to appraise the

17   situation as a threat (Lazarus, 1999). If the golfer believes that he cannot psychologically

18   adjust to the encounter (low EFC), and is not flexible in his coping abilities (Ziegler, 2001),

19   then he is more likely to experience dysfunctional anxiety (David et al., 2002) in anticipation

20   of the tee-off. Importantly, cognitive appraisals and irrational beliefs are seen as co-occurring

21   simultaneously rather than occurring in a sequential and fixed order.

22          Within a sporting context, researchers have investigated the association between

23   irrational beliefs and challenge and threat, finding irrational beliefs to be positively associated

24   with threat and no association to be found with challenge (Dixon, Turner, & Gillman, 2016).

25   Similarly, another study (Evans, Turner, Pickering, & Powditch, 2018) found that soccer

1    athletes who received a rational team talk (promoting rational beliefs) at half-time reported

2    significantly lower threat compared to athletes who received an irrational team talk

3    (promoting irrational beliefs). Research has also examined the effect of irrational and rational

4    beliefs on performance within golf (Turner, Kirkham, & Wood, 2018a; Turner et al., 2018b).

5    One study (Turner et al., 2018a) found that when golfers used rational self-talk they

6    performed more accurately in a putting task than when they used irrational self-talk.

7    Similarly, Turner et al. (2018b) used an REBT intervention with amateur golfers and found

8    that as irrational beliefs decreased so to did golf-specific anxiety and in addition, golf

9    performance improved. However, this fledgling research fails to examine how irrational

10   beliefs and challenge and threat interact to predict competitive affective states. In the present

11   study, cognitive appraisals, irrational beliefs, and challenge and threat are assessed in relation

12   to upcoming competitive situations. Based on past research, it is the combination of these

13   psychological constructs that gives rise to emotions in competitive situations (Neil et al.,

14   2011).

15          The constructs of challenge and threat have been the subject of growing research in

16   sport literature (e.g., Blascovich, Seery, Mugridge, Norris, & Weisbuch, 2004), spawning

17   theories of challenge and threat that attempt to predict athletic performance (Jones, Meijen,

18   McCarthy, & Sheffield, 2009; Vine, Moore, & Wilson, 2016). Challenge and threat are

19   important constructs in Lazarus's appraisal process and are labeled as relational meanings in

20   his appraisal theory (Lazarus, 2000). Threat appraisal refers to evaluation of future harm or

21   loss; whereas challenge appraisal occurs when an individual perceives a future gain (Lazarus,

22   1991). In extant theory, challenge and threat result in emotional responses, where challenge is

23   said to be associated with more positive emotions, whereas threat is associated with more

24   negative emotions (Jones et al., 2009; Skinner & Brewer, 2004). Furthermore, positive

25   emotions are proposed to be interpreted as facilitative for performance in challenge whereas

1    negative emotions as debilitative in threat (Jones et al., 2009; Skinner & Brewer, 2004). With

2    regards to anxiety, research evidence demonstrates that threat is positively associated with

3    greater cognitive and somatic anxiety and a more debilitative interpretation of anxiety

4    compared to challenge (Moore, Vine, Wilson, & Freeman, 2012; Quested, Bosch, Burns,

5    Cumming, Ntoumanis, & Duda, 2011; Williams, Cumming, & Balanos, 2010). Therefore,

6    challenge and threat are important antecedents to affective states that should be studied

7    alongside cognitive appraisals, and irrational beliefs.

8        The current research is the first to investigate and understand how affective states

9    occur through the complex interaction of antecedent cognitive appraisals, irrational beliefs

10   and challenge and threat within a specific sporting population. This integrative examination

11   might facilitate a more complete understanding of how affective states occur through the

12   complex interaction of cognitive antecedents.

13   The current research

14       The main aim of the current study is to examine the interaction between, cognitive

15   appraisals, irrational beliefs, and challenge and threat, to predict pre-competitive affective

16   states. To achieve this main aim, two study phases are reported; phase 1 meets the main aim

17   in an imagined imminent golf competition, and phase 2 meets the main aim in an actual

18   future golf competition. For the two phases, we illustrate our hypotheses in Figure 1, which

19   are informed and supported by past research. Based on past research, it is hypothesized that

20   (H1) golfers' cognitive appraisals will be negatively associated with irrational beliefs (David

21   et al., 2002; 2005), (H2) high irrational beliefs will be positively associated with threat and

22   negatively with challenge (Dixon et al., 2016), (H3) cognitive appraisals will be negatively

23   associated with threat and positively with challenge (Lazarus, 1999), (H4) challenge will be

24   positively associated with positive emotions, and threat will be positively associated with

25   negative emotions (Jones et al., 2009), (H5) threat will be positively associated with cognitive

1   and somatic anxiety, and challenge will be negatively associated with cognitive and somatic

2   anxiety (Moore et al., 2012), and (H6) threat will be negatively associated with facilitative

3   perceptions of anxiety, and challenge will be positively associated with facilitative

4   perceptions of anxiety (Quested et al., 2011). It is also hypothesized that (H7) the relationship

5   between cognitive appraisals and affective states will be mediated by irrational beliefs (David

6   et al., 2002; 2005) and challenge and threat (Jones et al., 2009). Further, on the basis of meta-

7   analytical data (Visla et al., 2016) where stronger associations were found between irrational

8   beliefs and affective states during a real-stressor, we hypothesize that (H8) the associations

9   between target variables will be stronger in phase 2 than in phase 1. Lastly, we examine

10  differences in variables between study phases 1 and 2, and hypothesize that (H9) in phase 2

11  golfers will report greater cognitive appraisals, irrational beliefs, threat and affective states

12  and lower challenge, positive emotions and facilitative perceptions of anxiety in comparison

13  to phase 1.

14                          ***ADD FIGURE 1 HERE***

15                              **Method**

16  **Participants**

17      In phase 1, 287 participants (*Male* = 232, *Female* = 55; *M*age = 38.7 ± 15.20) with a

18  golf handicap between 0 and 31 (*M*handicap = 8.85 ± 7.13) took part in the study. The

19  participants encompassed Indians ($n = 220$), British ($n = 41$) and other ethnic origins ($n = 26$).

20  They had an average of 11.85 years (± 8.31) golfing experience and were competing at a club

21  ($n = 115$), amateur ($n = 120$) and professional ($n = 52$) level. In phase 2, 212 golfers (*Male* =

22  169, *Female* = 43; *M*age = 38.55 ±15.08) with a handicap between 0 to 31 (*M*handicap = 8.68

23  ± 7.16) completed the study. The participants encompassed Indians ($n = 161$), British ($n =$

24  30) and other ethnic origins ($n = 21$). They had an average of 12.28 years (± 8.38) of golfing

25  experience and were competing at the club ($n = 83$), amateur ($n = 86$) and professional ($n =$

1    43) level. No incentive was offered to the participants for taking part in the research. Ethical

2    approval was granted from the ethics committee of Staffordshire University and individual

3    informed consent was obtained prior to data collection. The participants were recruited by

4    contacting local golf clubs on their willingness to participate in the research project. The lead

5    author approached golf clubs and golf organisations in India to recruit golfers. Further, the

6    distribution of an online survey resulted in snowball sampling that helped in the recruitment

7    of golfers.

8    **Measures**

9         **Irrational performance beliefs**. The irrational Performance Beliefs Inventory (iPBI;

10   Turner et al., 2018) was used as a performance specific measure of irrational beliefs. It

11   comprises 28-items representing four core irrational beliefs; primary belief and three

12   secondary beliefs (Ellis & Dryden, 1997). The primary irrational belief is stated to be

13   demandingness (DEM), which refers to rigid, absolutistic requirements expressed in the form

14   of "musts", "shoulds", and "oughts" (e.g., "I must attain my goals"). The three secondary

15   irrational beliefs comprise of awfulizing (AWF), low frustration tolerance (LFT) and

16   depreciation (DEP). AWF refers to the beliefs that an individual holds where unpleasant

17   situations are assessed in the greatest negative manner (e.g., "If I don't attain my goals it is

18   awful"). LFT reflects an individuals evaluation that they are absolutely incapable of enduring

19   a given situation, accompanied with the view that they will not experience any happiness if

20   what they want does not exist (e.g., "If I don't attain my goals I can't stand it"), and DEP

21   appears when individuals tend to be excessively critical about themselves, others or the world

22   when they fail to live up to their self-imposed demands (e.g., "If I don't attain my goals, I am

23   a complete failure"; Ellis, 1994). The responses are made on a 5-point Likert-scale ranging

24   from 1 (*strongly disagree*) to 5 (*strongly agree*) to a series of performance belief statements.

25   The iPBI has previously been used with athletes (Turner et al., 2019) including golfers

1     (Turner et al., 2018b) and has demonstrated good internal validity and reliability among

2     sporting populations (Turner & Allen, 2018). However, due to a novel and relatively

3     homogenous sample population in the current study, confirmatory factor analysis (CFA) was

4     conducted to test the four-factor structure of the iPBI. One item from DEM showing factor

5     loading less than .40 was eliminated from further analyses (Comrey & Lee, 1992; Tabachnick

6     & Fidell, 2007). Cronbach's alphas from the current sample were .76 for DEM, .84 for AWF,

7     .87 for LFT, and .87 for DEP.

8            **Cognitive appraisals.** The primary and secondary cognitive appraisals were assessed

9     with five single-item questions used in previous research (David et al., 2002), modified from

10    Smith and Lazarus (1993). The single-item questions were answered on a 11-points Likert-

11    scale ranging from 1 (*not at all*) to 11 (*extremely*). The measure assesses motivational

12    relevance (MR), motivational congruence (MC; 2-items), problem-focused coping potential

13    (PFC), and emotion-focused coping (EFC). A total cognitive appraisal score was obtained by

14    calculating the mean score of all the items. Higher cognitive appraisals indicated more

15    positive appraisals.

