A Psychological Exploration of Factors Which Affect the Uptake and Retention of Diabetes Prevention Programmes

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‘In the name of Allah, the Most merciful, the Most compassionate’

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Contents

Abstract

Aims: The overall aims of this thesis are to investigate which factors are associated with higher uptake and retention of Diabetes Prevention Programmes (DPPs), and also to examine the role of modifiable psychological factors in predicting uptake and completion of the NHSDPP in England. This includes a qualitative exploration of influences on attendance and completion for a DPP in Southwark. **Methods:** This thesis consists of: (i) a systematic review identifying recruitment strategies associated with high uptake and behaviour change techniques (BCTs) associated with high levels of retention in group-based DPPs; (ii) two qualitative studies which explore key influences on whether or not participants from ethnically diverse backgrounds attend and complete a DPP in a socioeconomically deprived area; and (iii) a quantitative study investigating whether psychological variables predict uptake and/or completion of a DPP, independent from other possible non-modifiable factors. **Results:** Regarding attendance, a range of recruitment strategies were used making it difficult to discern associations with uptake rates. Qualitative data found how understanding type 2 diabetes, making lifestyle changes, comparisons with others, having support and self-perceptions can affect motivations to attend, with accessibility and practicalities influencing both motivation and attendance. The quantitative study identified how illness perceptions, mental wellbeing, age and deprivation were significant predictors of uptake. Regarding completion, programmes with high retention were more likely to have specific BCTs, such as problem-solving. Qualitative data found that DPP completion was related to beliefs relating to illness threat, programme perceptions, influence from family and friends, lifestyle changes, and practicalities, in addition to motivation and communication issues. The quantitative study identified how those with higher self-efficacy, who were younger and/or from a specific area (West Yorkshire) were less likely to complete a DPP. **Conclusions:** The findings have identified a range of different influences on attendance and completion of a DPP. Understanding these various influences when organising and delivering sessions will contribute towards maximising response, uptake and retention rates, thus improving programme viability.

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List of Outputs

This thesis includes a combination of a published manuscript, manuscripts currently being prepared for submission, and studies written up as chapters. Data from this thesis have also been presented at UK conferences. The details of all outputs related to this thesis are as follows:

Articles:

Begum, S., Povey R., Gidlow, C., Ellis, N., & Chadwick, P. (In preparation). "It's a bad sickness": A qualitative study of the views and experiences of completers and non-completers from ethnically diverse backgrounds living in a socioeconomically deprived area.

Begum, S., Povey R., Ellis, N., Gidlow, C., & Chadwick, P. (2022). Influences of decisions to attend a national diabetes prevention programme from people living in a socioeconomically deprived area. *Diabetic Medicine, 39:* e14804. https://doi.org/10.1111/dme.14804.

Begum, S., Gidlow, C., Povey R., Chadwick, P., & Ellis, N. (In preparation). The effects of illness perceptions, self-efficacy and mental wellbeing scores on uptake and completion of a diabetes prevention programme in England.

Begum, S., Povey R., Ellis, N., & Gidlow, C. (2020). A systematic review of recruitment strategies and behaviour change techniques in group-based diabetes prevention programmes focusing on uptake and retention. *Diabetes Research and Clinical Practice, 166*:108273. https://doi.org/10.1016/j.diabres.2020.108273.

Conference presentations:

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Begum, S., Gidlow, C., Povey R., Chadwick, P., & Ellis, N. (2021). The effects of illness perceptions, self-efficacy and mental wellbeing scores on uptake and completion of a diabetes prevention programme in England. Delivered an oral presentation at the Annual Health Psychology conference (online), Staffordshire University, UK, June 2021.

Begum, S., Povey R., Gidlow, C., Ellis, N., & Chadwick, P. (2021). “It’s a bad disease”: A qualitative study of the views and experiences of completers and non-completers from ethnically diverse backgrounds living in a socioeconomically deprived area. Delivered an oral presentation at the Annual Midlands Health Psychology Network conference, MHPN (online), June 2021.

Begum, S., Gidlow, C., Povey R., Chadwick, P., & Ellis, N. (2021). The effects of illness perceptions, self-efficacy and mental wellbeing scores on uptake and completion of a diabetes prevention programme in England. Poster and video recording presented at the Diabetes UK Professional Conference, Diabetes UK (online), UK, April 2021. Abstract is published in Diabetic Medicine journal: https://doi.org/10.1111/dme.33_14556.

Begum, S., Povey R., Ellis, N., Gidlow, C., & Chadwick, P. (2021). National Diabetes Prevention Programme: A qualitative study of the views and experiences of attenders and non-attenders from ethnically diverse backgrounds living in a socioeconomically deprived area. Delivered an oral presentation at the Psychology & Counselling Associate Lecturers Conference, The Open University (online), UK, March 2021.

Begum, S., Povey R., Ellis, N., Gidlow, C., & Chadwick, P. (2019). NHS Diabetes Prevention Programme: Views and experiences of attenders and non- attenders. Delivered an oral presentation at the Annual Health Psychology conference, Staffordshire University, UK, June 2019.

Begum, S., Povey R., Ellis, N., & Gidlow, C. (2019). A systematic review of recruitment strategies and behaviour change techniques in group-based diabetes prevention programmes focusing on uptake and retention. Poster presented at the Joint Keele and Staffordshire Psychology Postgraduate Research Conference, Staffordshire University, UK, May 2019.

Begum, S., Povey R., Gidlow, C., Ellis, N., & Chadwick, P. (2017). NHS Diabetes Prevention Programme: A Qualitative Exploration. Poster presented at the Annual Health Psychology conference, Staffordshire University, UK, June 2017.

N.B. As all of the studies in this thesis are either published or in preparation, each chapter has an extended literature review as would appear in an empirical article. Therefore, some repetition may be present regarding the description and explanation of theory and/or research.

List of Acronyms

T2DM	Type 2 Diabetes Mellitus
COVID-19	Coronavirus Disease 2019
WHO	World Health Organisation
IDF	The International Diabetes Federation
UK	United Kingdom
PHE	Public Health England
NHS	National Health Service
NHSDPP	Healthier You: NHS Diabetes Prevention Programme
NICE	National Institute for Health and Care Excellence
IGR	Impaired Glucose Regulation
IGT	Impaired Glucose Tolerance
IFG	Impaired Fasting Glucose
FPG	Fasting Plasma Glucose
HbA1c	Glycated Haemoglobin
FINDRISC	Finnish Diabetes Risk Score
USA	United States of America
DPPs	Diabetes Prevention Programmes
BCTs	Behaviour Change Techniques
COM-B Model	Capability, Opportunity, Motivation, Behaviour Model
BCW	Behaviour Change Wheel
IPs	Illness Perceptions
CSM	Common-Sense Model
Brief-IPQ	Brief Illness Perception Questionnaire
SE	Self-Efficacy
NGS-ES	New General Self-Efficacy Scale
MWB	Mental Wellbeing
WEMWBS	Warwick-Edinburgh Mental Wellbeing Scale
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-analysis
EPHPP	Effective Public Health Practice Project
RCTs	Randomised Control Trials

RR	Response Rates
BAME	Black, Asian and Minority Ethnic group
IPA	Interpretative Phenomenological Analysis
IA	Initial Assessment
GP	General Practitioner
IMD	Index of Multiple Deprivation
CCG	Clinical Commissioning Group
LP	Local Provider
LR	Logistic Regression
OR	Odds Ratio
CI	95% Confidence Interval

Glossary

Term	**Definition**
Type 2 Diabetes Mellitus	This condition is a result of insufficient production of insulin by the pancreas or when the insulin does not work properly, leading to increased blood glucose (sugar) levels in the body (Diabetes UK, 2021c).
Prediabetes (other terms include: Impaired Glucose Regulation or Non-Diabetic Hyperglycaemia (Diabetes UK, 2021b), Impaired Glucose Tolerance or Impaired Fasting Glucose (Punthakee et al., 2018).	Those at high risk of T2DM. Those individuals who have higher than normal blood glucose levels but not high enough to be classified as having T2DM (American Diabetes Association, 2008).
Behaviour Change Techniques	"Active ingredients" of behaviour change (Abraham & Michie, 2008; Conner & Norman, 2017; Susan Michie et al., 2013).
Response Rate	The proportion of participants that responded to recruitment, out of the number of participants exposed to the study information via recruitment (Chapter 2).
Uptake Rate	The proportion of participants that started the group-based DPP, out of the number of participants allocated to the group-based DPP (Chapter 2).
Retention Rate	The proportion participants that did not drop-out from the group-based intervention, out of the number of participants present at the start (Chapter 2).
NHSDPP Uptake	Those who attended the first session (or at least one session) following the initial assessment (Chapters 5 and 7).

Term	**Definition**
NHSDPP Completion	Those who attended a threshold of at least 75% of sessions (14/18) (Chapters 6 and 7), in line with the criterion definition used by NHS England for payment by completion (NHS England, 2016b).
Illness Perceptions	Beliefs or organised cognitive and emotional representations held by individuals regarding their illnesses (Leventhal et al., 1992; Petrie et al., 2007).
Self-Efficacy (SE)	Perceived SE- an individuals` judgement of their own capability to perform an action/s in order to reach their desired goals (Bandura, 1977), general SE relates to beliefs in one's overall capacity to perform tasks (Smith, Gardner, & Michie, 2010).
Mental Wellbeing	Refers to positive mental health, which includes the subjective experience of happiness and life satisfaction, positive psychological functioning and developing and maintaining good personal and social relationships (Putz, Rebecca; O'Hara, Kate; Taggart, Frances and Stewart-Brown, 2012; Ryan & Deci, 2001; Stewart-Brown & Janmohamed, 2008). It also incorporates maintaining a sense of autonomy, self-acceptance, personal growth and self-esteem (Stewart-Brown & Janmohamed, 2008).
Modifiable Factors	These are influences that can be changed or improved (American Heart Association, 2015; Siddiqui et al., 2020).

Term	**Definition**
Non-Modifiable Factors	These are influences that cannot be changed or improved (American Heart Association, 2015; Siddiqui et al., 2020).
Initial Assessment	Brief appointment that participants are required to attend before programme commencement (i.e., before starting the first session of the NHSDPP).
Secondary Data	Sources of data that already exist which can be used for research purposes (Bowling, 2014).
Index of Multiple Deprivation	An overall measure of relative deprivation of small areas or neighbourhoods known as Lower-layer Super Output Areas (Department for Communities and Local Government., 2015). This measure is based on 37 different indicators running across seven separate domains related to income, employment, education, health, crime, housing, and the living environment (Department for Communities and Local Government., 2015; New Policy Institute, 2016).

Chapter 1: Literature Review

Type 2 Diabetes Mellitus (T2DM) is a serious, long-term, chronic health condition (i.e., long-lasting) that has become a global epidemic (Herman & Zimmet, 2012; O'Halloran et al., 2004; Saeedi et al., 2019). This condition is a result of insufficient production of insulin by the pancreas or when the insulin does not work properly, leading to increased blood glucose (sugar) levels in the body (Diabetes UK, 2021c). It is estimated that 463 million people worldwide are living with T2DM with half being unaware of their condition (Saeedi et al., 2019). Although approximately 1.5 million deaths annually (worldwide) are directly linked to T2DM, this chronic condition is also a major risk factor for other causes of death and conditions such as cardiovascular disease, kidney diseases and blindness (Bloom et al., 2011; Safiri et al., 2022; World Health Organization, 2023). This has led to increased financial implications and health care costs (Bommer et al., 2018).

The prevention of T2DM is an international health care priority, with prevalence of prediabetes (i.e., those at high risk of T2DM) estimated to rise from 374 million to 548 million between 2019 and 2045 (Saeedi et al., 2019). Levels of obesity and physical inactivity are also increasing, which are considered to be key causal factors towards the global diabetes burden (Forouzanfar et al., 2015; Saeedi et al., 2019). Current research has also shown the importance of T2DM to Coronavirus Disease 2019 (COVID-19) outcomes such as increased mortality rates, which further highlights the need for T2DM prevention (Apicella et al., 2020; Holman et al., 2020; Ruiz-Roso et al., 2020; Sardu et al., 2020; Zhu et al., 2020).

1.1 Policy and Position Statements around Diabetes Prevention

Type 2 Diabetes prevention has featured high on national and international public health agendas (Richardson et al., 2016; World Health Organization (WHO), 2016). The World Health Organisation (WHO) Global report highlights the international diabetes problem and provides key recommendations on addressing this such as evaluating behaviour change programmes, ensuring national policies are effectively implemented and evaluated, and prioritising actions that prevent individuals from becoming overweight and obese (World Health Organization (WHO), 2016; World Health Organization, 2023). Obesity increases the likelihood of T2DM so attempts have also been made internationally to reduce obesity rates, and halt the rise of both obesity and T2DM (Mendis, 2014; World Health Organization, 2023). The International Diabetes Federation (IDF) also recommends countries to implement comprehensive, cost-effective lifestyle programmes for those with prediabetes, and implement public health measures to encourage healthier diets (International Diabetes Federation, 2016, 2023).

Type 2 Diabetes prevention has also been a key focus for the UK. Currently, there are 4.9 million people with diabetes living in the UK, of which 90% have T2DM (Diabetes UK, 2021a). In addition, it is estimated there are an extra 850,000 people living with T2DM who are not yet diagnosed (Diabetes UK, 2021a). Furthermore, there are more than 13.6 million people at high risk of developing T2DM and it is estimated that the number of individuals with diabetes will increase to 5.5 million by 2030 (Diabetes UK, 2021a). This highlights the importance of T2DM prevention.