16           **Challenge and threat.** The Challenge and Threat in Sport scale (CAT-Sport;

17    Rossato, Uphill, Swain, & Coleman, 2016), comprises 12-items representing two subscales;

18    challenge and threat. The responses are made on a 6-point Likert-scale ranging from 1

19    (*totally disagree*) to 6 (*totally agree*) in anticipation of a competition. The CAT-Sport has

20    only recently been developed, so confirmatory factor analysis (CFA) was conducted to test

21    the two-factor structure. One item from challenge displaying factor loading less than .40 was

22    eliminated from further analyses (Comrey & Lee, 1992; Tabachnick & Fidell, 2007). The

23    CAT-Sport has previously demonstrated good internal validity and reliability in athlete

24    populations (Rossato et al., 2016) and the Cronbach's alphas from the current sample were

1    .90 for threat, and .77 for challenge in phase 1, and .91 for threat and .82 for challenge in

2    phase 2.

3          **Emotion.** The Positive and Negative Affect Schedule (PANAS; Watson, Clark, &

4    Tellegen, 1988) incorporates two 10-item subscales based on a bi-dimensional theory of

5    emotion. Individuals can experience a mixture of positive affect (PA; e.g., 'enthusiastic') and

6    negative affect (NA; e.g., 'afraid') during a specific period of time (Watson & Clark, 1997;

7    Watson & Tellegen, 1985). The items are scored on a 5-point Likert scale ranging from 1

8    (*very slightly or not at all*) to 5 (*extremely*). The PANAS has previously demonstrated good

9    internal validity and reliability in athlete populations (Watson et al., 1988) and the

10   Cronbach's alphas from the current sample were .87 for PA and .84 for NA in phase 1, and

11   .90 for PA and .91 for NA in phase 2.

12         **Anxiety.** The Competitive State Anxiety Inventory-2 (CSAI-2; Martens, Burton,

13   Vealey, Bump & Smith, 1990; Jones & Swain, 1992) was used to assess the intensity and

14   directional interpretation of cognitive and somatic anxiety symptoms. Cognitive anxiety (CA)

15   assesses the mental component of anxiety caused by negative expectations about success or

16   negative self-evaluation (e.g., "I am concerned about losing") and somatic anxiety (SA) is

17   associated with the physiological or affective component of anxiety (e.g., "My hands are

18   clammy"). The items are scored on a 4-point Likert-scale ranging between 1 (*not at all*) to 4

19   (*very much so*) for intensity. Further, the directional interpretation of the anxiety symptoms

20   was assessed using a single-item question on a 7-point Likert-scale ranging from -3 (*very*

21   *negative/debilitative*) to +3 (*very positive/facilitative*). The CSAI-2 has previously

22   demonstrated good internal validity and reliability in athlete populations (Burton, 1998) and

23   the Cronbach's alphas from the current sample were .88 for CA and .89 for SA in phase 1,

24   and .88 for CA and .89 for SA in phase 2.

25   **Design**

1       The current study is a cross-sectional, single time-point atemporal design that examines

2   golfers' approach to competitive situations; an imagined imminent golf competition (phase

3   1), and an actual future golf competition (phase 2). Specifically, we examine how irrational

4   beliefs interact with cognitive appraisals and challenge and threat to predict affective states

5   (emotions and anxiety) across the two phases. The study was introduced in the form of an

6   online survey to explore the ways in which golfers approach motivated performance

7   situations (golf competition). In phase 1, we adopted an experimental vignette methodology

8   (EVM, Aguinis & Bradley, 2014), where participants were presented with a vignette that

9   represented a real-life scenario in which golfers imagined themselves approaching an

10  imminent golf competition, followed by questionnaires exploring their thoughts and affective

11  states about this event. The vignette was adapted from Skinner and Brewer (2002) to

12  represent a stressful golfing situation, and was presented to players in written form. The

13  personal meaning of the scenario was enhanced by emphasizing the prestige of the

14  tournament, and the composition of the audience. In addition, expectations of other

15  personnel, the final reward, and the presence of other competitors from all across the country

16  emphasized the importance of the event and ensured high levels of pressure. Further, ego-

17  threatening instructions were included, as in line with past golf research (Turner, Kirkman, &

18  Wood, 2018; Wilson, Wood, & Vine, 2009) where poor performance represented lack of skill

19  to play at a competitive level. Participants took on average 26-minutes to complete the

20  survey. The scenario presented to the golfers was as follows:

21      *You are at an important competition waiting for your name to be announced by the*

22  *starter at which point you will collect your score card. As you approach the first tee box to*

23  *start your round, you notice there is a large and dense crowd, more than you have seen*

24  *before, waiting for you to tee off. This competition is crucial because it is the most*

25  *prestigious event you have played in and the prize money is the most you've competed for.*

1    *There are high expectations for your performance from friends, family, and the crowd. If you*

2    *don't play well then people will think you are not capable of playing at this level and*

3    *therefore you probably won't be invited next year. In addition, there is a really strong field of*

4    *competitors from all over the country. As you step up to the tee, you notice the drastic change*

5    *in weather conditions…. the wind has picked up and it is now raining. You take your position*

6    *and ready yourself to tee off…*

7    In phase 2, participants were asked to provide details about their next actual important

8    golf competition and complete questionnaires about their thoughts and affective states in

9    relation to that important event. The aim of phase 2 is to extend phase 1 by examining how

10   golfers' irrational beliefs interact with cognitive appraisals and challenge and threat to predict

11   affective states in relation to an actual future golf competition. Therefore, the real-life event

12   of an actual upcoming competition allows us to explore the phenomenon in relation to a real-

13   life stressor. This is important, because irrational beliefs are implicated in affectivity different

14   for real vs. imagined stressors (Visla et al., 2016).

15   **Analytic Strategy**

16   Data for both the phases were examined for missing values. In phase 1, little's MCAR

17   test revealed that across each variables data between 2.4% to 10.5% were missing at random,

18   $\chi^2 = 462.55$, df $= 425$, $p > .05$. In phase 2, little's MCAR test revealed that across each

19   variables the data between 2.8% to 4.7% were missing at random, $\chi^2 = 192.37$, df $= 169$, $p >$

20   .05. In the current research, since the missing values were scattered throughout the data, the

21   employment of the deletion technique where missing values are discarded would have

22   resulted in substantial loss of participants, thus reducing the total sample size and further

23   resulting in loss of power (Baraldi & Enders, 2010; Tabachnick & Fidell, 2007). Therefore,

24   we used expectation maximisation (EM) method, a simple and reasonable approach to

25   estimate the missing values (Graham, 2009), and providing a complete data set for the main

1    analyses (Quinton, Cumming, & Williams, 2018). Further, in line with previous research

2    (e.g., Dixon & Yuen, 1974; Orr, Sackett, & DuBois, 1991; Smith, 2011) the data were

3    checked for outliers and data points with z scores greater than 2 were winsorized which

4    involved replacing extreme values to reduce the influence of outliers on the data. For phase 1,

5    items for DEM ($n = 15$), AWF ($n = 14$), LFT ($n = 8$), DEP ($n = 13$), MR ($n = 13$), MC ($n =

6    14$), PFC ($n = 12$), EFC ($n = 14$), challenge ($n = 14$), threat ($n = 7$), positive emotions ($n =

7    11$), negative emotions ($n = 11$), cognitive anxiety ($n = 9$), somatic anxiety ($n = 10$), and

8    directional interpretation ($n = 11$) were windsorized. For phase 2, items for MR ($n = 10$), MC

9    ($n = 8$), PFC ($n = 8$), EFC ($n = 13$), challenge ($n = 6$), threat ($n = 10$), positive emotions ($n =

10   8$), negative emotions ($n = 15$), cognitive anxiety ($n = 10$), somatic anxiety ($n = 10$), and

11   directional interpretation ($n = 15$) were windsorized.

12         Prior to the main analyses, since the data was collected from the same participants in

13   regards to the imagined imminent golf competition (phase 1), and an actual future golf

14   competition (phase 2), it was important to examine differences in cognitive appraisals,

15   challenge and threat, affective states (emotions and anxiety) and directional interpretations of

16   anxiety, between the two phases. To compare the means for each dependent variable between

17   the imagined imminent golf competition and the actual future golf competition, three

18   repeated measures multivariate analysis of covariance (MANCOVA) were conducted, one for

19   cognitive appraisals, one for challenge and threat, and one for affective states. In addition,

20   one repeated measure analysis of covariance (ANCOVA) was conducted for directional

21   interpretations of anxiety. Age and handicap were included as covariates in all analyses in

22   both phases, and in phase 2, the number of weeks until the next important competition was

23   also included as a covariate. The result of Shapiro-Wilk for number of weeks, $W_{(212)} = .67$, $p

24   = .000$, indicated that this variable was not normally distributed. Therefore, the variable was

1    transformed using log transformation to overcome the heteroscedastic errors (i.e., large error

2    variance) associated with the variable and to make it more homogenous (Nevill, 1997).

3         Main analyses for both phases were conducted in three main stages. First, descriptive

4    statistics and Pearson's correlations were calculated for all self-report variables to examine

5    associations between cognitive appraisals, irrational beliefs, challenge and threat, and

6    affective states. Second, path analysis was employed in conjunction with bootstrapping

7    procedures to test the hypothesized model using AMOS. Since most of the variables were

8    moderately to strongly correlated, it was possible to introduce a structure to the correlation

9    matrix in accordance with the path diagram (see Figure 1). The model fit was evaluated using

10   the chi-square statistic ($\chi^2$), comparative fit index (CFI), the root-mean-square error of

11   approximation (RMSEA). CFI provides an indication of how the theoretical model better fits

12   the data in comparison to a base model constraining all constructs to be uncorrelated with one

13   another. A non-significant $\chi^2$ and CFI value of .90 or above is considered a good fit (Bentler,

14   1990; Hu & Bentler, 1998; Vandenbergh & Lance, 2000). Further, a RMSEA value of < .06

15   indicates a close fit whereas a value < .08 is also considered an acceptable fit (Browne &

16   Cudek, 1993). Vandenbergh and Lance (2000) suggest that a cut-off value of .10 for RMSEA

17   is acceptable.