Diabetes UK, the UK`s leading diabetes charity, has position statements that provide recommendations on early identification of T2DM and preventing T2DM through reducing levels of obesity (Diabetes UK, 2020, 2021b). Public Health England (now known as the UK Health Security Agency and Office for Health Improvement and Disparities since October 2021) have also provided recommendations on how to prevent T2DM and implement the NHS Diabetes Prevention Programme (NHSDPP), a joint commitment from NHS England, Public Health England and Diabetes UK. This is an evidence-based programme for individuals with prediabetes (and will be discussed further in Chapter 4) (NHS England Publications, 2016; Public Health England (PHE), 2018). National policies and campaigns have been implemented to tackle obesity and prevent T2DM, and the National Institute for Health and Care Excellence (NICE) have also provided guidance on how to prevent T2DM at both the population and community level (National Institute for Health and Care Excellence (NICE), 2011; Public Health England (PHE), 2018).

1.2 Defining Prediabetes

There are various terms used to describe those who are at high risk of developing T2DM. People with “prediabetes” are defined as those individuals who have higher than normal blood glucose levels but not high enough to be classified as having T2DM (American Diabetes Association, 2008). Prediabetes can also be described in terms of impaired glucose regulation (IGR), non-diabetic hyperglycaemia (Diabetes UK, 2021b), impaired glucose tolerance (IGT) or impaired fasting glucose (IFG) (Punthakee et al., 2018). Prediabetes is diagnosed in different ways such as assessing glycated haemoglobin (HbA1c) levels (American Diabetes Association, 2008; Punthakee et al., 2018; World Health Organization (WHO), 2016) or through using diabetes risk scores such as the Finnish diabetes risk score (FINDRISC) (Hernan et al., 2012).

There are many factors (both modifiable and non-modifiable) which increase someone's risk of developing T2DM. Many of these are non-modifiable such as increasing age, a previous history of gestational diabetes, a family history of T2DM, those from lower socioeconomic groups, and ethnicity (some ethnic groups have higher risk such as South Asian, African-Caribbean, Black African and Chinese) (National Institute for Health and Care Excellence (NICE), 2011; World Health Organization (WHO), 2016). However, a number of risk factors are modifiable including being overweight or obese, having high waist circumference, unhealthy diets, being physically inactive, smoking, high blood pressure (hypertension) and abnormal cholesterol (lipid) levels (Díaz-Redondo et al., 2015; National Institute for Health and Care Excellence (NICE), 2011; World Health Organization (WHO), 2016).

There is overwhelming evidence that T2DM can be prevented or delayed by making changes to the modifiable factors, such as adopting healthier diets, losing weight and increasing levels of physical activity (International Diabetes Federation, 2016, 2023; Knowler et al., 2002; Penn et al., 2009; Ramachandran et al., 2006; World Health Organization, 2023). This is why many countries such as Finland, USA, Australia, China and the UK have implemented diabetes prevention programmes (DPPs) to support those with prediabetes to delay or prevent the onset of T2DM by encouraging lifestyle modification and weight loss through physical activity and diet usually in a group setting (Absetz et al., 2007; Diabetes Prevention Program Research Group, 2009; Dunbar, 2017; Howarth et al., 2020; Laatikainen et al., 2007; Lindstrom et al., 2006; Pan et al., 1997; Penn et al., 2018; Rintamäki et al., 2021; Valabhji et al., 2020).

1.3 Importance of Uptake and Retention

It is vital that DPPs are clinically effective and financially viable particularly when they are delivered at scale to improve population health (Albright, 2012; Alva, 2019). Continued or renewed funding for community health programmes like DPPs is usually dependent on achieving high uptake and retention (McCann et al., 2013). The importance of good participant uptake and retention is emphasised as it significantly contributes to clinically relevant changes (Brown et al., 2018; Clark et al., 2017) and economically relevant savings (Alva, 2019; Bozack et al., 2014). Exploring uptake and retention in group-based DPPs in particular is important as many national and community level DPPs and lifestyle programmes have a group-based element (Dunbar, 2017; Laatikainen et al., 2007; Penn et al., 2018; Sharma, 2007). Group-based programmes can produce better clinical health outcomes and are more cost-effective by reducing staff costs when compared to individual-based programmes (Ackermann et al., 2008; Borek et al., 2018; Odgers-Jewell et al., 2017) (see Chapter 2).

However, issues with low uptake and retention are common in DPPs (Absetz et al., 2007; Ackermann et al., 2008; Aziz et al., 2015; Chin et al., 2020; Venkataramani et al., 2019; Yates et al., 2017). These issues impact programme sustainability leading to some DPPs being discontinued in certain locations (Azar et al., 2019; Brown et al., 2018). Many DPPs have stated more needs to be done to improve and optimise uptake and retention, in order for programmes to be effective, reach their full potential, help to reduce health inequalities and achieve the desired effects (Azar et al., 2019; Brown et al., 2018; Gray et al., 2016; D. Griauzde et al., 2019; Jiang et al., 2018; Ritchie et al., 2018; Valabhji et al., 2020; Venkataramani et al., 2019; Whelan & Bell, 2022).

To identify how to improve both uptake and retention, it is important to explore factors associated with higher uptake (e.g., recruitment strategies employed) (Aziz et al., 2015; McCann et al., 2013) and higher retention (e.g., behaviour change techniques DPPs have utilised as they are “active ingredients” of interventions, and are increasingly used when designing programmes; see Chapter 2). A better understanding of individual needs, views and experiences of DPPs are required so that effective strategies can be developed to encourage participants to attend and remain engaged (Aziz et al., 2015; Chin et al., 2020; Laws et al., 2012; Rodrigues et al., 2020). To explore factors affecting uptake and retention, it is important to determine how DPPs define these terms, which can vary (Howarth et al., 2020).

1.4 Defining Uptake

“Uptake” is defined in many ways and DPPs use various terms related to uptake, such as enrolment and attendance. Some DPPs define uptake as the proportion of referrals attending a short appointment (Initial Assessment) before starting the first programme session (Barron et al., 2018; Howarth et al., 2020); others define uptake as the proportion of participants recruited to the intervention, out of the total number of eligible participants (Griauzde et al., 2019); and most define it as those participants who attend at least one session, usually the first session (Centers for Disease Control and Prevention, 2015; Conlon et al., 2015; Ely et al., 2017; Gray et al., 2016; Howarth et al., 2020; Jeffers et al., 2019; Laws et al., 2012; Ritchie, Holtrop, et al., 2020; Ritchie et al., 2017; Ritchie, Baucom, et al., 2020; Ritchie, Gutiérrez-Raghunath, et al., 2020). For the purpose of this thesis, uptake (also referred to as attendance) to a specific DPP will be defined as those who attended the first session (or at least one session) following the initial assessment (Chapters 5 and 7).

1.5 Defining Retention

There are many ways of defining retention and DPPs use various terms related to retention, such as adherence, engagement and completion. Many DPPs provide definitions of retention in terms of the proportion of sessions attended. This can be done specifically such as attending a specific minimum number of sessions (e.g., 9/16 sessions, or 12/24 sessions) as thresholds to represent an adequate exposure to elicit lifestyle changes to reduce T2DM risk (Centers for Disease Control and Prevention, 2015, 2018; Chakkalakal et al., 2019; Ely et al., 2017; Helitzer et al., 2007; Jeffers et al., 2019; O’Brien et al., 2015; Whittemore et al., 2014; Woods-Giscombe et al., 2019), or more generally (i.e., authors detail what proportion of sessions attended are calculated without specifying these thresholds in detail) (Bukman et al., 2017; Conlon et al., 2015; Eaglehouse et al., 2017; Ritchie, Baucom, et al., 2020; Ritchie, Gutiérrez-Raghunath, et al., 2020; Ritchie, Holtrop, et al., 2020; Van Dongen et al., 2016).

Retention is also defined as attending a certain number of sessions (Adams et al., 2016; Alva, 2019a; Alva et al., 2019; Amundson et al., 2009; Aziz et al., 2015; Bozack et al., 2014; Brokaw et al., 2015; Centers for Disease Control and Prevention, 2015; Chin et al., 2020; Gómez et al., 2018; Islam et al., 2013; Laatikainen et al., 2007; Ritchie et al., 2017; Ritchie, Baucom, et al., 2020) or completing a certain proportion of sessions such as 60% or 75% (Cezaretto et al., 2012; Howarth et al., 2020; Jaber et al., 2011; Lim et al., 2017; NHS England, 2016b; Valabhji et al., 2020). Retention is also defined as the proportion of participants that did not drop-out from the DPP, out of the number of participants present at the start (Begum et al., 2020; Cannon et al., 2020; Woods-Giscombe et al., 2019). For the purpose of this thesis, completion (i.e., good retention) of a specific DPP will be defined as those who attended a threshold of at least 75% of sessions (14/18) (Chapters 6 and 7), in line with the criterion definition used by NHS England for payment by completion (NHS England, 2016b).

1.6 Modifiable Factors Affecting Uptake and Retention

Modifiable factors are important to explore as they can be changed or improved as opposed to non-modifiable factors (American Heart Association, 2015; Siddiqui et al., 2020). It is recommended that to develop and improve DPPs, studies should explore factors that affect participants' decisions when making the choice to start and complete DPPs (Aziz et al., 2015; Borek et al., 2019; Gray et al., 2016; Whelan & Bell, 2022), particularly those from ethnically diverse backgrounds living in socioeconomically deprived areas as many DPPs have found they are less likely to start and complete (Aujla et al., 2019; Bozack et al., 2014; Chin et al., 2020; Gray et al., 2016; Jeffers et al., 2019; Jiang et al., 2013; Laatikainen et al., 2007; Lim et al., 2017; Ritchie et al., 2017, 2018; Seidel et al., 2014; Smith et al., 2019; Taetzsch et al., 2019; Teuschl et al., 2012; Valabhji et al., 2020; Vita et al., 2016; Whittemore et al., 2014; Zigmont et al., 2018). Diabetes Prevention Programmes have stated the need to explore why participants do not start or complete programmes, and to investigate facilitators and barriers (Alva, 2019; Chambers et al., 2017; Ely et al., 2017; Pinelli, Herman, Brown,

& Jaber, 2010). This can be done by interviewing participants who attend/do not attend and complete/do not complete DPPs as well as examining the extent to which modifiable factors predict attendance and completion (e.g., illness perceptions, self-efficacy and mental wellbeing).

1.6.1 Reported Participant Facilitators and Barriers

Qualitative literature exploring service users' experiences of DPPs, suggest a number of factors that could influence uptake. These include positive factors such as: wanting to improve health (Borek et al., 2019; Harrison et al., 2020) or being motivated by anticipated programme benefits (Rodrigues et al., 2020). Barriers include having conflicting work-related commitments (Aujla et al., 2019; Gómez et al., 2018; Harrison et al., 2020; Thomas et al., 2019; Troughton et al., 2015; Woods-Giscombe et al., 2019), lack of time (Gómez et al., 2018; Van Dongen et al., 2016) or family responsibilities (Aujla et al., 2019; Gómez et al., 2018; Thomas et al., 2019; Woods-Giscombe et al., 2019).

Qualitative literature also suggests several factors that could influence completion. These include positive factors such as: positive social support received from programme groups, family or friends (Azzi et al., 2020; Bozack et al., 2014; Coppell et al., 2017; Di Battista et al., 2017; Hawkes et al., 2020; Penn et al., 2018; Rodrigues et al., 2020), coaches who were described as informative, increasing motivation, forming good relationships (Aujla et al., 2019; Bozack et al., 2014; Coppell et al., 2017), and having a convenient session location (Aujla et al., 2019; Di Battista et al., 2017). Negative factors influencing completion are: having work commitments (Realmuto et al., 2018; Woods-Giscombe et al., 2019), having family responsibilities (e.g., childcare, caring for elderly) (Harrison et al., 2020; Parikh et al., 2010; Realmuto et al., 2018; Seear et al., 2019) or session times being inconvenient or issues with the venue (Hawkes et al., 2020; Realmuto et al., 2018; Seear et al., 2019). However, none of these studies interviewed non-attenders or non-completers, nor did they explore perceptions from people with ethnically diverse backgrounds and/or from socioeconomically deprived areas, which the research presented in this thesis will aim to do (see Chapters 5 and 6).

1.6.2. Psychological Factors

Psychological factors i.e., the way people think about their condition and their ability to change, could play a role in uptake and/or retention of a diabetes prevention programme. Illness perceptions (IPs), self-efficacy (SE) and mental wellbeing are important factors for DPPs to consider as they have been identified as influencing uptake and/or retention for other health prevention programmes such as cardiac rehabilitation (Broadbent et al., 2006; Cassidy et al., 2014; Cooper et al., 1999; French et al., 2006; Petrie et al., 1996; Whitmarsh et al., 2003; Yohannes et al., 2007), breast screening (Marmarà et al., 2017, 2019), and weight reduction programmes (Bernier & Avard, 1986).

Illness perceptions (IPs) have been derived from the Common-Sense Model (Leventhal, 1970; Leventhal et al., 1980, 1992) and are beliefs or organised cognitive and emotional representations held by individuals regarding their illness (Leventhal et al., 1992; Petrie et al., 2007). These IPs consist of five main, broad components which include beliefs related to: illness identity (perceptions held on the label and symptoms of an illness), causes (perceptions held on the cause of an illness), timeline (perceptions held on the duration of an illness), consequences (perceptions held on the expected effects of an illness), and control/cure (perceptions held on the controllability/ curability of an illness) (Broadbent et al., 2006; Moss-Morris et al., 2002; Petrie & Weinman, 2006; Weinman et al., 1996). Later on, subtypes were created from original components or additional components were added as part of IPs including illness: coherence (perceptions held on the understanding of an illness), control/cure was split into personal control and treatment control (perceptions held on the extent to which treatment can help to control an illness), and another additional component was emotional response (perceptions held on the emotional effects of an illness including illness concern) (Broadbent et al., 2006; Moss-Morris et al., 2002). It is well established that IPs are important determinants of behaviour and various outcomes in individuals with different health conditions such as T2DM (Petrie et al., 2007).