18        Lastly, serial atemporal multiple mediation analysis (SAMM) were conducted using

19   PROCESS version 2.10 for IBM SPSS (Hayes, 2013), to understand the direct and indirect

20   effects of cognitive appraisal, irrational beliefs, and challenge and threat, on affective states.

21   Considering practical implications, PROCESS was employed for multiple mediation as it

22   calculates relevant statistics automatically and efficiently in comparison to structural equation

23   modeling (SEM) programmes such as AMOS that require greater effort and programming

24   skills to gain relevant output. In addition, literature suggests (Hayes, Montoya, & Rockwood,

25   2017) that where the models are entirely based on observed variables, the results yielded

1    from PROCESS and AMOS programmes are substantively identical. Thus, the current

2    methodology is in line with Monteiro et al. (2018), where SEM was used to analyse the

3    relationship between different variables and serial multiple mediation was used to access

4    direct and indirect mediation effects of independent variables on dependent variables. Figure

5    2 represents a generic model of SAMM with two mediators for illustrative purposes. In the

6    current study in both phases, the independent variable (X) was cognitive appraisals and

7    dependent variables (Y) were affective states (positive or negative emotions, cognitive and

8    somatic anxiety, and directional interpretation of anxiety). Since, there is an established

9    causation from cognitive appraisals to affective states (Lazarus, 1991), in the current

10   research, we treated affective states as the Y variable and cognitive antecedents of affective

11   states as the X and M variables. The data is available on request from the first author of the

12   current study.

13                              ***ADD FIGURE 2 HERE***

14                                       **Results**

15   **Repeated measures comparison of phase 1 and phase 2**

16          **Cognitive appraisals.** The results of the MANCOVA indicated a significant main

17   effect for cognitive appraisals, Wilks' $\Lambda = .92$, $F(1, 199) = 4.28$, $p < .01$ $\eta^2 = .08$. A

18   significant within-subjects effect was revealed for MC, $F(1, 199) = 6.02$, $p < .01$, $\eta^2 = .03$,

19   with pairwise comparisons indicating that golfers perceive goals to be less motivationally

20   congruent in anticipation of the imagined imminent golf competition ($M = 6.94 \pm 1.71$)

21   compared to an actual future golf competition ($M = 7.32 \pm 1.89$). Similarly, a significant

22   within-subjects effect was revealed for PFC, $F(1, 199) = 9.31$, $p < .01$, $\eta^2 = .04$, with pairwise

23   comparisons indicating that golfers perceived more problem focused coping potential in

24   anticipation of the imagined imminent golf competition ($M = 7.81 \pm 1.85$) compared to an

25   actual future golf competition ($M = 7.59 \pm 2.17$).

1       **Challenge and threat.** The results of the MANCOVA indicated a significant main

2       effect for challenge and threat, Wilks' $\Lambda = .92$, $F(1, 203) = 8.16$, $p < .001$, $\eta^2 = .07$. A

3       significant within-subjects effect was revealed for threat, $F(1,203) = 15.68$, $p < .01$, $\eta^2 = .07$,

4       with pairwise comparisons indicating golfers reported greater threat in anticipation of the

5       imagined imminent golf competition ($M = 2.79 \pm 1.10$) compared to an actual future golf

6       competition ($M = 2.22 \pm 1.02$).

7       **Affect.** The results of the MANCOVA indicated a significant main effect for emotions,

8       Wilks' $\Lambda = .84$, $F(1, 199) = 8.98$, $p < . 001$, $\eta^2 = .15$. A significant within-subjects effect was

9       revealed for negative emotion, $F(1,199) = 12.09$, $p < .01$, $\eta^2 = .06$, with pairwise comparisons

10      indicating golfers experienced more negative emotions in anticipation of the imagined

11      imminent golf competition ($M = 1.87 \pm .55$) compared to an actual future golf competition ($M$

12      $= 1.53 \pm .56$). A significant within-subjects effect was revealed for cognitive anxiety, $F(1,$

13      $199) = 8.53$, $p < .01$, $\eta^2 = .04$, with pairwise comparisons indicating golfers reported greater

14      cognitive anxiety in anticipation of the imagined imminent golf competition ($M = 2.05 \pm .64$)

15      compared to an actual future golf competition ($M = 1.79 \pm .58$). Also, a significant within-

16      subjects effect was revealed for somatic anxiety, $F(1, 199) = 34.63$, $p < .001$, $\eta^2 = .15$, with

17      pairwise comparisons indicating golfers experienced more somatic anxiety in anticipation of

18      the imagined imminent golf competition ($M = 2.04 \pm .57$) in comparison to an actual future

19      golf competition ($M = 1.60 \pm .50$).

20      **Directional interpretation of anxiety.** The results of the ANCOVA indicated a

21      significant main effect for directional interpretation of anxiety, Wilks' $\Lambda = .91$, $F(1, 199) =$

22      $18.51$, $p < .01$, $\eta^2 = .08$, with pairwise comparisons indicating that golfers perceived their

23      anxiety as less facilitative in anticipation of the imagined imminent golf competition ($M =$

24      $1.72 \pm 1.26$) compared to an actual future golf competition ($M = 2.01 \pm 1.01$).

25                                       **Phase 1 Results**

1    **Test of the model**

2          Path analysis revealed that the hypothesized model demonstrated an acceptable fit to

3    the data $\chi^2$ (21) = 60.39, $p$ < .05, CFI = .97, RMSEA = .08. The standardized path

4    coefficients for each individual path are displayed in Figure 3, demonstrating patterns

5    consistent with study hypotheses. Overall, cognitive appraisals and irrational beliefs

6    accounted for 33% of total variance in threat and 23% of total variance in challenge. With

7    regards to affective states (emotions and anxiety), cognitive appraisals, irrational beliefs, and

8    challenge and threat accounted for 35% of variance in positive emotion, 47% of variance in

9    negative emotion, 52% of variance in cognitive anxiety, 37% of variance in somatic anxiety,

10   and 35% of variance in directional interpretation of anxiety.

11                                   ***ADD FIGURE 3 HERE***

12   **Serial atemporal multiple mediation analyses (SAMM)**

13         A total of ten SAMM were conducted to assess the direct and indirect effects of

14   cognitive appraisals on affective states (positive and negative emotions, and cognitive and

15   somatic anxiety, and directional interpretation of anxiety), through irrational beliefs, and

16   challenge and threat. Age and handicap were included as covariates. The results of SAMM

17   are presented in Table 2. Total effects for cognitive appraisals on affective states and

18   directional interpretation of anxiety were significant in all the ten mediation models tested.

19   Furthermore, SAMM generated the following results:

20         **Positive emotion.** There were significant indirect effects for cognitive appraisals on

21   positive emotion through challenge ($\beta$ = .24, 95% CI = .16 to .31) and through threat ($\beta$ = .06,

22   95% CI = .02 to .11). The indirect effect for cognitive appraisals on positive emotion through

23   irrational beliefs ($\beta$ = -.03, 95% CI = -.06 to -.01) was significant when threat was included in

24   the model (i.e., model 6). Furthermore, there was a significant indirect effect for cognitive

25   appraisals on positive emotion through both irrational beliefs and threat ($\beta$ = .01, 95% CI =

.003 to .03). In sum, there was a significant positive direct effect for cognitive appraisals on positive emotion when both mediators (i.e., irrational beliefs and challenge or threat) were included.

**Negative emotion.** There were significant indirect effects for cognitive appraisals on negative emotion through challenge ($\beta$ = -.12, 95% CI = -.19 to -.06) and through threat ($\beta$ = -.18, 95% CI = -.23 to -.12). The indirect effect for cognitive appraisals on negative emotion through irrational beliefs ($\beta$ = -.04, 95% CI = -.08 to -.02) was significant when challenge was included in the model (i.e., model 2). Furthermore, there was a significant indirect effect for cognitive appraisals on negative emotion through both irrational beliefs and threat ($\beta$ = -.04, 95% CI = -.07 to -.01). In sum, there was a significant negative direct effect for cognitive appraisals on negative emotion when both mediators (i.e., irrational beliefs and challenge or threat) were included.

**Cognitive anxiety.** There were significant indirect effects for cognitive appraisals on cognitive anxiety through irrational beliefs when challenge ($\beta$ = -.07, 95% CI = -.11 to -.02) or threat ($\beta$ = -.02, 95% CI = -.05 to -.01) were included in the model (i.e., model 3 and 8). The indirect effects for cognitive appraisals on cognitive anxiety were significant through challenge ($\beta$ = -.09, 95% CI = -.16 to -.04) and also through threat ($\beta$ = -.18, 95% CI = -.25 to -.13). Furthermore, there was a significant indirect effect for cognitive appraisals on cognitive anxiety through both irrational beliefs and threat ($\beta$ = -.04, 95% CI = -.07 to -.01). In sum, there was a significant negative direct effect for cognitive appraisals on cognitive anxiety when both mediators (i.e., irrational beliefs and challenge or threat) were included.