Research exploring predictors of uptake in other health preventative and lifestyle behaviour change programmes have shown that some illness perceptions significantly predict higher uptake (Marmarà et al., 2017, 2019; Murray et al., 2012). Studies have shown that attenders (i.e., those who started a programme) had higher illness identity or controllability scores than non-attenders (Broadbent et al., 2006; Cooper et al., 1999; French et al., 2006; Petrie et al., 1996; Whitmarsh et al., 2003). Also, participants with more positive identity, more control, who believed there were worse consequences, and had coherent beliefs were more likely to attend, with controllability being the strongest predictor of attendance than the other IP components (French et al., 2006). Non-completion has been associated with a lower number of illness consequences and lower perceptions of controllability or treatment control (Whitmarsh et al., 2003; Yohannes et al., 2007), as well as higher levels of personal control (Yohannes et al., 2007) in two studies of cardiac rehabilitation programmes.

Perceived SE can be defined as an individual’s judgement of their own capability to perform an action/s in order to reach their desired goals (Bandura, 1977), and general SE relates to beliefs in one's overall capacity to perform tasks (Smith, Gardner, & Michie, 2010). Self-efficacy is a vital link between knowledge application and actual behaviour change, and it is one of the main, effective predictors of health behaviour (Bandura, 1982; Chen & Lin, 2010). Self-efficacy determines the amount of effort and perseverance an individual will invest in a behaviour (Schwarzer, 1999), and higher levels of SE have been linked to increased behavioural change (Miller et al., 2016).

Many DPPs have demonstrated improved levels of SE (Borek et al., 2019; Chen et al., 2017; Lim et al., 2017; Miller et al., 2016; Vincent et al., 2014). This increased SE (as a result of the programme) has been found to lead to improvements in physical activity (Block et al., 2016; Cha et al., 2014; Cioffi et al., 2018; Critchley et al., 2012; Delahanty et al., 2006; Leung et al., 2019; Plotnikoff et al., 2003; Taylor et al., 2016), healthy eating (Block et al., 2016; Glynn & Ruderman, 1986; Kyrios et al., 2009; Leung et al., 2019; Miller et al., 2016; Townsend et al., 2016), weight loss (Byrne et al., 2012; Delahanty et al., 2013; Hays et al., 2014; Teixeira et al., 2004) and reduction in risk of developing T2DM by promoting healthier lifestyles (Chen & Lin, 2010). Research on cardiac rehabilitation and lifestyle change programmes have shown SE is related to attendance (i.e., starting and attending a certain proportion of sessions) (Murray et al., 2012; Selzler et al., 2019) and those with lower levels of SE were more likely to drop out and become non-completers (Bernier & Avard, 1986; Grace et al., 2002; Jancey et al., 2007; Kampshoff et al., 2016).

Mental wellbeing (MWB) is a further factor DPPs should consider. Mental wellbeing refers to positive mental health, which includes the subjective experience of happiness and life satisfaction, as well as positive psychological functioning and developing and maintaining good personal and social relationships (Putz, Rebecca; O’Hara, Kate; Taggart, Frances and Stewart-Brown, 2012; Ryan & Deci, 2001; Stewart-Brown & Janmohamed, 2008). Mental wellbeing also incorporates maintaining a sense of autonomy, self-acceptance, personal growth and self-esteem (Stewart-Brown & Janmohamed, 2008).

Mental wellbeing has been shown to be associated with uptake and attendance of lifestyle change programmes (Khalil et al., 2012; Murray et al., 2012) and cardiac rehabilitation programmes (Deskur-Śmielecka et al., 2009). Some have also demonstrated that MWB can positively affect completion or encourage continued attendance (Cassidy et al., 2014; Khalil et al., 2012). For DPPs, some have found that as a result of programme participation, MWB improved or self-esteem increased (Castro Sweet et al., 2018; Kulzer et al., 2009; Quiñones et al., 2018). Others have shown that completers had better MWB (lower scores on measures of psychological distress, anxiety and depression) when compared to non-completers (Laatikainen et al., 2007; Teuschl et al., 2012).

To date, there is a lack of research investigating whether Illness Perceptions, perceived self-efficacy, and mental wellbeing have a role in predicting uptake and/or completion of DPPs like the NHS diabetes prevention programme. This is what this thesis aims to do (see Chapter 7).

1.7 Non-modifiable Factors Affecting Uptake and Retention

It also important to be aware of non-modifiable factors (i.e., age, sex, ethnicity and deprivation) which can influence DPP uptake and retention. Those DPPs which have reported how these non-modifiable factors relate to uptake and retention will be now discussed.

1.7.1 Age

T2DM is usually diagnosed in non-pregnant adults aged 40 years and older, but age of onset is becoming increasingly lower in certain high risk groups (International Diabetes Federation, 2016; National Institute for Health and Care Excellence (NICE), 2011). The majority of DPPs have found those who are older are more likely to be interested in and go on to start the programmes when compared to those who are younger (Barron et al., 2018; Brunisholz et al., 2017; Chambers et al., 2017, 2019; Howarth et al., 2020; Ritchie et al., 2017; Venkataramani et al., 2019; Vermunt et al., 2010; Zigmont et al., 2018). Some DPPs have found non-attenders are significantly younger than attenders (Aujla et al., 2019; Gray et al., 2016; Taradash et al., 2015; Teuschl et al., 2012; Whittemore et al., 2014).

Although some DPPs have found there to be no association between age and retention (Amundson et al., 2009; Lee et al., 2018; Seidel et al., 2008), the majority have found those who are older are more likely to attend more sessions (i.e., achieve the required attendance thresholds) and complete DPPs as opposed to non-completers who are significantly younger in age (Bozack et al., 2014; Brokaw et al., 2015; Cannon et al., 2020; Chin et al., 2020; Conlon et al., 2015; Eaglehouse et al., 2017; Ely et al., 2017; Gray et al., 2016; Guyse et al., 2011; Howarth et al., 2020; Jeffers et al., 2019; Jiang et al., 2013; Kramer et al., 2009; Lim et al., 2017; Ritchie et al., 2017; Smith et al., 2019; Valabhji et al., 2020; Vanderwood et al., 2010, 2011; Vermunt et al., 2012; Vita et al., 2016; Whittemore et al., 2009).

1.7.2 Sex

Sex is another risk factor for T2DM, as rates of T2DM are higher in males than females (Lipscombe & Hux, 2007). Although a few DPPs have found there are no significant differences by sex in uptake (Barron et al., 2018; Chambers et al., 2017) and others have found males are more likely to attend (Gray et al., 2016; Troughton et al., 2015), the majority of DPPs report females are more likely to be interested and go on to start when compared to males who are more likely to become non-attenders (Barron et al., 2018; Brunisholz et al., 2017; Cannon et al., 2020; Chambers et al., 2019; Gary-Webb et al., 2018; Jackson et al., 2020; Sanchez et al., 2018; Vermunt et al., 2010; Whittemore et al., 2014; Zigmont et al., 2018).

Although some DPPs have found there to be no associations between sex and retention (Amundson et al., 2009; Brokaw et al., 2015; Cannon et al., 2020; Conlon et al., 2015; Ely et al., 2017; Valabhji et al., 2020; Vita et al., 2016), other DPPs have found females to be more likely to achieve the required attendance thresholds and complete DPPs when compared to males who are more likely to drop out and become non-completers (Cezaretto et al., 2012; Coppell et al., 2009; Gilis-Januszewska, Lindström, et al., 2018; Ockene et al., 2012; Quiñones et al., 2018).

1.7.3 Ethnicity

Ethnicity is another important risk factor for T2DM as research has shown when compared to white ethnic groups, specific ethnic groups such as South Asian, African-Caribbean, Black African and Chinese are more likely to develop T2DM (National Institute for Health and Care Excellence (NICE), 2011; Nordström et al., 2016; World Health Organization (WHO), 2016).

There is mixed evidence regarding ethnicity and uptake. Although some DPPs have found those from Black, Asian, Afro-Caribbean, or mixed ethnic backgrounds are more likely to be interested in and start DPPs when compared to any other ethnic or White European groups (Barron et al., 2018; Venkataramani et al., 2019; Zigmont et al., 2018), others have found non-Hispanic White or White ethnic individuals are more likely to start and become attenders than other ethnic groups (Aujla et al., 2019; Ritchie et al., 2017, 2018).

Regarding retention, there is a clearer pattern in findings. Many DPPs have found Latinos, non-Caucasian, non-Hispanic African Americans, those from Asian, Black or mixed ethnic groups to be more likely to drop out and become non-completers when compared to White ethnic groups who are more likely to become completers (Bozack et al., 2014; Cannon et al., 2020; Chin et al., 2020; Ritchie et al., 2018; Seidel et al., 2008; Smith et al., 2019; Valabhji et al., 2020).

Overall, findings for ethnicity are mixed, particularly for uptake. It is important to note that most of these studies were conducted in the US which have different ethnic groups when compared to the UK. So, whether these findings are applicable to the ethnically diverse groups living in the UK is questionable and would need further exploration.

1.7.4 Socioeconomic Status

Socioeconomic status is a risk factor for T2DM. Those from more socioeconomically deprived areas are more likely to have prediabetes (Mainous III et al., 2014) and are more likely to develop T2DM regardless of whether they are from high, middle or low income countries (Agardh et al., 2011). Although a few DPPs have found those with lower family income or from the most deprived quintile to be more likely to start (Barron et al., 2018; Venkataramani et al., 2019), other DPPs have found those from less socioeconomically deprived areas, with higher income, a higher level of education or were employed, to be more likely to start and become attenders (Gray et al., 2016; Jeffers et al., 2019; Whittemore et al., 2014; Zigmont et al., 2018). Regarding retention, most DPPs have found those from the most deprived quintile, unemployed or with lower income, or lower levels of education were more likely to drop out and become non-completers (Bozack et al., 2014; Jiang et al., 2013; Laatikainen et al., 2007; Lim et al., 2017; Smith et al., 2019; Taetzsch et al., 2019; Teuschl et al., 2012; Valabhji et al., 2020; Vita et al., 2016) .

Overall, the majority of studies have found those from more socioeconomically disadvantaged backgrounds are less likely to start and complete DPPs. So, exploring participants` views and experiences including barriers and facilitators to uptake and completion of a DPP in an ethnically diverse socioeconomically disadvantaged area would be beneficial.

1.8 Summary

Improving uptake and retention in diabetes prevention programmes is important to ensure they are clinically effective and financially viable. This requires: an exploration of factors commonly associated with higher uptake and retention such as recruitment strategies and factors associated with the programmes themselves and an exploration of individual-level factors. Furthermore, there is a need to explore what influences participants from ethnically diverse backgrounds living in a socioeconomically deprived area, to start and complete DPPs such as the NHSDPP. This is particularly important considering those from ethnically diverse backgrounds and/or from more deprived areas are at increased risk of developing T2DM (Gholap et al., 2011; Mainous III et al., 2014).

This thesis will focus on exploring what influences participants to start and complete the NHSDPP and identifying which modifiable psychological factors predict uptake and retention, independent from other possible confounders (i.e., non-modifiable factors). This research will help with filling the gap in knowledge regarding which recruitment strategies and behaviour change techniques are commonly associated with higher uptake and retention in Diabetes Prevention Programmes. In addition, by exploring what influences participants from ethnically diverse backgrounds living in a socioeconomically deprived area to start and complete DPPs, it will be possible to provide guidance regarding how to promote uptake and retention within this specific population, therefore improving programme viability.

1.9 Aims of Thesis

The aims of this thesis are threefold. Firstly, to investigate which factors associated with recruitment and the programmes themselves, are associated with higher uptake and retention of diabetes prevention programmes in general. Secondly, to focus in on a DPP in a socioeconomically deprived area and explore what influences participants to attend and complete the programme and thirdly to examine the role of modifiable psychological factors in predicting uptake and completion of the NHS diabetes prevention programme in England.

1.10 Objectives

1. To identify important recruitment and programme-level factors (e.g., recruitment strategies and common behaviour change techniques) in group-based DPPs that are associated with high response, uptake and retention in the published literature.
2. To explore key influences of participants' decisions to start and attend a diabetes prevention programme in a socioeconomically deprived area.
3. To explore key influences on why participants complete/do not complete a diabetes prevention programme in a socioeconomically deprived area.
4. To examine whether illness perceptions, self-efficacy, and mental wellbeing predict uptake and/or completion of a diabetes prevention programme, independent from other possible confounders (i.e., non-modifiable factors).

1.11 Outline of Thesis

The thesis is structured as follows.

Chapter 2 - Systematic Review: Provides an insight into recruitment strategies associated with high uptake and behaviour change techniques associated with high levels of retention which have not been previously explored in diabetes prevention programmes.

Chapter 3 – Methodology: Provides a rationale for each study design, including why certain data collection and analysis approaches were taken.

Chapter 4 - Context and Background to Research: Provides a brief introduction to the NHS Diabetes Prevention Programme (NHSDPP), and a profile of Southwark, where the specific diabetes prevention programme explored in Chapters 5-6 is based.

Chapter 5 – Qualitative Study with Attenders and Non-Attenders: Presents findings on the key influences of decisions in participants from ethnically diverse backgrounds to attend the NHSDPP in Southwark.

Chapter 6 – Qualitative Study with Completers and Non-Completers: Presents findings on the key influences on whether or not participants complete the NHSDPP in Southwark.

Chapter 7 – Quantitative Study of Illness Perceptions, Self-Efficacy and Mental Wellbeing: Presents findings on whether factors including illness perceptions, self-efficacy and mental wellbeing predict uptake and/or completion of the NHSDPP, independent from other possible non-modifiable factors (e.g., age, sex, ethnicity, deprivation).

Chapter 8 - Discussion and Conclusions: Summarises findings from Chapters 2, 5, 6 and 7. An evaluation of the research objectives as well as the strengths and weaknesses of this research are discussed. Future research and recommendations for practice are considered, with some researcher reflections on the PhD journey.

The next chapter presents a systematic review of group-based DPPs which aims to investigate which recruitment strategies and behaviour change techniques are commonly associated with higher uptake and retention. This chapter has been written up as a paper and published in *Diabetes Research and Clinical Practice* (please see pages vi – viii (List of Outputs) for details). The chapter is written in the form of the accepted article.

Chapter 2: A Systematic Review of Recruitment Strategies and Behaviour Change Techniques in Group-Based Diabetes Prevention Programmes Focusing on Uptake and Retention.

2.1 Introduction

Type 2 Diabetes Mellitus (T2DM) prevention is a worldwide health care priority (Saeedi et al., 2019), with levels of prediabetes predicted to rise from 374 million in 2019 to 548 million by 2045 (Saeedi et al., 2019). This is increasingly important as levels of obesity and physical inactivity being major contributory factors towards the global diabetes burden, are escalating (Forouzanfar et al., 2015; Saeedi et al., 2019). Although T2DM directly leads to approximately 1.3 million deaths annually (worldwide), it is a major risk factor for other causes of death and conditions such as cardiovascular disease, kidney diseases and blindness (Bloom et al., 2011).

To delay or prevent the onset of T2DM, many countries like Finland, USA, Australia, China and the UK have implemented diabetes prevention programmes (DPPs) that involve lifestyle modification through physical activity and diet (Absetz et al., 2007; Diabetes Prevention Program Research Group, 2009; Dunbar, 2017; Laatikainen et al., 2007; Lindstrom et al., 2006; Pan et al., 1997; Penn et al., 2018). A primary objective of DPPs is to support those with prediabetes (i.e., at high risk of T2DM) to lower their risk of developing T2DM through weight loss or management (Absetz et al., 2007; Diabetes Prevention Program Research Group, 2009; Diabetes Prevention Team, 2015).

It has been recommended that national DPPs incorporate group-based elements or a social dimension (Public Health England, 2016). Group-based delivery can reduce programme costs as it requires less staff time than individual-based interventions (The Diabetes Prevention Program Research Group, 2003). It is important that DPPs are clinically effective and financially viable (Albright, 2012). Programme viability is dependent on reaching and supporting sufficient numbers of the target population; i.e., uptake and retention (Ahmad & Crandall, 2010; Alva, 2019a).

Uptake relies on effective recruitment strategies (McCann et al., 2013). Understanding which recruitment strategies are most likely to elicit a response from potential participants (response rate) and lead to them starting a programme (uptake) is important to maximise response and uptake rates, and minimise the risk and financial costs related to insufficient recruitment (Aziz et al., 2015; McCann et al., 2013).

Retention refers to sustaining participant involvement in the programme for as long as possible (McCann et al., 2013). To ensure high retention, it is important that DPPs and the lifestyle change (behaviour change) in question are attractive, social and timely (Public Health England, 2016). Therefore, interventions need to be examined to explore common characteristics of those with high rates of retention. One way of systematically examining interventions is to identify which Behaviour Change Techniques (BCTs) are used (Conner & Norman, 2017; Michie et al., 2013). BCTs are described as the “active ingredients” of behaviour change and are increasingly considered when designing interventions as they are building blocks of interventions (Abraham & Michie, 2008; Susan Michie et al., 2013). By identifying BCTs common among DPPs with high rates of retention, programme designers can ensure that these are incorporated to optimise retention.

To summarise, DPPs are an important part of the global response to the rising prevalence of T2DM and are recommended to use group-based elements. Uptake and retention are important for DPP viability. By exploring recruitment strategies and BCTs they employ, factors to promote uptake and retention can be identified. To date, there has been no published review on uptake and retention in group-based DPPs where recruitment strategies and BCTs are extracted. This systematic review of the published literature on group-based DPPs aimed to:

- Identify recruitment strategies associated with high response rate and uptake in Diabetes Prevention Programmes that were predominantly group-based and involved lifestyle modification (e.g., diet, physical activity).
- Identify BCTs that are common in Diabetes Prevention Programmes that were predominantly group-based and involved lifestyle modification with high levels of retention.

2.2 Methods

This systematic review is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines (Moher et al., 2009; PRISMA, 2015) (see Appendix 1: PRISMA checklist).

2.2.1 Criteria for Inclusion/Exclusion (Table 1)

2.2.1.1 Design

This was a systematic, critical review of randomised control trials (RCTs), prospective, cohort, pilot and feasibility programmes.

2.2.1.2 Participants

Programmes targeting adults aged 18 years and over, with prediabetes or non-diabetic hyperglycaemia, impaired glucose tolerance or impaired fasting glucose were included.

2.2.1.3 Interventions

Programmes that were predominantly group-based and involved lifestyle modification (e.g., diet, physical activity) and in which uptake and/or retention could be determined, were included.

2.2.1.4 Outcomes

Programmes that had primary outcomes of weight loss or reduction in T2DM risk (reduced glucose levels, calorie intake and/or increased physical activity) were included.

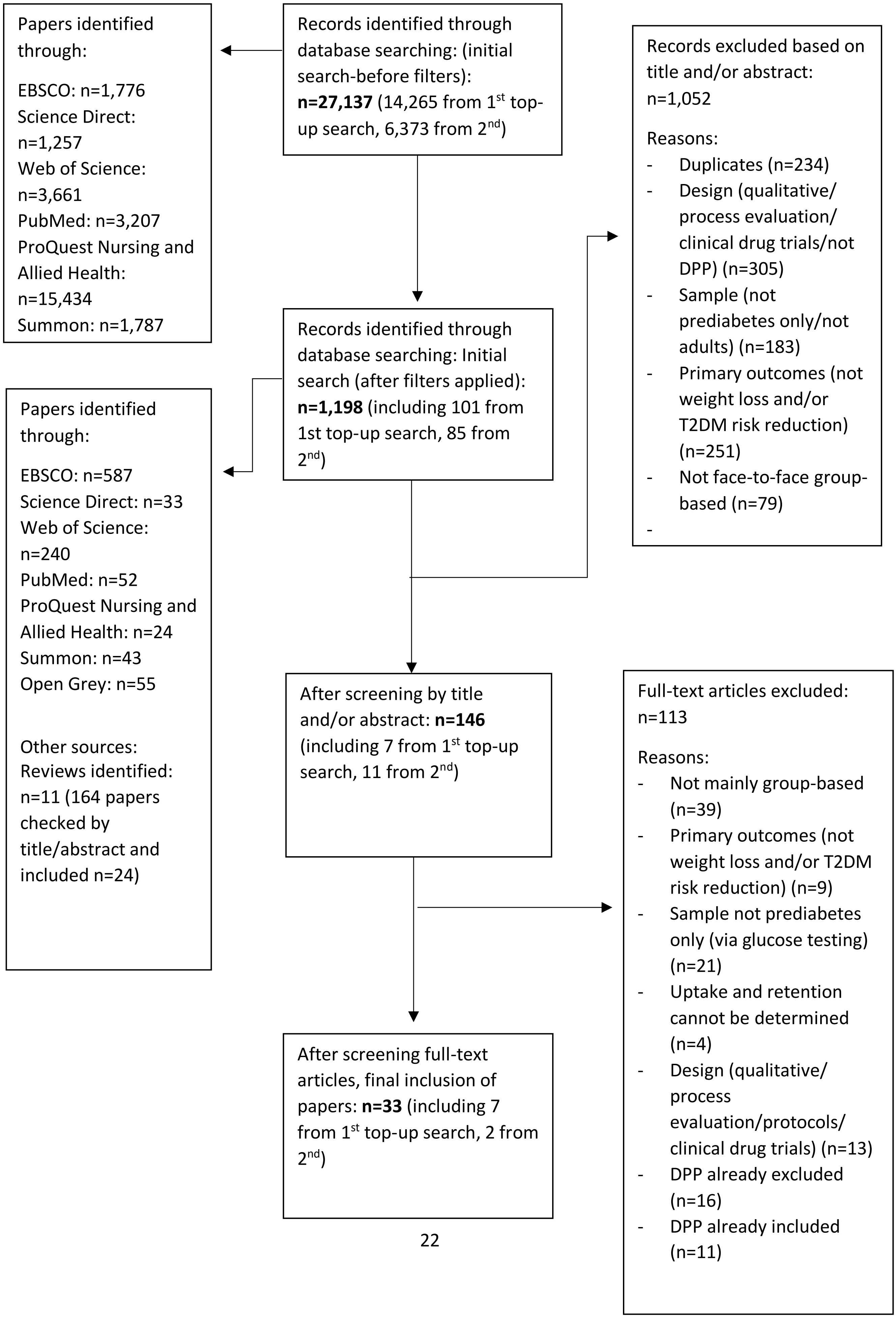
Table 1: Inclusion/exclusion criteria

Inclusion	**Exclusion**
Group-based (necessary component; ≥50% sessions are group-based)	Mostly individual sessions Optional group sessions/unclear if group-based Unable to determine both uptake and retention
Prediabetes Non-diabetic hyperglycaemia (determined by glucose testing) Impaired glucose tolerance/Impaired fasting glucose	Confirmed T2DM Combination of T2DM and prediabetes T1DM Gestational diabetes/post-partum Normal glucose levels/metabolic syndrome.
Adults ≥18yrs	
English language	
RCTs/prospective/cohort/relevant studies within reviews/pilot studies/feasibility studies	Qualitative studies (methodology and/or analysis) Case studies Mixed methods, process evaluation, reviews, protocols (with no data)/observational only
Face-to-face Intensive lifestyle modification	Intervention included: metformin/drugs/medication. Intervention only used cable television/digital platforms/handheld device/video/mobile app/web-based/e-learning/video conferencing
Primary outcomes: weight loss/T2DM risk reduction	

2.2.2 Search Strategy

A comprehensive database search for relevant papers published prior to the 8th of March 2017 was conducted (searching for papers from when the database started to current day). Top-up searches were conducted on the 10th of December 2018 and 21st of October 2019 (to identify relevant papers published subsequent to the initial search (March 2017-October 2019). Databases included EBSCO (MEDLINE, CINAHL Plus with Full Text, SPORTDiscus with Full Text, PsycINFO, PsycARTICLES); Science Direct; Web of Science, PubMed, ProQuest Nursing & Allied Health Database, Staffordshire University Summon tool and Opengrey. Key search terms were: prediabetes intervention* OR prediabetes program* OR diabetes prevention intervention* OR diabetes prevention program* AND group*. Filters were then applied to restrict the search to papers written in English, participants who are adults, papers where the key search terms appeared in the title only. Publication titles and abstracts were screened followed by full text of the selected papers. Reference lists of included papers and relevant reviews were examined for additional papers. Authors were contacted if full text of relevant papers could not be retrieved or to provide additional detail (Figure 1).

Figure 1: PRISMA diagram of papers included/excluded for review.



2.2.3 Quality Assessment

Quality of studies was assessed using the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies (Effective Public Health Practice Project, 2010). Ten percent of the included papers were independently checked by a second reviewer (RP) and any discrepancies resolved by consensus.

2.2.4 Data Extraction and Synthesis

Data were extracted from the included papers: country, study design, setting, intervention type, group components, length of follow-up, recruitment method, sample characteristics, response, uptake and retention rates, and reasons for drop out (Appendix 2: Data extraction table).

For each study, the components of the intervention were screened to identify behaviour change techniques using the BCT taxonomy v1 (Michie et al., 2013). Each technique identified was noted down and carefully compared with the corresponding definition given to ensure that it fitted with the label. A second reviewer (RP) was involved to address any discrepancies which were resolved by consensus.

2.2.5 Statistical Analysis

Due to the heterogeneity of DPPs in terms of intervention components, information provided in relation to response, uptake and retention rates, and BCTs, a systematic, critical review was carried out, not a meta-analysis.

Response rate (%) was calculated (where possible) as the proportion of participants that responded to recruitment, out of the number of participants exposed to the study information via recruitment.

Uptake rate (%) was calculated (where possible) as the proportion of participants that started the group-based DPP, out of the number of participants allocated to the group-based DPP.

Retention rate (%) was calculated (where possible) as the proportion participants that did not drop-out from the group-based intervention, out of the number of participants present at the start. This gave a consistent completion rate for each paper as not all included papers clearly defined completion.

When response, uptake and retention rates were calculated, a second reviewer (CG) was involved to ensure consistency in these calculations.

2.3 Results

2.3.1 Inclusion/Exclusion

In Figure 1, the process of paper inclusion/exclusion at each stage is presented. The initial search resulted in 27,137 records (6,499 from the initial search, 14,265 from the first top-up search and 6,373 from the second top-up search). It was not possible to conduct the two top-up searches using the Web of Science database due to changes in institutional subscriptions. Therefore, additional databases (PubMed, ProQuest Nursing and Allied Health and Summon) were used for literature searching. After English language, adults-only and title-only filters were applied, 1,198 titles were found (including 101 from the first top-up search and 85 from the second). After duplicates were removed and the titles and/or abstracts were screened, 146 full texts were retrieved (128 from initial search, 7 from the first top-up search and 11 from the second), of which 33 were included (including 7 from the first top-up search and 2 from the second).

Ten per cent of the 128 papers (n=13) from the initial search were independently checked by a second reviewer (RP) which led to 77% agreement. After detailed discussions, the disagreement was found to be due to ambiguous wording of two criteria (prediabetes and group-based (a necessary component of the programme)) which were then further refined (prediabetes determined by glucose testing; and 50% or more sessions are group-based). Once criteria were refined, the 128 papers were re-examined, and a further 5% of 128 papers (n=6) were independently checked by the second reviewer (RP) reaching 100% agreement. After the two top-up searches were conducted, 10% of 18 papers (n=2) were independently checked by the second reviewer (RP), with 100% agreement. The results of most of these DPPs were generally published in multiple papers, all of which were examined, and relevant information extracted (Appendix 2: Data extraction table).