**Somatic anxiety.** There were significant indirect effects for cognitive appraisals on somatic anxiety through challenge ($\beta$ = -.11, 95% CI = -.18 to -.05) and through threat ($\beta$ = -.15, 95% CI = -.21 to -.10). The indirect effect for cognitive appraisals on somatic anxiety through irrational beliefs ($\beta$ = -.04, 95% CI = -.08 to -.01) was significant when challenge

1   was included in the model (i.e., model 4). Furthermore, there was a significant indirect effect

2   for cognitive appraisals on somatic anxiety through both irrational beliefs and threat ($\beta$ = -

3   .03, 95% CI = -.06 to -.01). In sum, there was a significant negative direct effect for cognitive

4   appraisals on somatic anxiety when both mediators (i.e., irrational beliefs and challenge or

5   threat) were included.

6       **Directional interpretation.** There were significant indirect effects for cognitive

7   appraisals on directional interpretation of anxiety through challenge ($\beta$ = .17, 95% CI= .11 to

8   .24) and through threat ($\beta$ = .10, 95% CI = .06 to .15). The indirect effect for cognitive

9   appraisals on directional interpretation of anxiety through irrational beliefs ($\beta$ = .02, 95% CI=

10  .002 to .04) was significant when challenge was included in the model (i.e., model 5).

11  Furthermore, there was a significant indirect effect for cognitive appraisals on directional

12  interpretation of anxiety through both irrational beliefs and threat ($\beta$ = .02, 95% CI = .01 to

13  04). In sum, there was a significant positive direct effect for cognitive appraisals on

14  directional interpretation of anxiety when both mediators (i.e., irrational beliefs and challenge

15  or threat) were included.

16      In summary, the data shows that the relationship between cognitive appraisals and

17  affective states is mediated by irrational beliefs and threat in all models, and by irrational

18  beliefs and challenge in some models. In other words, the cognitive appraisals, irrational

19  beliefs and threat are seen as essential antecedents in predicting affective states among

20  golfers.

21                      ***ADD TABLE 1, 2, 3, 4 HERE***

22                              **Phase 2 Results**

23  **Test of the model**

24      Path analysis revealed that the hypothesized model demonstrated an acceptable fit to

25  the data $\chi^2$ (31) = 107.31, $p$ < .05, CFI = .94, RMSEA = .11. The standardized path

1    coefficients for each individual path are displayed in Figure 4, demonstrating patterns

2    consistent with study hypotheses. Overall, cognitive appraisals and irrational beliefs

3    accounted for 37% of total variance in threat and 57% of total variance in challenge. With

4    regards to affective states (emotions and anxiety), cognitive appraisals, irrational beliefs, and

5    challenge and threat accounted for 46% of variance in positive emotion, 41% of variance in

6    negative emotion, 53% in cognitive anxiety, 40% in somatic anxiety, and 34% in directional

7    interpretation of anxiety.

8                                    ***ADD FIGURE 4 HERE***

9    **Serial atemporal multiple mediation analysis (SAMM)**

10           A total of ten SAMM analyses were conducted to assess the indirect effects of

11   cognitive appraisals on affective states (positive and negative emotions, cognitive and

12   somatic anxiety, and directional interpretation or anxiety), through irrational beliefs and

13   challenge and threat. Age, handicap and number of weeks to the next important competition

14   were included as covariates. The results of SAMM are presented in Table 6. Total effects of

15   cognitive appraisals on affective states and directional interpretation of anxiety were

16   significant in all the ten mediation models tested. Furthermore, SAMM generated the

17   following results:

18           **Positive emotion.** There were significant indirect effects for cognitive appraisals on

19   positive emotion through challenge ($\beta$ = .36, 95% CI = .27 to .45) and through threat ($\beta$ = .08,

20   95% CI = .03 to .15). The indirect effect for cognitive appraisals on positive emotion through

21   irrational beliefs ($\beta$ = -.05, 95% CI = -.10 to -.01) was significant when threat was included in

22   the model (i.e., model 6). Furthermore, there was a significant indirect effect for cognitive

23   appraisals on positive emotion through both irrational beliefs and challenge ($\beta$ = -.02, 95% CI

24   = -.04 to -.002) or threat ($\beta$ = .02, 95% CI = .003 to .04). In sum, there was a significant

1    positive direct effect for cognitive appraisals on positive emotion when both mediators (i.e.,

2    irrational beliefs and challenge or threat) were included.

3          **Negative emotion.** There were significant indirect effects for cognitive appraisals on

4    negative emotion through challenge ($\beta$ = -.21, 95% CI = -.31 to -.11) and through threat ($\beta$ = -

5    .19, 95% CI = -.27 to -.11). The indirect effect for cognitive appraisals on negative emotion

6    through irrational beliefs ($\beta$ = -.05, 95% CI = -.09 to -.01) was significant when challenge

7    was included in the model (i.e., model 2). Furthermore, there was a significant indirect effect

8    for cognitive appraisals on negative emotion through both irrational beliefs and challenge ($\beta$

9    = .01, 95% CI = .001 to .03) or threat ($\beta$ = -.04, 95% CI = -.07 to -.01). In sum, there was a

10   non-significant negative direct effect for cognitive appraisals on negative emotion when both

11   mediators (i.e., irrational beliefs and challenge) were included.

12         **Cognitive anxiety.** There were significant indirect effects for cognitive appraisals on

13   cognitive anxiety through irrational beliefs when challenge ($\beta$ = -.08, 95% CI = -.15 to -.03)

14   or threat ($\beta$ = -.03, 95% CI = -.07 to -.01) were included in the model (i.e., model 3 and 8).

15   The indirect effects for cognitive appraisals on cognitive anxiety were significant through

16   challenge ($\beta$ = -.12, 95% CI = -.21 to -.03) and also through threat ($\beta$ = -.22, 95% CI = -.30 to

17   -.13). Furthermore, there was a significant indirect effect for cognitive appraisals on cognitive

18   anxiety through both irrational beliefs and challenge ($\beta$ = .01, 95% CI = .0003 to .02) or

19   threat ($\beta$ = -.05, 95% CI = -.08 to -.02). In sum, there was a non-significant negative direct

20   effect for cognitive appraisals on cognitive anxiety when both mediators (i.e., irrational

21   beliefs and challenge or threat) were included.

22         **Somatic anxiety:** There were significant indirect effects for cognitive appraisals on

23   somatic anxiety through challenge ($\beta$ = -.20, 95% CI = -.30 to -.10) and through threat ($\beta$ =

24   .18, 95% CI = -.26 to -.11). The indirect effect for cognitive appraisals on somatic anxiety

25   through irrational beliefs ($\beta$ = -.05, 95% CI = -.10 to -.01) was significant when challenge

1    was included in the model (i.e., model 4). Furthermore, there was a significant indirect path

2    for cognitive appraisals on somatic anxiety through both irrational beliefs and challenge ($\beta$ =

3    .01, 95% CI = .001 to .02) or threat ($\beta$ = -.04, 95% CI = -.07 to -.01). In sum, there was a

4    significant negative direct effect for cognitive appraisals on somatic anxiety when both

5    mediators (i.e., irrational beliefs and challenge or threat) were included.

6           **Directional interpretation:** There were significant indirect effects for cognitive

7    appraisals on directional interpretation of anxiety through challenge ($\beta$ = .24, 95% CI = .14 to

8    .34) and also through threat ($\beta$ = .08, 95% CI = .03 to .14). The indirect effect for cognitive

9    appraisals on directional interpretation of anxiety through irrational beliefs ($\beta$ = .02, 95% CI

10   = .0005 to .06) was significant when challenge was included in the model (i.e., model 5).

11   Furthermore, there was a significant indirect path for cognitive appraisals on directional

12   interpretation of anxiety through both irrational beliefs and challenge ($\beta$ = -.01, 95% CI = -

13   .03 to -.001) or threat ($\beta$ = .02, 95% CI = .003 to .04). In sum, there was a significant positive

14   direct effect for cognitive appraisals on directional interpretation of anxiety when both

15   mediators (i.e., irrational beliefs and challenge or threat) were included.

16                          ***ADD TABLE 5, 6, 7, 8 HERE***

17          In summary, data analyses demonstrate that the relationships between cognitive

18   appraisals and affective states and directional interpretation of anxiety is mediated by

19   irrational beliefs and challenge and threat in all models. In other words, the interaction of

20   cognitive appraisals, irrational beliefs, and challenge and threat, emerged as antecedent to the

21   golfers' affective states on approach to both imagined imminent, and actual future golf

22   competitions.

23                                  **Discussion**

24          The main aim of the current study was to examine the interaction between cognitive

25   appraisals, irrational beliefs, and challenge and threat, in anteceding pre-competitive affective

1    states (emotions and anxiety) and directional interpretation of anxiety in golfers. To achieve

2    this main aim, two study phases were undertaken where golfers considered an imagined

3    imminent golf competition (phase 1), and an actual future golf competition (phase 2). The

4    current study is the first to investigate how affective states occur through the complex

5    interaction of antecedent cognitive appraisals, irrational beliefs, and challenge and threat,

6    within a specific sporting population.

7            In accordance with study hypotheses, the results of path analyses across both the

8    study phases revealed that threat was positively associated with negative emotions (H4) and

9    both cognitive and somatic anxiety (H5). Threat was also negatively associated with

10   directional interpretation of anxiety, such that greater threat was associated with less

11   facilitative perceptions of anxiety (H6). In addition, threat was positively associated with

12   irrational beliefs (H2) and negatively associated with cognitive appraisals (H3). Challenge

13   was negatively associated with negative emotions (H4) and somatic anxiety (H5), and

14   positively associated with positive emotions (H4) and more facilitative perceptions of anxiety

15   (H6). Also, cognitive appraisals were negatively associated with irrational beliefs (H1).

16   Further, challenge was positively related to cognitive appraisals (H3), and in phase 2 was

17   positively associated with irrational beliefs (H2), but unrelated to irrational beliefs in phase 1.

18            In other words, a golfer approaching competition with low cognitive appraisals, that

19   report high irrational beliefs, is more likely to be threatened, and less likely to be challenged.