2.3.2 Design and Quality

From the 33 included papers, 13 were RCTs (Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014; Chen et al., 2017; Davies et al., 2016; Duijzer et al., 2017; Katula et al., 2013; Kulzer et al., 2009; Marrero et al., 2016; McDermott et al., 2014; Moore et al., 2011; Ockene et al., 2012; Parikh et al., 2010; Sakane et al., 2011; Yates, Davies, Gorley, Bull, & Khunti, 2009), eight were cohort (one group pre + post (before and after)) (Alva, 2019; Davis-Smith, 2007; Gilis-Januszewska, Piwońska-Solska, et al., 2018; Jiang et al., 2013; Laatikainen et al., 2007; Makrilakis et al., 2010; Quiñones et al., 2018; Tsai et al., 2018), six were cohort analytic (two group pre + post) (Almeida, Shetterly, Smith-Ray, Estabrooks, 2010; Boltri et al., 2011; Coppell et al., 2017; Fianu et al., 2016; Moin et al., 2017; Payne, Walsh, Harvey, Livy, Mckenzie, Donaldson, 2008) and six were controlled clinical trials (Aekplakorn et al., 2019; Gagnon et al., 2011; Miller et al., 2016; Pimentel et al., 2010; Vincent et al., 2014; Yeh et al., 2015). For quality assessment, 10% of the included papers (n=3) were independently checked by a second reviewer (RP). There were six components for each of the three papers and 83% agreement was reached (15/18 components). For majority of the included papers, study design, confounders, data collection methods, number of withdrawals and the reasons for drop out were rated as strong; blinding and selection bias was rated as moderate. Overall, the majority of papers had a quality rating of strong (n=17) (Aekplakorn et al., 2019; Coppell et al., 2017; Davies et al., 2016; Gagnon et al., 2011; Kulzer et al., 2009; Marrero et al., 2016; McDermott et al., 2014; Miller et al., 2016; Moore et al., 2011; Ockene et al., 2012; Parikh et al., 2010; Payne, Walsh, Harvey, Livy, Mckenzie, Donaldson, 2008; Pimentel et al., 2010; Quiñones et al., 2018; Vincent et al., 2014b; Yates et al., 2009; Yeh et al., 2015), followed by moderate (n=12) (Alva, 2019; Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014; Chen et al., 2017; Davis-Smith, 2007; Duijzer et al., 2017; Gilis-Januszewska, Piwońska-Solska, et al., 2018; Katula et al., 2013; Laatikainen et al., 2007; Makrilakis et al., 2010; Moin et al., 2017; Sakane et al., 2011; Tsai et al., 2018), and then weak (n=4) (Almeida, Shetterly, Smith-Ray, Estabrooks, 2010; Boltri et al., 2011; Fianu et al., 2016; Jiang et al., 2013) (Table 2).

2.3.3 Participants

Across all included papers the number of participants who started the intervention ranged from 10 to 3,317 participants. Mean participant age ranged from 47.0 (±9.0) to 69.0 (±4.0) years. The majority had predominantly female samples (n=27) (Aekplakorn et al., 2019; Almeida, Shetterly, Smith-Ray, Estabrooks, 2010; Alva, 2019; Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014; Boltri et al., 2011; Chen et al., 2017; Coppell et al., 2017; Davis-Smith, 2007; Fianu et al., 2016; Gagnon et al., 2011; Gilis-Januszewska, Piwońska-Solska, et al., 2018; Jiang et al., 2013; Katula et al., 2013; Laatikainen et al., 2007; Makrilakis et al., 2010; Marrero et al., 2016; McDermott et al., 2014; Miller et al., 2016; Moore et al., 2011; Ockene et al., 2012; Parikh et al., 2010; Payne, Walsh, Harvey, Livy, Mckenzie, Donaldson, 2008; Pimentel et al., 2010; Quiñones et al., 2018; Tsai et al., 2018; Vincent et al., 2014b; Yeh et al., 2015). Many papers did not state participant ethnicity (n=14) (Aekplakorn et al., 2019; Almeida, Shetterly, Smith-Ray, Estabrooks, 2010; Chen et al., 2017; Fianu et al., 2016; Gilis-Januszewska, Piwońska-Solska, et al., 2018; Kulzer et al., 2009; Laatikainen et al., 2007; Makrilakis et al., 2010; McDermott et al., 2014; Moore et al., 2011; Payne, Walsh, Harvey, Livy, Mckenzie, Donaldson, 2008; Sakane et al., 2011; Tsai et al., 2018; Yeh et al., 2015); others reported majority of white/Caucasian participants (n=9) (Alva, 2019; Coppell et al., 2017; Davies et al., 2016; Duijzer et al., 2017; Gagnon et al., 2011; Katula et al., 2013; Marrero et al., 2016; Miller et al., 2016; Moin et al., 2017; Quiñones et al., 2018; Yates et al., 2009). A small number of papers involved predominantly non-white/Caucasian samples [African-American (n=3) (Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014; Boltri et al., 2011; Davis-Smith, 2007); Latino (Dominican origin) (n=1) (Ockene et al., 2012); Brazilian (n=1) (Pimentel et al., 2010); Mexican (n=1) (Vincent et al., 2014), mainly Hispanic sample (n=1) (Parikh et al., 2010); American Indian and Alaska native sample (n=1) (Jiang et al., 2013)].

2.3.4 Interventions

Intervention Type

The overall duration of interventions ranged from 1 day (n=1) (Yates et al., 2009) to 2 years (n=2) (Aekplakorn et al., 2019; Katula et al., 2013). All interventions included both diet and exercise components, except one diet only intervention (Pimentel et al., 2010).

Country/Setting

Most DPPs were delivered in healthcare settings (n=16) (Aekplakorn et al., 2019; Almeida, Shetterly, Smith-Ray, Estabrooks, 2010; Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014; Chen et al., 2017; Coppell et al., 2017; Davies et al., 2016; Duijzer et al., 2017; Gagnon et al., 2011; Gilis-Januszewska, Piwońska-Solska, et al., 2018; Laatikainen et al., 2007; Makrilakis et al., 2010; Moin et al., 2017; Moore et al., 2011; Ockene et al., 2012; Sakane et al., 2011; Yeh et al., 2015). Others used community (n=7) (Alva, 2019; Coppell et al., 2017; Duijzer et al., 2017; Katula et al., 2013; Marrero et al., 2016; Parikh et al., 2010; Quiñones et al., 2018), church (n=4) (Boltri et al., 2011; Davis-Smith, 2007; Marrero et al., 2016; Vincent et al., 2014), workplace (n=1) (Makrilakis et al., 2010) or university settings (n=1) (Miller et al., 2016). In others, the intervention setting was unknown or unclear (n=8) (Fianu et al., 2016; Jiang et al., 2013; Kulzer et al., 2009; McDermott et al., 2014; Payne, Walsh, Harvey, Livy, Mckenzie, Donaldson, 2008; Pimentel et al., 2010; Tsai et al., 2018; Yates et al., 2009). DPPs were mainly conducted in the USA (n=15) (Almeida, Shetterly, Smith-Ray, Estabrooks, 2010; Alva, 2019; Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014; Boltri et al., 2011; Davis-Smith, 2007; Jiang et al., 2013; Katula et al., 2013; Marrero et al., 2016; Miller et al., 2016; Moin et al., 2017; Ockene et al., 2012; Parikh et al., 2010; Quiñones et al., 2018; Vincent et al., 2014b; Yeh et al., 2015); but also Australia (n=3) (Laatikainen et al., 2007; Moore et al., 2011; Payne, Walsh, Harvey, Livy, Mckenzie, Donaldson, 2008); UK (n=2) (Davies et al., 2016; Yates et al., 2009); Taiwan (n=2) (Chen et al., 2017; Tsai et al., 2018); Thailand (n=1) (Aekplakorn et al., 2019); New Zealand (n=1) (Coppell et al., 2017); Netherlands (n=1) (Duijzer et al., 2017); Poland (n=1) (Gilis-Januszewska, Piwońska-Solska, et al., 2018); Canada (n=1) (Gagnon et al., 2011); France (n=1) (Fianu et al., 2016); Germany (n=1) (Kulzer et al., 2009); Greece (n=1) (Makrilakis et al., 2010); India (n=1) (McDermott et al., 2014); Brazil (n=1) (Pimentel et al., 2010) and Japan (n=1) (Sakane et al., 2011).

Group Size and Frequency

The number of participants in a group session varied from 5-10 participants (Yates et al., 2009), to 15-20 participants (Payne, Walsh, Harvey, Livy, Mckenzie, Donaldson, 2008), in the 17 papers in which they were reported.

Timing and Number of Group Sessions

Out of the 23 papers in which it was specified, duration of group sessions ranged from 45 minutes (Gagnon et al., 2011), to 8 hours (McDermott et al., 2014), with a mean of 2 hours. All papers stated the number of group sessions in their intervention, which varied from 1 (or 2 half days) (Davies et al., 2016; McDermott et al., 2014; Yates et al., 2009) to 74 sessions (Fianu et al., 2016), with a mean of 19 sessions.

Length of Follow-Up

All DPPs had a baseline measure and most had assessments immediately after the programme to monitor changes in outcomes (n=23) (Aekplakorn et al., 2019; Almeida, Shetterly, Smith-Ray, Estabrooks, 2010; Alva, 2019; Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014; Boltri et al., 2011; Coppell et al., 2017; Duijzer et al., 2017; Gagnon et al., 2011; Jiang et al., 2013; Katula et al., 2013; Makrilakis et al., 2010; Marrero et al., 2016; McDermott et al., 2014; Miller et al., 2016; Moin et al., 2017; Moore et al., 2011; Ockene et al., 2012; Payne, Walsh, Harvey, Livy, Mckenzie, Donaldson, 2008; Pimentel et al., 2010; Quiñones et al., 2018; Sakane et al., 2011; Vincent et al., 2014b; Yeh et al., 2015). Time of follow-up varied from 2 weeks (n=1) (Parikh et al., 2010), to 7 years (n=1) (Fianu et al., 2016), with follow-up after 1 year of the intervention being most common (n=8) (Boltri et al., 2011; Davies et al., 2016; Davis-Smith, 2007; Jiang et al., 2013; Kulzer et al., 2009; Laatikainen et al., 2007; Tsai et al., 2018; Yates et al., 2009).

2.3.5 Reasons for Dropout

Eighteen DPPs reported reasons for participant dropout. These included: lost interest (Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014; Duijzer et al., 2017; Marrero et al., 2016), doctors specifying that participant's raised blood sugar does not need attention (Parikh et al., 2010), unable to commit to intervention schedule (Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014; Gilis-Januszewska, Piwońska-Solska, et al., 2018; Jiang et al., 2013; Marrero et al., 2016; Miller et al., 2016; Quiñones et al., 2018; Tsai et al., 2018), time constraints (Duijzer et al., 2017; Gilis-Januszewska, Piwońska-Solska, et al., 2018; Laatikainen et al., 2007; Ockene et al., 2012; Yates et al., 2009), caring for ill family member (Miller et al., 2016), distance was too far (Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014), lack of transport (Laatikainen et al., 2007; Marrero et al., 2016), fuel costs (Laatikainen et al., 2007), relocation (Aekplakorn et al., 2019; Gagnon et al., 2011; Jiang et al., 2013; Marrero et al., 2016; Ockene et al., 2012;

Parikh et al., 2010; Pimentel et al., 2010; Sakane et al., 2011; Yates et al., 2009), holiday (Yates et al., 2009), work commitments (Yates et al., 2009), family/health related issues or conditions (Duijzer et al., 2017; Laatikainen et al., 2007; Marrero et al., 2016; Ockene et al., 2012; Parikh et al., 2010; Quiñones et al., 2018; Sakane et al., 2011; Tsai et al., 2018; Yates et al., 2009), hospitalisation (Quiñones et al., 2018), stress due to weight gain (Miller et al., 2016), pregnancy/disability (Duijzer et al., 2017; Fianu et al., 2016; Parikh et al., 2010; Yates et al., 2009) or poor literacy (Laatikainen et al., 2007). Compared with completers, non-completers were more likely to be male (Davies et al., 2016; Ockene et al., 2012; Sakane et al., 2011), have higher BMI (Gilis-Januszewska, Piwońska-Solska, et al., 2018; Moore et al., 2011) and waist circumference (Gilis-Januszewska, Piwońska-Solska, et al., 2018; Moore et al., 2011), and were younger (Fianu et al., 2016; Jiang et al., 2013).

2.3.6 Recruitment Methods, Response Rates (RR) and Uptake Rates

Table 2 shows the recruitment strategies, response rates (RR) and uptake rates (where they could be calculated). For the two programmes where it was possible to calculate RR (Duijzer et al., 2017; Makrilakis et al., 2010), recruitment methods were not clearly described (Makrilakis et al., 2010) or medical records/referrals were used (Duijzer et al., 2017), which prevented meaningful analysis.

It was possible to calculate uptake for 12 DPPs. For the five DPPs with highest uptake (Davis-Smith, 2007; Duijzer et al., 2017; Fianu et al., 2016; Ockene et al., 2012; Quiñones et al., 2018), two used invitation letters/mailing and flyers (Ockene et al., 2012; Quiñones et al., 2018), one used presentations and bulletins (Davis-Smith, 2007), one used medical records/referrals (Duijzer et al., 2017), one used telephone calls, newspaper advertisements, radio and TV (Ockene et al., 2012), and one used posters (Quiñones et al., 2018). For one DPP, it was not possible to determine the methods used (Fianu et al., 2016). For the five lowest uptake DPPs (Almeida, Shetterly, Smith-Ray, Estabrooks, 2010; Boltri et al., 2011; Jiang et al., 2013; Laatikainen et al., 2007; Tsai et al., 2018), two used medical records/referrals (Almeida, Shetterly, Smith-Ray, Estabrooks, 2010; Jiang et al., 2013), one used a magazine and website (Almeida, Shetterly, Smith-Ray, Estabrooks, 2010), one used bulletins (Boltri et al., 2011), and two did not clearly state the recruitment method used (Laatikainen et al., 2007; Tsai et al., 2018). Overall, it is difficult to discern any trends from the data in relation to recruitment methods and uptake.