20   As a result, the golfer will likely experience greater negative emotions and anxiety and is

21   more likely to perceive their anxiety symptoms as less facilitative for their performance in

22   that competition.

23            The findings of current research support some extant research (e.g., David et al.,

24   2002; 2005) in revealing the interaction between irrational beliefs and cognitive appraisals in

25   the prediction of affective states. The current research extends previous research by

1    investigating and understanding the complex interaction of antecedents to affective states

2    within a golf specific sport setting. David et al. (2002, 2005) did not consider challenge and

3    threat in their studies. Our findings that challenge and threat mediate the relationship between

4    cognitive appraisals and affective states alongside irrational beliefs is an important extension

5    of our knowledge of how affective states occur. Also, our research takes into account the

6    interpretation of anxiety, previously unexplored in research. The current research also makes

7    methodological advancements by using more sophisticated analytical procedures (SEM and

8    SAMM).

9        The inclusion of challenge and threat in the current study, alongside irrational beliefs

10   and cognitive appraisals, is a particularly important extension of past research because it

11   more comprehensively reflects the antecedents of affective states in anticipation of personally

12   relevant situations. Researchers have found irrational beliefs to be positively associated with

13   threat (Dixon et al., 2016; Evans et al., 2018), but the current study develops this research by

14   offering an integration of cognitive appraisals, irrational beliefs, and challenge and threat.

15   The finding that challenge and threat are associated differentially with affective states is in

16   line with the postulations of prominent theories (e.g., Jones et al., 2009; Skinner & Brewer,

17   2004). That is, challenge was associated with positive affective states, and more facilitative

18   perceptions of anxiety, whilst threat was related to negative affective states, and less

19   facilitative perceptions of anxiety. The findings concerning anxiety in the current study are in

20   line with previous research that demonstrates threat to be associated with greater cognitive

21   and somatic anxiety and a more debilitative interpretation of anxiety responses compared to a

22   challenge (e.g., Moore et al., 2012; Quested et al., 2011; Williams et al., 2010).  Specifically,

23   Moore et al., (2012) found that the golfers who received challenge instructions reported lower

24   levels of cognitive anxiety compared to golfers who received threat instructions. In addition,

1    golfers who received challenge instructions interpreted anxiety to be more facilitative for

2    their performance in comparison to golfers who received threat instructions.

3            Beyond the bivariate associations emerging from path analyses, SAMM provided

4    some important evidence concerning the mechanisms that could explain the relationships

5    between cognitive appraisals and affective states. There were significant indirect effects

6    across both study phases, implying that the association between cognitive appraisals and

7    affective states was mediated by irrational beliefs and threat (H7). This is in support of

8    previous research in which irrational beliefs are associated with cognitive appraisals (David

9    et al., 2002; 2005), and where higher irrational beliefs are associated with greater threat, and

10   lesser challenge (Dixon et al., 2016). That irrational beliefs and threat mediated the

11   relationship between cognitive appraisal and affective states in serial suggests that it is the

12   interaction between cognitive appraisals, irrational beliefs, and threat, that is particularly

13   important for understanding anticipatory affective states on approach to competitive golf

14   situations.

15           With regards to challenge, there were some differences between phase 1 and phase 2

16   in the serial multiple atemporal mediation results. With challenge in the mediation model, at

17   phase 1 no significant serial mediation was found for any affective outcomes, although

18   simple mediation was revealed. However, in phase 2, significant serial mediation was found

19   for all affective states, showing that irrational beliefs and challenge (H7) in serial mediated

20   the association between cognitive appraisals and affective states. This lack of serial mediation

21   in phase 1 could be due to a variety of factors. First, there is no significant relationship

22   between irrational beliefs and challenge in phase 1, revealed in bivariate correlations (table

23   1), and in the path analysis. Second, in phase 1 participants approached an imagined

24   competition scenario, whereas in phase 2 they approached a real future competition. It might

25   be that the imagined event induced greater psychological pressure than what the participants

1    might face in their next actual competition. In phase 1, we induced pressure using ego-threat,

2    but in phase 2, we did not induce pressure at all. Therefore, challenge might have been more

3    salient in phase 2 where a participant's next competition might be one in which they are

4    facing less pressure to perform because some participants are unlikely to be performing under

5    the pressured conditions reflected in phase 1. Therefore, challenge is more likely to emerge

6    on approach to a less pressured competition (Blascovich & Mendes, 2000).

7            The finding that mediation and bivariate associations differed across phase 1 and

8    phase 2 is also echoed in the phase 1-phase 2 tests of differences, and differences in the

9    strength of relationships between the two phases, reported in the results. Specifically, the

10   results revealed that golfers appraised the imagined imminent competition as less

11   motivationally congruent and perceived greater problem focused coping potential during

12   phase 1 than in phase 2. Also, the golfers reported greater threat greater negative emotions

13   and anxiety in phase 1. PFC reflects the potential to act directly on the situation with the

14   purpose of changing the situation or bringing it in accordance with one's desires (Lazarus,

15   1999). However, in the current study, PFC is unrealistic for the golfers because the imagined

16   competition is imminent and unchangeable. For instance, if a golfer perceives the situation to

17   be incongruent with his or her goals, focuses on problem focused coping and evaluates the

18   competition as a threat, then he or she is more likely to experience greater negative emotions

19   and anxiety before an imminent golf competition.

20           The phase 1-phase 2 differences were unexpected and contrary to our hypotheses (H8,

21   9). We expected golfers to experience stronger negative emotions during phase 2 (H9), and

22   we expected stronger associations between variables in phase 2 (H8), because research

23   indicates that real events are more stressful and should elicit bivariate associations (Visla et

24   al., 2016). It is important however to consider past literature, which suggests that temporal

25   proximity is an important factor when measuring responses to stressful events. For instance,

1    research has extensively investigated the temporal patterning of competitive anxiety (Cerin,

2    Szabo, Hunt & Williams, 2000) and the findings of the studies revealed that the intensity of

3    the somatic component of competitive anxiety increases as competition nears (Slaughter,

4    Selder, & Patterson, 1994), whereas the cognitive anxiety component can increase (Slaughter

5    et al., 1994; Swain & Jones, 1993) or remain stable (Caruso, Dzewaltowski, Gill, & McElroy,

6    1990) on approach to competition. Our findings that affective states were lower in the real

7    event (phase 2) in comparison to the imminent imagined situation (phase 1) could be because

8    the next event for each participant varied in proximity ranging from a few days to months.

9         The results of the present study indicate the importance of using various procedural

10   and data analytical methods to investigate the associations between cognitive appraisals,

11   irrational beliefs, challenge and threat, and affective states. Although, there were some

12   differences between phases 1 and phase 2, overall path analytical and atemporal mediational

13   models were broadly consistent across both the phases. The findings of the current paper may

14   have some important theoretical implications, in part because we offer a more complex

15   model than has previously need proposed and tested (e.g., David et al., 2002).  It is essential

16   and advantageous to consider cognitive appraisals, irrational beliefs, and challenge and

17   threat, in the occurrence of affective states. The model proposed and tested in the current

18   study provides a more accurate and comprehensive explanation concerning the antecedents of

19   affective states on approach to competitive situations. Importantly, cognitive appraisals and

20   irrational beliefs are seen as co-occurring simultaneously rather than occurring in a sequential

21   and fixed order (Ziegler, 2001).

22        The consistency in SEM and SAMM results between phases 1 and 2 demonstrate the

23   utility of experimental vignettes that represent real-life golf scenarios. The current research

24   has not investigated REBT interventions per se, however, it has provided useful information

25   for the readers with regards to potential practical implications. That is, by having golfers

1    imagine approaching an upcoming competition, we were able to identify their beliefs and

2    trigger affective states similar to what was reported for a real golf competition. Thus,

3    practitioners in the field can encourage athletes to imagine upcoming situations in order to

4    trigger cognitive appraisals and irrational beliefs for the purposes of more accurate

5    assessment and intervention. Indeed, in REBT Rational Emotive Imagery (REI) is an oft-used

6    technique (Maultsby, 1971) with athletes (Turner & Bennett, 2018). REI involves athletes

7    visualizing the situation that elicits unhealthy negative emotions and then emotional change

8    is brought about by encouraging them to change their irrational beliefs into rational beliefs.

9           Researchers have not yet investigated the effects of REI within sporting performance,

10   but motivational general arousal (MG-A) imagery has been suggested as an effective

11   intervention for the enhancement of athletes overall affect experiences and interpretation of

12   pre-competitive symptoms (Mellalieu, Hanton, & Thomas, 2009). Clearly, there is some

13   overlap between MG-A imagery and REI, where imagery focuses upon the emotional

14   experiences associated with stress, anxiety and arousal (Vadocz, Hall, & Moritz, 1997).

15   However, in MG-A imagery the athletes are asked to imagine arousal reducing images (e.g.,

16   imagine oneself in a relaxed place) whereas, in REI the athletes are asked to alter their

17   irrational beliefs in order to change their unhealthy emotional responses to the imagined

18   situation. Further, imagery has been used in research to manipulate challenge and threat (Hale

19   & Whitehouse, 1998; Williams & Cumming, 2012; Williams et al., 2010) and deemed as a

20   useful strategy to help athletes evaluate the competitive situation as a challenge prior to their

21   performance. Additionally, the findings of the current research have established associations

22   between cognitive appraisals, irrational beliefs, and challenge and threat (David et al., 2002;

23   Dixon et al., 2016; Evans et al., 2018). Therefore, practitioners can promote the use of REI

24   combined with MG-A imagery with athletes during consultation. For instance, athletes can be

25   asked to imagine themselves in events or situations (A) that obstruct their goals (G), and

1    trigger unhealthy emotional and behavioural consequences (C), depending on their beliefs

2    about the self, others, and the world in relation to the situation (A). If the athletes beliefs (B)

3    are irrational (rigid, illogical, and extreme) then the practitioner can help them change their

4    irrational beliefs into rational beliefs (flexible, logical, and non-extreme), which in turn can

5    influence athletes to appraise the competition as a challenge, thus, leading to healthy

6    emotional and behavioural responses (C) prior competition. Thus, similar to the imaged

7    situations, REI can be a useful practical tool for practitioners to use with athletes to

8    encourage healthy affective states among athletes in competitions (Ellis & Dryden, 1997).