Table 2: Papers detailing quality rating (overall), recruitment strategies, response and uptake rates (high-low)

	Fianu (2016)	Davis-Smith (2007)	Duijzer (2017)	Ockene (2012)	Quinones (2018)	Makrilakis (2010)	Moin (2017)	Laatikainen (2007)	Boltri (2011	Tsai (2018)	Jiang (2013)	Almeida (2010)	Alva (2019)
Quality rating (overall)	W	M	M	S	S	M	M	M	W	M	W	W	M
Response rates (%)	-	-	53.6	-	-	41.0*	-	-	-	-	-	-	-
Uptake rates (%)	93.0	90.0	89.7	85.8	85.7	76.1	64.1	63.3	50.0	32.5	31.0	8.3	-
Recruitment methods													
Referrals/medical records			X				X				X	X	X
Post/letters/mailing				X	X								
Flyers				X	X								
Presentations		X											
Newsletters/bulletins		X							X				
Posters					X								
Newspapers advertisements				X									
Magazines/brochures												X	
Telephone				X									
Radio				X									

	Fianu (2016)	Davis-Smith (2007)	Duijzer (2017)	Ockene (2012)	Quinones (2018)	Makrilakis (2010)	Moin (2017)	Laatikainen (2007)	Boltri (2011	Tsai (2018)	Jiang (2013)	Almeida (2010)	Alva (2019)
TV				X									
Website/social media												X	
Unclear/too general								X					
Not stated	X					X				X			

Key: N/A (-); *This figure might be questionable as in the recruitment strategy, for occupational settings, a day was organised when questionnaires were given, meaning some may have been informed about the study but not given the questionnaire to complete; Strong (S); Moderate (M); Weak (W).

Table 2 Cont`d: Papers detailing quality rating (overall), recruitment strategies, response and uptake rates (high-low)

	Gilis-Januszewska (2018)	Katula (2013)	Yeh (2015)	Yates (2009)	Miller (2016)	Pimentel (2010)	Davies (2016)	Gagnon (2011)	Kulzer (2009)	Payne (2008)	Sakane (2011)	Vincent (2014)	Coppell (2017)	Marrero (2016)	Parikh (2010)	Chen (2017)	McDermott (2014)	Moore (2011)	Bernstein (2014)	Aekplakorn (2019)
Quality rating (overall)	M	M	S	S	S	S	S	S	S	S	M	S	S	S	S	M	S	S	M	S
Response rates (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uptake rates (%)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Recruitment methods																				
Referrals/medical records		X						X		X		X	X					X		
Post/letters/mailing		X		X	X		X													
Flyers/leaflets	X	X			X						X	X								
Presentations		X										X			X					X
Newsletters/bulletin					X															
Posters		X									X									
Magazines/brochures		X																		
Telephone				X																
Website/social media												X								
Email					X															

	Gilis-Januszewska (2018)	Katula (2013)	Yeh (2015)	Yates (2009)	Miller (2016)	Pimentel (2010)	Davies (2016)	Gagnon (2011)	Kulzer (2009)	Payne (2008)	Sakane (2011)	Vincent (2014)	Coppell (2017)	Marrero (2016)	Parikh (2010)	Chen (2017)	McDermott (2014)	Moore (2011)	Bernstein (2014)	Aekplakorn (2019)
Newspapers		X			X															
Word of mouth											X									
Unclear/too general						X											X			
Not stated			X						X					X		X			X	

Key: N/A (-); Strong (S); Moderate (M); Weak (W).

2.3.7 BCTs and Retention Levels

Overall Patterns

Table 3 shows the BCTs identified from the DPPs, and the retention rates for 31 DPPs in which they could be calculated. Independent of retention, all DPPs used a credible source (9.1), 81% used instruction on how to perform a behaviour (4.1; n=25), 71% used goal setting (behaviour) (1.1; n=22) and 68% used goal setting (outcome) (1.3; n=21). Six studies included an incentive for participation. This did not fit into any BCT definitions as stated in the Taxonomy v1 (Michie et al., 2013).

Table 3: Retention rates (high-low) for those interventions where BCTs have been identified

	Bernstein (2014)	Tsai (2018)	Yeh (2015)	McDermott (2014)	Chen (2017)	Fianu (2016)	Gagnon (2011)	Ockene (2012)	Kulzer (2009)	Davis-Smith (2007)	Aekplakorn (2019)	Yates (2009)	Moore (2011)	Pimentel (2010)	Miller (2016)	Duijzer (2017)	Katula (2013)	Marrero (2016)
Retention rates (%)	100	100	100	95.2	95.0	94.1	92.3	92.1	91.4	90.0	89.2	89.1	87.9	87.5	85.0	84.9	84.1	83.9
1. Goals and planning																		
1.1 Goal setting (behaviour)	X	X			X		X	X		X		X	X		X	X	X	
1.2 Problem-solving	X	X			X		X	X			X	X	X		X		X	X
1.3 Goal setting (outcome)		X					X	X		X			X		X	X	X	X
1.4 Action planning		X				X		X				X			X			
1.5 Review behaviour goal(s)		X			X			X							X			
1.6 Discrepancy between current behaviour and goal		X																
1.7 Review outcome goal(s)		X						X										
2. Feedback and monitoring																		
2.1. Monitoring of behaviour by others without feedback								X										
2.2. Feedback on behaviour							X								X			
2.3. Self-monitoring of behaviour		X			X			X	X			X			X		X	
2.4 Self-monitoring of outcome(s) of behaviour		X					X											X

	Bernstein (2014)	Tsai (2018)	Yeh (2015)	McDermott (2014)	Chen (2017)	Fianu (2016)	Gagnon (2011)	Ockene (2012)	Kulzer (2009)	Davis-Smith (2007)	Aekplakorn (2019)	Yates (2009)	Moore (2011)	Pimentel (2010)	Miller (2016)	Duijzer (2017)	Katula (2013)	Marrero (2016)
2.5 Monitoring outcome(s) of behaviour by others without feedback										X								
2.7 Feedback on outcome(s) of behaviour															X	X		
3. Social support																		
3.1. Social support (unspecified)		X		X	X			X		X	X				X	X		
3.2 Social support (practical)						X												
3.3. Social support (emotional)	X	X														X		
4. Shaping knowledge																		
4.1. Instruction on how to perform the behaviour	X	X	X	X	X	X	X	X			X		X	X	X	X	X	X
5. Natural consequences																		
5.1. Information about health consequences		X										X						
6. Comparison of behaviour																		
6.1. Demonstration of the behaviour	X		X	X		X		X								X		
7. Associations																		
7.1. Prompts/cues										X								
8. Repetition and substitution																		

	Bernstein (2014)	Tsai (2018)	Yeh (2015)	McDermott (2014)	Chen (2017)	Fianu (2016)	Gagnon (2011)	Ockene (2012)	Kulzer (2009)	Davis-Smith (2007)	Aekplakorn (2019)	Yates (2009)	Moore (2011)	Pimentel (2010)	Miller (2016)	Duijzer (2017)	Katula (2013)	Marrero (2016)
8.1. Behavioural practice/rehearsal	X		X	X		X										X		
8.7. Graded tasks							X					X						
9. Comparison of outcomes																		
9.1. Credible source	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
9.2 Pros and cons					X													
11. Regulation																		
11.2. Reduce negative emotions	X	X		X	X								X					
13. Identity																		
13.2. Framing/reframing																	X	
New BCTs																		
Incentive for participation	X	X			X	X		X										

Table 3 Cont`d: Retention rates (high-low) for all those interventions where BCTs have been identified

	Payne (2008)	Coppell (2017)	Laatikainen (2007)	Makrilakis (2010)	Davies (2016)	Jiang (2013)	Sakane (2011)	Gilis-Januszewska (2018)	Parikh (2010)	Moin (2017)	Vincent (2014)	Quinones (2018)	Alva (2019)	Almeida (2010)	Boltri (2011)
Retention Rates (%)	80.3	78.8	76.2	76.1	76.1	74.1	70.6	70.2	70.0	66.3	65.8	61.1	53.2	-	-
1.Goals and planning															
1.1 Goal setting (behaviour)	X	X	X	X		X	X	X		X		X	X	X	
1.2 Problem-solving	X										X		X	X	
1.3 Goal setting (outcome)	X	X	X	X	X	X	X	X		X		X	X	X	
1.4 Action planning	X				X		X							X	
1.7 Review outcome goal(s)													X		
2. Feedback and monitoring															
2.1 Monitoring of behaviour by others without feedback	X												X		
2.2. Feedback on behaviour						X					X	X			
2.3. Self-monitoring of behaviour	X		X	X	X	X	X				X	X			
2.4 Self-monitoring of outcome(s) of behaviour	X			X		X									
2.5 Monitoring outcome(s) of behaviour by others without feedback													X		
2.7 Feedback on outcome(s) of behaviour							X								
3 Social support															

	Payne (2008)	Coppell (2017)	Laatikainen (2007)	Makrilakis (2010)	Davies (2016)	Jiang (2013)	Sakane (2011)	Gilis-Januszewska (2018)	Parikh (2010)	Moin (2017)	Vincent (2014)	Quinones (2018)	Alva (2019)	Almeida (2010)	Boltri (2011)
3.1. Social support (unspecified)		X	X		X			X		X	X				X
3.2. Social support (practical)								X							
3.3. Social support (emotional)	X														
4. Shaping knowledge															
4.1. Instruction on how to perform the behaviour	X	X	X		X		X	X	X		X		X	X	
6. Comparison of behaviour															
6.1. Demonstration of the behaviour	X							X			X				
8. Repetition and substitution															
8.1. Behavioural practice/rehearsal								X			X				
8.7. Graded tasks	X				X										
9. Comparison of outcomes															
9.1. Credible source	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
10. Reward and threat															
10.4. Social reward											X				
11. Regulation															
11.2. Reduce negative emotions	X										X		X		
New BCTs															
Incentive for participation									X						

Key: N/A (-)

High Retention

For the ten DPPs with highest retention (Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014; Chen et al., 2017; Davis-Smith, 2007; Fianu et al., 2016; Gagnon et al., 2011; Kulzer et al., 2009; McDermott et al., 2014; Ockene et al., 2012; Tsai et al., 2018; Yeh et al., 2015) (Appendix 3: BCTs present in the ten highest and ten lowest retention programmes):

- all reported using credible source (9.1);
- eight instructed participants how to perform a behaviour (4.1);
- six used goal setting (behaviour) (1.1);
- five demonstrated the behaviour (6.1), used problem-solving (1.2), social support (unspecified) (3.1) or an incentive for participation;
- four used techniques to reduce negative emotions (11.2), used behavioural practice/rehearsal (8.1) or goal setting (outcome) (1.3).

Low Retention

For the ten DPPs with lowest retention (Alva, 2019; Davies et al., 2016; Gilis-Januszewska, Piwońska-Solska, et al., 2018; Jiang et al., 2013; Makrilakis et al., 2010; Moin et al., 2017; Parikh et al., 2010; Quiñones et al., 2018; Sakane et al., 2011; Vincent et al., 2014b) (Appendix 3):

- all reported using credible source (9.1);
- eight used goal setting (outcome) (1.3);
- seven used goal setting (behaviour) (1.1);
- six instructed how to perform a behaviour (4.1) or used self-monitoring of behaviour (2.3);
- four provided social support (unspecified) (3.1).

2.4 Discussion

Diabetes Prevention Programmes (DPPs) are important to address rising global prevalence of T2DM (Absetz et al., 2007; Diabetes Prevention Program Research Group, 2009; Lindstrom et al., 2006; Pan et al., 1997; Penn et al., 2018). Their impact depends on both effectiveness and the ability to reach and engage with those at high risk of T2DM (Ahmad & Crandall, 2010; Alva, 2019a). We report the first systematic review to explore recruitment strategies associated with high response and uptake rates in group-based DPPs, as well as BCTs associated with high retention.

2.4.1 Recruitment Methods, Response Rates (RR) and Uptake

Recruitment strategies reported in the DPPs varied from referrals, letters, flyers, presentations, bulletins to magazine, posters, newspapers, telephone, website, email, radio, TV and word of mouth. For certain strategies such as medical referrals and invitation letters, it is possible to determine RR, as the number of participants reached is known. This is not the case for many other recruitment strategies such as TV, radio and flyers as there is uncertainty of reaching the target population with these strategies (McCann et al., 2013). Associations between recruitment methods and RR could not be explored as RR could only be calculated for two DPPs (one used medical records/referrals, one did not state recruitment methods). More consistent and detailed reporting of recruitment methods is required to better understand which are most effective in promoting initial responses given the common challenges in recruiting to DPPs (Dunbar et al., 2015).

It was also difficult to state trends in relation to uptake, which could only be calculated for 36% of included DPPs. For most, it was not possible to determine the proportion of the participants who started the programme from those who were allocated to the group-based programme, again highlighting the need for robust reporting (Ahmad & Crandall, 2010).

2.4.2 BCTs and Retention

Overall, many different BCTs were identified across DPPs. All DPPs used a “credible source” which is where part or all of the intervention was delivered by a credible spokesperson like a healthcare professional, for example, dieticians who were promoting healthier lifestyle changes or discouraging unhealthy habits (Almeida, Shetterly, Smith-Ray, Estabrooks, 2010; Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014; Jiang et al., 2013; Laatikainen et al., 2007; Makrilakis et al., 2010; Miller et al., 2016; Payne, Walsh, Harvey, Livy, Mckenzie, Donaldson, 2008). The majority of DPPs used “instruction on how to perform a behaviour”, which involved advising participants how to perform a particular behaviour through exercise or cookery classes. Goal setting (behaviour) was also identified in the majority of DPPs, which included setting or agreeing a behavioural goal as part of the intervention, like agreeing to undertake a certain amount of daily exercise. Although NICE guidelines recommend incorporating BCTs such as goal planning for successful behaviour change (National Institute for Health and Care Excellence (NICE), 2014), this BCT was present in both high and low retention programmes, so was not a clear correlate of retention.