9         The current research is not without its limitations. The primary limitation is that we

10   adopted a cross-sectional single time point atemporal design. Cognitions and affective states

11   change in the lead up to important events (e.g., Skinner & Brewer, 2002), and cognitive

12   appraisals are most accurately considered to be iterative, rather than static and singular

13   occurrences (Blascovich & Mendes, 2000; Lerner & Keltner, 2000; Schneider, 2008).

14   Therefore, future research should explore the role that irrational beliefs play in the temporal

15   changes in cognitive appraisals and affective states in the lead up to a sport competition.

16        Furthermore, the current research uses self-report measures, which can result in biases

17   when investigating cognitive appraisals (e.g., Paunonen & LeBel, 2012). It is possible that

18   the hypothetical scenario in the current paper influenced appraisals unconsciously, outside of

19   the conscious awareness of the participants. Indeed, it may be that only some aspects of

20   cognitive appraisal are consciously accessible with an even smaller section of those

21   perceptions considered acceptable to report by individuals (e.g., Blascovich & Mendes, 2000;

22   Greenwald & Banaji, 1995; LeDoux, 1998; Quigley, Barrett, & Weinstein, 2002). To

23   overcome such a limitation, future research using longitudinal designs could investigate

24   emotional experience using more objective psychophysiological markers (see Jones et al.,

25   2009). Also, future researchers would benefit from the development of a sport specific

1    measure for primary and secondary cognitive appraisals. Further, the current research lacks

2    objective measure of sport performance, and researchers should aim to explore how irrational

3    beliefs and cognitive appraisals interact to predict affective states, and in turn, athletic

4    performance. The current sample also involves higher proportion of male golfers in

5    comparison to females. The sex-imbalance with the sport of golf, with 15% of golf club

6    members being female (England Golf, 2018) makes it difficult to make comparisons,

7    therefore future research should look at recruiting equal numbers of males and females for a

8    detailed comparisons (Turner et al., 2018a). In addition, the substantial time delay from

9    completion of the questionnaires to the next competition for some golfers meant that there is

10   great variability in the time to event data. Indeed, due to the variability, we transformed the

11   variable number of weeks to allow us to include it in the analyses (make it more

12   homogenous). Nevertheless, future research might consider recruiting participants within the

13   same time proximity to the next competition to understand the phenomenon in a more

14   homogenous data set. Lastly, within current research, the participants were not recruited

15   based upon a specific range of handicap. The current research aimed to recruit golfers

16   competing at all different levels being club, amateur golfers and professional golfers. Hence,

17   the participants differed across a wide range of handicaps. However, the main aim of the

18   current research was to make an initial investigation concerning how cognitive appraisals,

19   irrational beliefs, and challenge and threat, relate to affective states among competitive

20   golfers. Future researcher could restrict the handicap to more elite athletes and examine the

21   differences between low and high handicap golfers.

22          In conclusion, the findings of the current study indicate that irrational beliefs interact

23   with cognitive appraisals and challenge and threat to determine affective states within golfers.

24   The data shows that the relationship between cognitive appraisals and affective states is

25   mediated by irrational beliefs and challenge or threat. In other words, cognitive appraisals,

1  irrational beliefs, and challenge and threat, are seen as interacting antecedents to pre-

2  competitive affective states among golfers. It is hoped that this study stimulates further

3  research and discussion concerning cognitive appraisal in anticipation of competitive

4  situations.

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Table 1.

*Mean Scales, Standard Deviations and Correlations among all variables regarding imagined imminent golf competition.*

| N= 287 | M | SD | Age | Handi | Exp | DEM | AWF | LFT | DEP | iBs | MR | MC | PFC | EFC | Cog App | Chall | Threat | Post Emo | Neg Emo | CA | SA | DI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | 38.71 | 15.20 | - | .65** | .53** | -.04 | -.06 | -.18** | -.06 | -.11 | -.11 | .07 | -.01 | .02 | .01 | -.01 | -.14* | -.06 | -.28** | -.12* | -.22** | .16** |
| Handi | 8.85 | 7.13 | | - | .10 | .04 | .04 | -.11 | .08 | .01 | -.00 | -.07 | -.08 | -.09 | -.10 | -.07 | .05 | -.09 | -.14* | .06 | -.13* | .10 |
| Exp | 11.86 | 8.31 | | | - | -.02 | -.03 | -.08 | -.03 | -.05 | -.09 | .18** | .07 | -.01 | .08 | .04 | -.06 | 01 | -.12* | -.08 | -.05 | .05 |
| DEM | 20.59 | 3.82 | | | | - | .76** | .53** | .45** | .81** | .12 | -.19** | -.04 | -.08 | -.10 | .01 | .35** | .08 | .21** | .35** | .19** | -.09 |
| AWF | 21.77 | 4.66 | | | | | - | .64** | .54** | .89** | .15* | -.21** | -.13* | -.17** | -.17** | -.06 | .46** | .00 | .31** | .42** | .30** | -.16** |
| LFT | 23.35 | 5.48 | | | | | | - | .46** | .83** | .17** | -.17** | -.11 | -.10 | -.10 | .00 | .30** | .13* | .22** | .35** | .28** | -.16** |
| DEP | 14.85 | 4.85 | | | | | | | - | .75** | .04 | -.22** | -.11 | -.30** | -.25** | -.22** | .47** | -.21** | .37** | .40** | .25** | -.24** |
| iBs | 20.14 | 3.85 | | | | | | | | - | .15* | -.24** | -.12* | -.20** | -.19** | -.08 | .48** | .00 | .34** | .46** | .32** | -.20** |
| MR | 8.59 | 1.91 | | | | | | | | | - | .09 | .15* | .07 | .44** | .17** | .03 | .32** | .05 | .11 | .10 | .15* |
| MC | 13.78 | 3.18 | | | | | | | | | | - | .34** | .31** | .77** | .32** | -.33** | .22** | -.28** | -.35** | -.29** | .32** |
| PFC | 7.86 | 1.86 | | | | | | | | | | | - | .41** | .69** | .40** | -.33** | .38** | -.28** | -.36** | -.30** | .40** |
| EFC | 8.53 | 2.10 | | | | | | | | | | | | - | .67** | .38** | -.38** | .28** | -.41** | -.34** | -.37** | .33** |
| Cog App | 9.69 | 1.49 | | | | | | | | | | | | | - | .48** | -.40** | .44** | -.37** | -.38** | -.35** | .46** |
| Chall | 4.93 | 0.70 | | | | | | | | | | | | | | - | -.38** | .59** | -.36** | -.33** | -.34** | .49** |
| Threat | 2.78 | 1.09 | | | | | | | | | | | | | | | - | -.27** | .65** | .72** | .57** | -.45** |
| PostEmo | 3.97 | 0.55 | | | | | | | | | | | | | | | | - | -.24** | -.22** | -.22** | .48** |
| NegEmo | 1.86 | 0.54 | | | | | | | | | | | | | | | | | - | .65** | .71** | -.48** |
| CA | 2.05 | 0.62 | | | | | | | | | | | | | | | | | | - | .71** | -.51** |
| SA | 2.02 | 0.55 | | | | | | | | | | | | | | | | | | | - | -.48** |
| DI | 1.66 | 1.24 | | | | | | | | | | | | | | | | | | | | - |