Furthermore, the programmes with high levels of retention were more likely to provide incentives for participation, use problem-solving, demonstrate the behaviour, use behavioural practice/rehearsal, and use techniques to reduce negative emotions. Those with lower levels of retention were more likely to use goal setting (outcome); similar findings have been reported for group-based weight management programmes (Gidlow et al., 2018). This suggests that to encourage retention, it is more useful to focus on changing a *behaviour* like diet or exercise, rather than an *outcome* such as weight. Programmes with low retention were more likely to include self-monitoring of behaviour. This contradicts research that suggests that self-monitoring of behaviour is one of the BCTs to improve retention or reduce T2DM incidence, so this finding should be treated with caution (Baker et al., 2011; Burgess et al., 2017). However, it is possible that participants may have felt that self-monitoring their behaviour was burdensome and time consuming (if a high level of self-monitoring was required) resulting in them losing interest in the programme, and therefore dropping out. Another reason may be that self-monitoring led participants to become demotivated to remain in the programme due to not achieving their dietary and/or physical activity expectations after completing questionnaires or activity logs to record their behaviour. This can lead to some individuals feeling discouraged or avoidant (Kangovi & Asch, 2018). This interesting and unexpected finding would merit further investigation.

In the high retention programmes, “incentive for participation” involved participants being given cash, gift vouchers or certificates at various points in the programme. This behaviour change technique does not fit into any of the 93 BCTs from the taxonomy as it refers to using rewards to encourage taking part, rather than rewards to encourage performing the health behaviour. This suggests that providing incentives for people to participate in behaviour change programmes should be considered to promote retention in DPPs by motivating participants to continue attending (Public Health England, 2016). However, providing monetary incentives to participants may not be feasible or sustainable in many settings, particularly in low- and middle-income countries, so non-monetary rewards, such as certificates or other incentives might also be worth considering. Some qualitative evidence suggested attrition was related to effectiveness of incentives (Ali et al., 2012), but whether incentives promote retention requires further investigation (Jochelson, 2007). Problem-solving was more likely to be included in high-retention programmes. It involved identifying barriers to making lifestyle changes and devising strategies to overcome them. This enables participants to have an active involvement in making the desired changes, and may encourage them to continue with the programme (Gidlow et al., 2018).

Demonstration of the behaviour included participants being shown how to perform the behaviour, for example how to exercise was demonstrated during physical activity sessions through observation (Fianu et al., 2016; McDermott et al., 2014; Yeh et al., 2015), healthy eating was demonstrated through showing portion sizes (Yeh et al., 2015) or healthy cooking methods (Ockene et al., 2012). Behavioural practice/rehearsal involved participants cooking healthy foods (Bernstein, Gendy, Rudd, Doyle, Fay, Moffett, 2014; Fianu et al., 2016) or participating in physical activity within the sessions (Fianu et al., 2016; McDermott et al., 2014; Yeh et al., 2015). Demonstrating and rehearsing the ideal behaviour as part of the behaviour change strategy, may equip participants with the confidence and capability to make the desired lifestyle changes and ultimately motivate them to continue with the programme (Dixon, 2008). This is supported by research on RCTs that found DPPs which successfully reduced T2DM incidence and had good retention had used BCTs such as demonstration and rehearsal of the ideal behaviour (Baker et al., 2011).

Although only a few programmes included the BCT “reducing negative emotions”, it was more prevalent in those with high retention. It was related specifically to stress-management and educating participants in finding ways to reduce stress. This supports previous findings which have suggested it is important for retention (Gidlow et al., 2018). As there are established links between cognitions, emotions and behaviour (Carpenter & Niedenthal, 2019; Conner & Norman, 2017; Ferrer & Mendes, 2018), it is important to consider emotional changes and how to deal with negative emotion as part of a behaviour change programme (DeSteno et al., 2013). If people are given the correct tools to deal with negative emotions, and programmes can address these potential emotional changes, this may help to increase participants’ motivation and capability of change (DeSteno et al., 2013; Dixon, 2008), promote good decision-making (Carpenter & Niedenthal, 2019) and ultimately increase programme retention.

2.4.3 Considerations/Limitations and Future Research

Several limitations are recognised. Firstly, although results from the searches were discussed regularly by the research team, the search was conducted entirely by one author (SB) which may compromise the comprehensiveness of the search. Secondly, it was not possible to determine whether some DPPs were group-based due to insufficient reporting. This may have led to some group-based DPPs not being included, despite our systematic review methods and requests to authors for clarifying information. In addition, the review only considered programmes which identified people who had glucose-defined prediabetes; other lifestyle-based diabetes prevention programmes conducted in the community or healthcare settings use diabetes risk scores or HbA1c[1] to identify high-risk individuals. Lack of reported information prevented rates being determined, particularly for response and uptake. Additionally, participants often drop out of sessions progressively, which is an important part of the retention issue. However, it was not possible to explore this matter in such depth due to the heterogeneity of sessions across the included DPPs and also the lack of reported information on completion. It was also not possible to code BCTs for some of the DPPs due to insufficient information in the papers. For example, some authors stated the use of social support which is important to include in group-based DPPs (National Institute for Health and Care Excellence (NICE), 2014; Paulweber et al., 2010; Public Health England, 2016), whereas others did not provide enough detail to be coded specifically as a BCT. This included one DPP (Pimentel et al., 2010) which stated that “discussion-format group sessions that took place”, but provided no further detail on what this entailed.

Future qualitative work could explore in depth the factors that impact the decisions of participants to start and continue with attending group-based DPPs. A qualitative approach would provide a richer insight into the facilitators and barriers, as well as exploring strategies to overcome challenges to maximise uptake and retention (Gul & Ali, 2010). Future studies of DPPs need to include detailed reporting of recruitment processes, sufficient information to allow extraction of BCTs and calculation of

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[1] Please note this was a mistake (those programmes identifying people through HbA1c were included in the review) but included here as it was stated within the accepted manuscript.

response, uptake and retention rates. This will enable better evaluation of group-based DPPs and provide evidence to help improve uptake and retention.

2.4.4 Conclusion

This review indicated that group-based DPPs with highest retention tend to include incentives for participation, problem-solving, reducing negative emotions, behaviour demonstration and practice. Identification of links between recruitment strategies and response or uptake rates were limited by reporting. By clinicians and programme organisers focusing their efforts on identifying effective recruitment strategies and incorporating ideal behaviour change techniques into their programmes, this will contribute towards maximising response, uptake and retention rates. More comprehensive reporting of recruitment strategies and intervention components is essential to allow accurate evaluations of DPPs, to ensure they are more cost-effective and viable. The next chapter in this thesis is the methodology chapter. This chapter will provide an overview on the methodologies and methods used as well as the rationale for the chosen analyses for this research.

Chapter 3: Methodology

3.1 Introduction

The various studies for this research were designed to answer applied questions which were important for the development of the Healthier You: NHS Diabetes Prevention Programme (NHSDPP) in England. The programme of research was initiated through collaborations with Public Health England and with a local provider of the NHSDPP, where the need for qualitative data in regard to exploring uptake and retention were discussed, particularly with BAME communities or ethnic minorities (Chapters 5 and 6). The need for this approach was also confirmed after conducting a literature review (Chapter 1).

From April to November 2017, individual, face-to-face, semi-structured interviews were conducted after participants attended their initial assessment (IA- a brief appointment all participants are required to attend before starting the first session of the diabetes prevention programme). After attending the IA, participants who did not start the programme were classified as “non-attenders” and those who attended at least one session, were classified as “attenders”. This was determined through regular updates from the local provider (LP) regarding whether the interviewed participants had started the programme. Attenders and non-attenders were then followed up with a short telephone call discussing reasons for their attendance or non-attendance (August 2017 to May 2018). These two sets of interviews provide the data for the study described in Chapter 5. From January 2018 to September 2018, the researcher received monthly updates from the LP as to whether or not the attenders completed the programme. Those who attended at least 75% of sessions (14/18) were classified as “completers”; this was in line with the definition used by NHS England for payment by completion (NHS England, 2016b). Completers and non-completers were then contacted, and individual semi-structured telephone interviews were conducted after obtaining their informed consent (March 2018 to September 2018). These interviews form the basis of the study described in Chapter 6.

When the qualitative studies were being conducted, service evaluation data that had already been collected by the local provider were offered to provide us with some additional quantitative data to explore predictors of uptake and retention further. Questionnaires measuring illness perceptions, self-efficacy and mental wellbeing had been given to participants when they attended their IA (April 2016 to January 2018). These data were given to us in April 2018 and provided an opportunity to explore predictors of uptake and retention from a quantitative perspective, complementing the other studies which took a qualitative approach. These data are reported and analysed in Chapter 7.

Collaboration is a mutually beneficial relationship where two or more organisations work together to achieve shared goals as they share similar interests (Green & Johnson, 2015; Mattessich & Monsey, 1992). One of the benefits of collaboration includes providing a means for organisations, institutions, or professions to achieve more than they can on their own (Green & Johnson, 2015). In this research, we worked closely together with the local provider in a collaborative manner (as we shared similar interests) to ensure development and implementation of these studies. These studies have allowed us to fill the gaps in the literature (see Chapter 1) and have enabled us to produce recommendations to improve uptake and retention, so the NHSDPP is more viable, potentially resulting in more individuals being able to attend and complete this programme, enhancing their lives and reducing their T2DM risk.

Collaboration allows access to resources such as participants so that more complex or meaningful research can take place (Green & Johnson, 2015). In this research, by working closely with the local provider, access to participants was granted, and without this important collaboration, research with NHSDPP participants may not have been possible. Good communication between collaborators is a key factor for collaboration success, with the potential of also facilitating sharing of information, resources and enabling learning to take place (Rycroft-Malone et al., 2015). This research involved engaging with the local provider, both with the senior team involved in design and programme management, with the staff involved in implementing the programme, and those responsible for programme logistics. These studies (Chapters 5 and 6) were designed and implemented after collaborating with the senior team and working closely with staff who were responsible for programme delivery and logistics. The findings of this research have been written up for publication and one of the authors (PC) who was part of the senior team of the local provider, was involved in the write up of these papers. Recommendations for improving the NHSDPP have been made (Chapter 8) and hopefully these will be implemented and taken into consideration when trying to improve uptake and retention to the NHSDPP both locally and nationally, as well as for other diabetes prevention programmes. The main findings of this thesis including suggestions for improvements will be given to the local provider.

In order to ensure high quality research is undertaken, a sound rationale for each study needs to be provided which includes justifying why the selected methodology, data collection and analysis approaches were taken. The following sections will highlight the rationale for the data collection and analyses adopted in this research, starting with the qualitative studies (Chapters 5 and 6) followed by the quantitative study (Chapter 7).

3.2 Qualitative Studies (Chapters 5 and 6)

3.2.1 Data Collection Techniques

Research included in Chapters 5 and 6 involve the use of qualitative interviewing to gain much needed in depth knowledge and understanding into the key influences of decisions of participants from ethnically diverse backgrounds living in a socioeconomically deprived area to attend and complete the Healthier You: NHS Diabetes Prevention Programme (NHSDPP). It was important to gain rich data, so semi-structured interviews were selected as the best methods to allow participants to express their views and experiences. The following will detail the possible data collection techniques and why semi-structured interviews were selected.

3.2.2 Why Other Data Collection Techniques Were Not Used.

Other data collection techniques can be used to generate qualitative data, and both strengths and weaknesses of these techniques will be discussed.

- *Structured and Unstructured Interviews*

Structured interviews involve the researcher having pre-determined questions, where specific answers are required (Bowling, 2014). Although the researcher has more control over what takes place during the interview and it can be argued there is more reliability with this type of interview due to the same format being used for each participant, structured interviews do not allow flexibility in the questions and limit what participants can discuss (Smith & Osborn, 2015). The current research aimed to explore participant views and experiences of the programme, so having flexibility in the questions was important to explore this. So, this methodology was not selected for this research.

Unstructured interviews do not involve pre-determined questions as the researcher asks open-ended questions and the participants express their views freely (Edwards & Holland, 2013). Although rich in-depth data can be generated, there is little room for standardisation as each interview is different and conducting and transcribing this type of interview can be time consuming (Hofisi et al., 2014) hence why this methodology was not chosen.

- *Focus Groups*

Focus groups involve having informal group discussions with a small number of people where a particular topic or set of issues are discussed (Wilkinson, 2015). The researcher acts as a moderator, facilitating these discussions and encouraging group interaction (Wilkinson, 2015). It can be argued that focus groups are more naturalistic in comparison to interviews as they best represent everyday conversations where different communicative processes are used such as storytelling and disagreements (Wilkinson, 2015). However, this methodology was not used as the research aimed to gain an understanding of individual views and experiences of the programme and wanted to minimise group influences that can affect responses given to questions.

- *Personal Diaries*

Diaries can offer an in-depth account of personal experiences where participants can record their experiences in their own time and pace, and presence of the researcher is not required so there are no practical issues such as agreeing with interview timing and location (Willig, 2013). However, there is lack of personal interaction between the researcher and participant where opportunities to ask further questions about a concept that is discussed is limited. Furthermore, due to the burden and high demand of keeping diaries for the participant, this method can lead to poor recruitment and high dropout rates (Willig, 2013). So, these are some of the reasons why diaries were not used as the selected methodology for this research.