1    Table 2. *Serial multiple mediation analysis for imagined imminent golf competition*

| Model No. | (M1) iBs | (M2) Appraisals | (Y) Outcome | $YR^2 = F(,) =, P$ | Total $c = t(df) =, P$ | Direct $c' = t(df) =, P$ | Indirect# =effect, [to] | |
|---|---|---|---|---|---|---|---|---|
| 1 | | Challenge | PostEmo | $R^2 = .38$ $F(5, 281) = 35.24$, $P < .001$ | .16 $t(283) = 8.12$, $P = .00$ | .08 $t(283) = 3.94$, $P = .00$ | Tot= .22 [.15 to .30] | Ind1= -.01 [- .03 to .002]; Ind2 = .24 [.16 to .32]; Ind 3 = -.001 [- .01 to .008] |
| 2 | | | NegEmo | $R^2 = .32$ $F(5, 281) = 26.46$, $P < .001$ | -.13 $t(283) = -6.85$, $P = .00$ | -.07 $t(283) = -3.48$, $P = .00$ | Tot= -.17 [-.24 to -.10] | Ind1= -.04 [-.08 to -.02]; Ind2 = -.12 [-.19 to -.06]; Ind3= .0003 [-.005 to .01] |
| 3 | | | CogAnxiety | $R^2 = .35$ $F(5, 281) = 29.77$ $P < .001$ | - .15 $t(283) = -6.67$, $P = .00$ | -.08 $t(283) = -3.60$ $P = .00$ | Tot= -.16 [-.24 to to -.08] | Ind1 = -.07 [-.11 to -.02]; Ind2 = -.09 [-.16 to -.03]; Ind3 = .0003 [-.003 to .005] |
| 4 | | | SomAnxiety | $R^2 = .26$ $F(5,281) = 20.17$ $P < .001$ | -.13 $t(283) = -6.38$, $P = .00$ | -.07 $t(283) = -3.29$, $P = .00$ | Tot= -.15 [-.24 to -.08] | Ind1= -.04 [-.08 to -.01]; Ind2 = -.11 [-.18 to -.05]; Ind3= .0003 [-.004 to .01] |
| 5 | | | DI | $R^2 = .35$ $F(5, 281) = 30.11$ $P < .001$ | .38 $t(283) = 8.87$, $P = .00$ | .22 $t(283) = 4.83$, $P = .00$ | Tot= .19 [.12 to .27] | Ind1 = .02 [.002 to .04]; Ind2 = .17 [.11 to .24]; Ind3= -.0005 [-.01 to .01] |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | Threat | PostEmo | $R^2 = .23$ $F(5, 281)=16.81$ $P < .001$ | 0.16 $t(283)= 8.12$, $P = .00$ | 0.14 $t(283)= 6.72$, $P = .00$ | Tot= 0.05 [.004 to .10] | Ind1= -.03 [-.06 to -.01]; Ind2= .06 [.02 to .11]; Ind3= .01 [.003 to .03] |
| 7 | | NegEmo | $R^2 = .48$ $F(5, 281)= 52.02$ $P < .001$ | -.13 $t(283)= -6.85$, $P = .00$ | -.05 $t(283)= -3.03$, $P = .00$ | Tot= -.22 [-.29 to -.16] | Ind1= -.004 [-.02 to .01]; Ind2= -.18 [-.24 to -.12]; Ind3= -.04 [-.07 to -.01] |
| 8 | | CogAnxiety | $R^2= .55$ $F(5, 281)= 67.86$ $P < .001$ | -.15 $t(283)= -6.67$, $P = .00$ | -.046 $t(283)= -2.48$, $P = .01$ | Tot= -.25 [-.33 to -.18] | Ind1= -.02 [-.05 to -.01]; Ind2= -.18 [-.25 to -.13]; Ind3= -.04 [-.07 to -.02] |
| 9 | | Som Anxiety | $R^2 = .38$ $F(5, 281)= 34.01$ $P < .001$ | -.13 $t(283)= -6.38$, $P = .00$ | -.06 $t(283)= -2.99$, $P = .00$ | Tot= -.19 [-.26 to -.13] | Ind1= -.01 [-.03 to .01]; Ind2= -.15 [-.21 to -.10]; Ind3= -.03 [-.06 to -.01] |
| 10 | | DI | $R^2= .32$ $F(5, 281)= 26.47$ $P < .001$ | .38 $t(283)= 8.87$ $P = .00$ | .28 $t(283)= 6.34$, $P = .00$ | Tot= .12 [.08 to .17] | Ind1= -.003 [-.03 to .02]; Ind2= .10 [.06 to .15]; Ind3= .02 [.01 to .04] |

1
2

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Table 3.

*Regression weights for serial multiple mediation models for imagined imminent golf competition*

| | Mediators | | | Regression Weights | | | | |
|---|---|---|---|---|---|---|---|---|
| Model No. | (M1) iBs | (M2) | (Y) Outcome | $a_1$ | $b_1$ | $d_{21}$ | $b_2$ | $a_2$ |
| 1 | | Challenge | PostEmo | -.46** | .01 | .00 | .39** | .22** |
| 2 | | | NegEmo | -.46** | .03** | .00 | -.19** | .22** |
| 3 | | | CogAnxiety | -.46** | .06** | .00 | -.17** | .22** |
| 4 | | | SomAnxiety | -.46** | .03** | .00 | -.18** | .22** |
| 5 | | | DI | -.46** | -.04* | .00 | .64** | .22** |
| 6 | | Threat | PostEmo | -.46 | .02** | .11** | -.11** | -.23** |
| 7 | | | NegEmo | -.46** | .00 | .11** | .28** | -.23** |
| 8 | | | CogAnxiety | -.46** | .02** | .11** | .34** | -.23** |
| 9 | | | Som Anxiety | -.46** | .01 | .11** | .24** | -.23** |
| 10 | | | DI | -.46** | .01 | .11** | -.37** | -.23** |

$*p < 0.05, **p < 0.01$

Table 4.

*Causal chain according to models (X-M-M-Y) for imagined imminent golf competition*

| | | | | |
|---|---|---|---|---|
| SMM1 | | | | |
| Ind1 | Cog Appraisals | iBs | Post Emo | |
| **Ind2** | **Cog Appraisals** | **Challenge** | **Post Emo** | |
| Ind3 | Cog Appraisals | iBs | Challenge | Post Emo |
| | | | | |
| SMM2 | | | | |
| **Ind1** | **Cog Appraisals** | **iBs** | **Neg Emo** | |
| **Ind2** | **Cog Appraisals** | **Challenge** | **Neg Emo** | |
| Ind3 | Cog Appraisals | iBs | Challenge | Neg Emo |
| | | | | |
| SMM3 | | | | |
| **Ind1** | **Cog Appraisals** | **iBs** | **Cog Anxiety** | |
| **Ind2** | **Cog Appraisals** | **Challenge** | **Cog Anxiety** | |
| Ind3 | Cog Appraisals | iBs | Challenge | Cog Anxiety |
| | | | | |
| SMM4 | | | | |
| **Ind1** | **Cog Appraisals** | **iBs** | **Som Anxiety** | |
| **Ind2** | **Cog Appraisals** | **Challenge** | **Som Anxiety** | |
| Ind3 | Cog Appraisals | iBs | Challenge | Som Anxiety |
| | | | | |
| SMM5 | | | | |
| **Ind1** | **Cog Appraisals** | **iBs** | **DI** | |
| **Ind2** | **Cog Appraisals** | **Challenge** | **DI** | |
| Ind3 | Cog Appraisals | iBs | Challenge | DI |
| | | | | |
| SMM6 | | | | |
| **Ind1** | **Cog Appraisals** | **iBs** | **Post Emo** | |
| **Ind2** | **Cog Appraisals** | **Threat** | **Post Emo** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Threat** | **Post Emo** |
| | | | | |
| SMM7 | | | | |
| Ind1 | Cog Appraisals | iBs | Neg Emo | |
| **Ind2** | **Cog Appraisals** | **Threat** | **Neg Emo** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Threat** | **Neg Emo** |
| | | | | |
| SMM8 | | | | |
| **Ind1** | **Cog Appraisals** | **iBs** | **Cog Anxiety** | |
| **Ind2** | **Cog Appraisals** | **Threat** | **Cog Anxiety** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Threat** | **Cog Anxiety** |
| | | | | |
| SMM9 | | | | |
| Ind1 | Cog Appraisals | iBs | Som Anxiety | |
| **Ind2** | **Cog Appraisals** | **Threat** | **Som Anxiety** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Threat** | **Som Anxiety** |
| | | | | |
| SMM10 | | | | |
| Ind1 | Cog Appraisals | iBs | DI | |
| **Ind2** | **Cog Appraisals** | **Threat** | **DI** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Threat** | **DI** |

Table 5.

*Mean Scales, Standard Deviations and Correlations among all variables for actual future golf competition*

| N= 212 | M | SD | Age | Handi | Exp | No. of Weeks | DEM | AWF | LFT | DEP | Total iBs | MR | MC | PFC | EFC | Cog App | Chall | Threat | PostEmo | NegEmo | CA | SA | DI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | 38.55 | 15.08 | - | .62** | .53** | -.07 | -.04 | -.07 | .18** | -.07 | -.12 | -.18** | -.04 | -.25** | -.04 | -.16* | -.10 | -.20** | -.01 | -.27** | -.18** | -.19** | .04 |
| Handi | 8.68 | 7.15 | | - | .09 | -.10 | .07 | .10 | -.08 | .14* | .06 | -.23** | -.18** | -.29** | -.17* | -.29** | -.12 | .04 | -.08 | -.09 | -.02 | -.12 | .02 |
| Exp | 12.81 | 8.38 | | | - | -.15* | -.05 | -.10 | -.13 | -.06 | -.10 | -.16* | .01 | -.06 | -.04 | -.07 | -.07 | -.08 | -.08 | -.13 | -.10 | -.05 | -.03 |
| No. of Weeks | 1.16 | 1.07 | | | | - | -.06 | .00 | -.07 | -.01 | -.04 | .07 | -.02 | .02 | .03 | .02 | -.05 | .14* | .07 | .12 | .15* | .15* | -.04 |
| DEM | 20.53 | 3.83 | | | | | - | .77** | .57** | .47** | .82** | .06 | -.14* | -.07 | -.15* | -.11 | .13 | .31** | .11 | .10 | .31** | .13 | .00 |
| AWF | 21.79 | 4.75 | | | | | | - | .67** | .57** | .90** | .04 | -.25** | -.12 | -.16* | -.18** | -.00 | .43** | .02 | .26** | .40** | .26** | -.15* |
| LFT | 23.59 | 5.52 | | | | | | | - | .47** | .83** | .14* | -.22** | .01 | -.11 | -.09 | .14* | .27** | .12 | .15* | .29** | .16* | -.09 |
| DEP | 14.90 | 5.11 | | | | | | | | - | .77** | .01 | -.36** | -.13 | -.34** | -.30** | -.15* | .51** | -.15* | .39** | .47** | .37** | -.27** |
| Total iBs | 20.20 | 3.98 | | | | | | | | | - | .08 | -.30** | -.09 | -.23** | -.21** | .03 | .46** | .03 | .28** | .45** | .28** | -.16* |
| MR | 7.82 | 2.48 | | | | | | | | | | - | .30** | .30** | .21** | .62** | .40** | -.13 | .43** | .03 | .05 | .01 | .20** |
| MC | 14.78 | 3.63 | | | | | | | | | | | - | .32** | .47** | .80** | .42** | -.41** | .30** | -.38** | -.38** | -.40** | .44** |
| PFC | 7.60 | 2.19 | | | | | | | | | | | | - | .53** | .69** | .44** | -.20** | .34** | -.11 | -.14* | -.17* | .33** |
| EFC | 8.44 | 2.21 | | | | | | | | | | | | | - | .74** | .41** | -.35** | .33** | -.36** | -.33** | -.40** | .50** |
| Cog App | 9.66 | 1.90 | | | | | | | | | | | | | | - | .58** | -.40** | .48** | -.31** | -.30** | -.35** | .51** |
| Chall | 4.96 | 0.73 | | | | | | | | | | | | | | | - | -.39** | .66** | -.37** | -.25** | -.39** | .54** |
| Threat | 2.24 | 1.00 | | | | | | | | | | | | | | | | - | -.30** | .63** | .73** | .61** | -.40** |
| PostEm | 3.98 | 0.65 | | | | | | | | | | | | | | | | | - | -.27** | -.18** | -.25** | .43** |
| NegEm | 1.53 | 0.53 | | | | | | | | | | | | | | | | | | - | .72** | .82** | -.40** |
| CA | 1.80 | 0.57 | | | | | | | | | | | | | | | | | | | - | .73** | -.40** |
| SA | 1.61 | 0.49 | | | | | | | | | | | | | | | | | | | | - | -.46** |
| DI | 1.99 | 1.00 | | | | | | | | | | | | | | | | | | | | | - |

*p < 0.05, **p < 0.01

Table 6. *Serial multiple mediation analysis for actual future golf competition*

| Model No. | (M1) iBs | (M2) Appraisals | (Y) Outcome | $YR^2 = F(,) =, P$ | Total $c = t$(df) =, $P$ | Direct $c' = t$ (df) =, $P$ | Indirect# =effect, [to] | |
|---|---|---|---|---|---|---|---|---|
| 1 | | Challenge | PostEmo | $R^2 = .47$ F(6, 205) = 30.44 P < .001 | .17 t(207)= 7.89 P= .00 | .06 t(207)= 2.52 P=.01 | Tot= .33 [.24 to .43] | Ind1= -.01 [-.04 to .01] Ind2= .36 [.27 to .45] Ind3 = -.02 [-.04 to -.002] |
| 2 | | | NegEmo | $R^2 = .32$ F (6, 205)= 15.81 P< .001 | -.10 t(207)= -5.55 P=.00 | -.03 t(207)= -1.45 P= .15 | Tot= -.25 [-.35 to -.14] | Ind1= -.05 [-.09 to -.01] Ind2= -.21 [-.31 to -.11] Ind3= .01 [.001 to .03] |
| 3 | | | CogAnxiety | $R^2 = .32$ F (6, 205)= 16.42 P< .001 | -.10 t(207)= -4.98 P=.00 | -.040 t(207)= -1.76 P= .08 | Tot= -.20 [-.31 to -.09] | Ind1= -.08 [-.15 to -.03] Ind2= -.12 [-.21 to -.03] Ind3= .01 [.0003 to .02] |
| 4 | | | SomAnxiety | $R^2 = .31$ F (6, 205)= 15.63 P< .001 | -.11 t(207)= -6.47 P=.00 | -.04 t(207)= -2.33 P= .02 | Tot= -.24 [-.35 to -.14] | Ind1= -.05 [-.10 to -.01] Ind2= -.20 [-.30 to -.10] Ind3= .01 [.001 to .02] |
| 5 | | | DI | $R^2 = .39$ F (6, 205)= 22.11 P< .001 | .30 t(207)= 9.34 P= .00 | .17 t(207)= 4.44 P= .00 | Tot= .25 [.15 to .35] | Ind1= .02 [.0005 to .06] Ind2= .24 [.14 to .34] Ind3= -.01 |

[-.03 to -.001]

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | Threat | PostEmo | $R^2$= .30 F (6, 205)= 14.58 P< .001 | .17 $t$(207)= 7.89 P=.00 | .15 $t$(207)= 6.59 P=.00 | Tot= .05 [-.01 to .13] | Ind1= -.05 [-.10 to -.01] Ind2= .08 [.03 to .15] Ind3= .02 [.003 to .04] |
| 7 | | NegEmo | $R^2$= .43 F (6, 205)= 26.21 P<.001 | -.10 $t$(207)= -5.55 P=.00 | -.04 t(207)= -2.18 P= .03 | Tot= -.22 [-.31 to -.14] | Ind1= .003 [-.02 to .03] Ind2= -.19 [-.27 to -.11] Ind3= -.04 [-.07 to -.01] |
| 8 | | CogAnxiety | $R^2$= .55 F (6, 205)= 42.40 P<.001 | -.10 $t$(207)= -4.98 P= .00 | -.01 $t$(207)= -.66 P= .51 | Tot= -.29 [-.39 to -.20] | Ind1= -.031 [-.07 to -.01] Ind2= -.22 [-.30 to -.13] Ind3= -.05 [-.08 to -.02] |
| 9 | | Som Anxiety | $R^2$= .43 F (6, 205)= 25.64 P<.001 | -.107 $t$(207)= -6.47 P= .00 | -.049 $t$(207)= -3.18 P= .00 | Tot= -.22 [-.31 to -.15] | Ind1= -.002 [-.03 to .02] Ind2= -.18 [-.26 to -.11] Ind3= -.04 [-.07 to -.01] |
| 10 | | DI | $R^2$= .34 F (6, 205)= 17.48 P<.001 | .30 $t$(207)= 9.34 P=.00 | .25 $t$(207)= 7.24 P= .00 | Total = .09 [.04 to .16] | Ind1= -.01 [-.04 to .02] Ind2= .08 [.03 to .14] Ind3= .02 |

Table 7. *Regression weights for serial multiple mediation models for actual future golf competition*

| | Mediators | | | Regression Weights | | | | |
|---|---|---|---|---|---|---|---|---|
| Model No. | (M1) iBs | (M2) | (Y) Outcome | $a_1$ | $b_1$ | $d_{21}$ | $b_2$ | $a_2$ |
| 1 | | Challenge | PostEmo | -.43** | .01 | .03* | .51** | .24** |
| 2 | | | NegEmo | -.43** | .03** | .03* | -.24** | .24** |
| 3 | | | CogAnxiety | -.43** | .06** | .03* | -.15* | .24** |
| 4 | | | SomAnxiety | -.43** | .03** | .03* | -.22** | .24** |
| 5 | | | DI | -.43** | -. 03* | .03* | .52** | .24** |
| 6 | | Threat | PostEmo | -.43** | .04** | .09** | -. 16** | -.18** |
| 7 | | | NegEmo | -.43** | -.00 | .09** | .29** | -.18** |
| 8 | | | CogAnxiety | -.43** | .02** | .09** | .36** | -.18** |
| 9 | | | Som Anxiety | -.43** | .00 | .09** | .26** | -.18** |
| 10 | | | DI | -.43** | .01 | .09** | -.24** | -.18** |

*$p < 0.05$, **$p < 0.01$

1 Table 8.
2
3 *Causal chain according to models (X-M-M-Y) for actual future golf competition*
4

| | | | | |
|---|---|---|---|---|
| **SMM1** | | | | |
| Ind1 | Cog Appraisals | iBs | Post Emo | |
| **Ind2** | **Cog Appraisals** | **Challenge** | **Post Emo** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Challenge** | **Post Emo** |
| | | | | |
| **SMM2** | | | | |
| **Ind1** | **Cog Appraisals** | **iBs** | **Neg Emo** | |
| **Ind2** | **Cog Appraisals** | **Challenge** | **Neg Emo** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Challenge** | **Neg Emo** |
| | | | | |
| **SMM3** | | | | |
| **Ind1** | **Cog Appraisals** | **iBs** | **Cog Anxiety** | |
| **Ind2** | **Cog Appraisals** | **Challenge** | **Cog Anxiety** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Challenge** | **Cog Anxiety** |
| | | | | |
| **SMM4** | | | | |
| **Ind1** | **Cog Appraisals** | **iBs** | **Som Anxiety** | |
| **Ind2** | **Cog Appraisals** | **Challenge** | **Som Anxiety** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Challenge** | **Som Anxiety** |
| | | | | |
| **SMM5** | | | | |
| **Ind1** | **Cog Appraisals** | **iBs** | **DI** | |
| **Ind2** | **Cog Appraisals** | **Challenge** | **DI** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Challenge** | **DI** |
| | | | | |
| **SMM6** | | | | |
| **Ind1** | **Cog Appraisals** | **iBs** | **Post Emo** | |
| **Ind2** | **Cog Appraisals** | **Threat** | **Post Emo** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Threat** | **Post Emo** |
| | | | | |
| **SMM7** | | | | |
| Ind1 | Cog Appraisals | iBs | Neg Emo | |
| **Ind2** | **Cog Appraisals** | **Threat** | **Neg Emo** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Threat** | **Neg Emo** |
| | | | | |
| **SMM8** | | | | |
| **Ind1** | **Cog Appraisals** | **iBs** | **Cog Anxiety** | |
| **Ind2** | **Cog Appraisals** | **Threat** | **Cog Anxiety** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Threat** | **Cog Anxiety** |
| | | | | |
| **SMM9** | | | | |
| Ind1 | Cog Appraisals | iBs | Som Anxiety | |
| **Ind2** | **Cog Appraisals** | **Threat** | **Som Anxiety** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Threat** | **Som Anxiety** |
| | | | | |
| SMM10 | | | | |

| Ind1 | Cog Appraisals | iBs | DI | |
|------|----------------|--------|--------|-----|
| **Ind2** | **Cog Appraisals** | **Threat** | **DI** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Threat** | **DI** |

1

2

3

4

5

| Ind1 | Cog Appraisals | iBs | DI | |
|------|----------------|--------|--------|-----|
| **Ind2** | **Cog Appraisals** | **Threat** | **DI** | |
| **Ind3** | **Cog Appraisals** | **iBs** | **Threat** | **DI** |