3.2.3 Rationale for Using Semi-Structured Interviews

Semi-structured, one-to-one, face-to-face interviews were deemed most appropriate for this research (Chapter 5) as rich, high-quality data would be generated. The questions asked in semi-structured interviews encourage and provide an opportunity for participants to express their views and experiences (Willig, 2013). Although the researcher prepares a set of questions (interview schedule-see Appendices 4 and 5) beforehand and has some level of control during the interview where they guide, facilitate and prompt, there is flexibility in the questions asked which can be adopted, prompts can be used and clarification can be asked in certain situations when the need arises (Willig, 2013). Taking into consideration that some participants did not always speak good English (Chapters 5 and 6), it was the most appropriate method as it enabled the use of prompts for answers, and also ask questions in a different way if participants did not understand.

These types of interviews can be recorded, allowing the conversation to flow naturally and enabling the researcher to fully focus on the participant instead of focusing on making written notes of what is being discussed (Willig, 2013). Skilled interviewing requires the researcher to implement active listening, be empathetic, non-judgemental and allow the participant to fully express their feelings, views and experiences (Willig, 2013). As the researcher gains more experience in conducting interviews, these skills are developed further which aids with obtaining in-depth, good quality data.

Overall, semi-structured interviewing was the chosen methodology as it allows the researcher and participant to build a good rapport, there is more flexibility in the questioning, and new, novel areas can be delved into when using this method compared to other data collection techniques (Willig, 2013). The researcher was also able to identify any important non-verbal cues which is not possible with other methods such as diaries. For the study described in Chapter 6, semi-structured telephone interviews were selected as the appropriate methodology to use as opposed to face-to-face semi-structured interviews. One of the advantages of conducting telephone interviews include being a convenient way of interviewing as no actual travel to a specific location is required (Hofisi et al., 2014). It can be argued telephone interviews allow a certain level of anonymity compared to face-to face interviews which can be an advantage where participants can freely answer a question, but, they may respond differently in ways they would not over the telephone than face-to-face (Hofisi et al., 2014). However, as these were follow-up interviews for the study described in Chapter 5, some of these issues would not apply.

3.2.4 Types of Qualitative Analysis

This research involved the use of reflexive thematic analysis to analyse participant experiences of the NHSDPP and the key influences of programme uptake and retention. The following will detail the possible data analysis techniques and why reflexive thematic analysis was selected.

3.2.5 Why Other Data Analysis Techniques Were Not Used

There are a variety of different qualitative analysis techniques with various perspectives being taken. The following will detail alternative data analysis techniques, alongside their strengths and weaknesses, and why they were not selected for this research.

- *Interpretative Phenomenological Analysis (IPA)*

Interpretative Phenomenological Analysis (IPA) is an idiographic approach used to explore an individual`s lived experience where the meanings that the individual assigns is given greater importance, and aims to examine in detail how certain individuals have experienced particular events (Shaw, 2010; Smith & Osborn, 2015). The idiosyncratic and culturally constructed factors that are associated with these experiences are explored, including how individuals make sense of their personal and social world (Shaw, 2010; Smith & Osborn, 2015). An IPA approach was not the selected method of analysis for this research as generalised conclusions about participant experiences cannot be obtained when using IPA, as this approach provides a deeper, individual insight (Smith & Osborn, 2015). Due to the research being focused on gaining an understanding about participant experiences of the NHSDPP, the aims were not to gain an understanding of the idiosyncratic and culturally constructed factors associated with these experiences.

- *Discourse Analysis*

Discourse analysis focuses on the relationship between language, thoughts and feelings, including how language is used to understand the social world (Wiggins & Riley, 2010). However, this research is not focused on how language is used by participants, but to gain an overall picture of participant experiences of the NHSDPP and the key influences of their decisions to attend and complete the programme.

- *Grounded Theory*

Grounded Theory enables new theories to develop from the data with no predetermined ideas on how this will occur (i.e., in an inductive way) (Charmaz, 2015; Gordon-Finlayson, 2010). However, focusing on a theoretical framework was not the aim of this research which was why this method of analysis was not chosen.

- *Content Analysis*

This methodology involves identifying patterns and themes by often providing frequency counts and coding qualitative data into categories (as opposed to thematic analysis which does not quantify themes) (Wilkinson, 2015). There is opportunity to alter qualitative data into quantitative form by using content analysis (Wilkinson, 2015). However, this methodology can lead to important detail being lost as it can be difficult to identify appropriate quotations that represent the categories and at the same time be compelling to the reader (Wilkinson, 2015). Also, a sense of individual participants can be lost when data are quantified (Wilkinson, 2015). Content analysis was not selected as an appropriate methodology for this research as the aims were to explore participant experiences and motivations for attending and/or completing the NHSDPP, and it was important to capture individual data and not lose important detail through the process of quantifying the data. Although some numerical information was included in one of the qualitative studies (see Chapter 5), the purpose was to indicate the proportion of participants that discussed a certain concept before starting the programme, and whether they went on to attend or not, it was not to quantify themes and provide frequency counts to demonstrate the importance of a theme or percentage of participants that fall within each category of data, which content analysis aims to achieve. The numerical information provided some context, so the data were not reduced to numbers where important meaning could be lost, instead numbers were used to supplement the qualitative data.

- *Narrative Approaches*

This type of analysis involves researchers using the stories people tell and analysing them in different ways in order to understand the meaning of these experiences that participants have reported in their stories (Merriam, 2009). However, this approach does not give an insight into the actual experience of individuals (i.e., what happens to participants and how these events had affected them), which was the main aim of this research, so narrative approaches were not used.

Despite considering other qualitative analysis alongside their strengths and limitations, an inductive approach to thematic analysis from an essentialist, realist perspective was considered the most appropriate method of analysis for this research. The following section provides a rationale for using thematic analysis.

3.2.6. Rationale for Using Reflexive Thematic Analysis

Reflexive thematic analysis is a type of methodology used to search, identify, analyse and report patterns or themes within the data (Braun & Clarke, 2013; Braun & Clarke, 2006, 2012). It is a flexible approach where a variety of theoretical and epistemological approaches can be applied (Braun & Clarke, 2006). Reflexive thematic analysis is theoretically flexible, it can be used within various frameworks and to answer various types of research questions, such as those related to people`s views and experiences (Braun & Clarke, 2019; Braun & Clarke, 2020, 2021a, 2021b; Braun & Clarke, 2019). Accessibility is another strength of thematic analysis where individuals, particularly those who are not trained researchers or qualitative experts, are taught the mechanics of coding and analysing qualitative data in a systematic way (Braun & Clarke, 2012).

Both the realist/essentialist and constructionist paradigms are compatible with thematic analysis (Braun & Clarke, 2006). When an essentialist, realist approach is taken, individual experiences, meanings, perceptions and motivations are explored (Braun & Clarke, 2006). This approach assumes that individuals have fixed qualities inside them (i.e., essences) like personality, which lead to the experiences and interpretations individuals report (Braun, Clarke, & Rance, 2015). Also, the words of individuals offer direct access to reality (Terry et al., 2017). However, when a constructionist approach is taken, the ways in which events, realities, meanings and experiences are the effects of various discourses operating within a society is explored (Braun & Clarke, 2006). This analysis is carried out within a framework where a single reality or essence is not assumed, but multiple realities are theorised which are constructed through language and social processes (Braun et al., 2015). In between essentialism and constructionism, there is also the ‘contextualist’ or ‘critical realist’ method which can be used. This method takes into account the ways in which individuals understand their experience (i.e., how they make meaning of their experience), followed by the effects of the wider social context on these meanings, while continuing to focus on the material and other limits of reality (Braun & Clarke, 2006; Terry et al., 2017).

An essentialist, realist perspective was the epistemological approach taken in this research. This research reports participant experiences, meanings, perceptions and motivations (which is compatible with a realist, essentialist approach), as opposed to exploring the ways in which events, realities, meanings and experiences are the effects of a range of discourses operating within society (which is compatible with a constructionist approach).

Reflexive thematic analysis is a flexible approach which allows full data exploration without any restrictions (i.e., provides a detailed explanation of the data) (Braun & Clarke, 2013; Braun & Clarke, 2006), and so was selected for this reason. The analysis allowed barriers and facilitators to attending and/or completing the NHSDPP to be identified and described. Themes or patterns in reflexive thematic analysis can be generated inductively from the data (i.e., ‘bottom up’ or data-driven) and/or deductively (i.e., ‘top down’ or theory-driven) (Braun & Clarke, 2013; Braun & Clarke, 2006, 2012, 2021a). An inductive approach was taken for this research where data were coded without attempting to fit them into an already existing coding frame, or aligning them with the preconceptions of the researcher (Braun & Clarke, 2006, 2012; Braun et al., 2015). It was important that these research findings were derived from the data itself and themes accurately represented participant experiences. Previous theory and research were then used to explain these findings.

3.2.7 Further Details on the Process of Data Analysis

The following section details the process of conducting data analysis. All interviews were transcribed verbatim, and an inductive thematic analysis was used to explore the views and experiences of participants, as well as exploring key influences on attendance and completion (see Chapters 5 and 6).

Although there is not one agreed way of conducting thematic analysis, Braun and Clarke's (2006) six phases to conducting thematic analysis, now preferred to be known as reflexive thematic analysis, was followed (Braun & Clarke, 2020, 2021a). It is important to note this was not a linear process of going through one phase to the next, rather it was a iterative and reflexive process, as the researcher moved back and forth through the phases as required (Braun & Clarke, 2013; Braun & Clarke, 2006, 2021) (see Table 4).

Table 4: Six phases for conducting thematic analysis (Braun & Clarke, 2013; Braun & Clarke, 2006, 2021)

Phase	**Description**
1. Data familiarisation	Re-listening to the audio recordings when transcribing data, reading and re-reading the transcripts and making notes about initial ideas.
2. Generating initial codes	Going through the complete dataset in a systematic way and coding all interesting features, and collating data which is applicable to each code.
3. Theme searching	Organising initial codes into potential sub-themes and later themes, ensuring relevant data is collated under each potential sub-theme and theme.
4. Reviewing themes	Examining sub-themes and themes and checking whether they make sense with respect to the coded extracts (level 1) and the complete data set (level 2), formulating a thematic map of the analysis.
5. Defining and naming themes	Continuous analysis to specify and refine sub-themes and themes so each has a clear name and definition, creating an overall story of the analysis.

6. Reporting and writing up the results	This is the final phase for analysis. Rich, interesting extracts are selected, the analysis is related back to the research questions and relevant literature, creating a scholarly report.

When the researcher first began interviewing, written notes were also taken regarding what procedural things happened as well as a reflective account of the researcher`s experiences as the researcher became more experienced in interviewing. As the researcher was transcribing the interviews and becoming familiar with the data, initial ideas were noted. Interviews were transcribed verbatim with page numbers and line numberings used to identify quotes from the original transcripts. Some transcription coding was used whilst transcribing to indicate things like short or long pauses. Transcripts were checked against audio tapes to ensure accuracy.

The transcripts were read repeatedly in order for the researcher to immerse herself within the data and become familiar with the depth and breadth of the dataset as recommended (Braun & Clarke, 2013; Braun & Clarke, 2006). The researcher had to be active whilst conducting this process so meanings and patterns could be identified, to assist with the analysis process and to generate initial thoughts of the data. Notes were made to record any ideas for potential sub-themes and themes.

Following on from this, initial codes were generated from the data which helped with managing and organising the data in a way that was meaningful. Initial coding was conducted using NVivo software where each transcript was repeatedly read and coded in a systematic way (see Appendices 8 and 9 for example of coding). After the initial coding, potential sub-themes and themes were formulated by gathering the initial codes under these themes. The researcher started to think about the associations and relationships between these codes, sub-themes and themes. This process was checked by a second, more experienced qualitative researcher (supervisor RP) who reviewed a sample of transcripts/codes. The potential sub-themes and themes generated were then discussed between the researcher and supervisor.

Themes were identified at the semantic, explicit level as opposed to the latent, interpretative level. At the semantic level, the researcher does not look beyond from what a participant had stated, and only surface meanings of the data are considered when developing themes (Braun & Clarke, 2006, 2021a; Braun et al., 2015). At the latent level, the researcher goes beyond describing the data and starts to interpret the data by identifying the features that give it a certain form and meaning (Braun & Clarke, 2006, 2021a). However, analysing the data from the latent level usually stems from a constructionist approach, so this was not the selected way of identifying themes as this research used a realist, essentialist approach, and identified themes at a semantic level (Braun & Clarke, 2006).

The final sub-themes and themes were reviewed, refined (e.g., merging two themes into one) and were rechecked against the original transcript to ensure authenticity, and whether sufficient data were included to support each sub-theme and theme. Discussions also took place with supervisors (RP and NE with Chapter 5, and with RP for Chapter 6) to ensure sub-themes and themes were distinct, clear and compatible. Definitions and names for each theme were then finalised. Model diagrams of these themes were also created and how they influenced attendance/completion to the NHSDPP (Chapters 5 and 6). The analysis was then written up and scholarly papers created (see Chapters 5 and 6). A 15-point checklist of criteria for good thematic analysis was also followed (Braun & Clarke, 2006).

Reflexivity

Reflexivity involves the researcher being able to critically examine and reflect how they themselves can have an impact on the research process (Finlay, 2003). By engaging in personal and epistemological reflexivity, both the researcher and supervisor (SB and RP) were able to acknowledge how their backgrounds, beliefs, interests in health psychology and their past experiences could have influenced their interpretation of the data. Researcher subjectivity is the primary “tool” for reflexive thematic analysis (Braun & Clarke, 2021b).

The researcher (SB) is a British Pakistani female health psychology researcher who has experiences of working for the NHS, caring for and supporting patients with long term conditions such as T2DM. During the process of this research, a family member who was informed of being at high risk of T2DM, was diagnosed with this condition. The supervisor (RP) is a British White female Chartered Psychologist and a Health Psychologist who has experiences, interests and expertise in the psychological aspects of healthy eating, dietary change and diabetes. A reflexive diary was kept whilst conducting the interviews and data analyses in order to maintain rigour. During the analyses, both the researcher and supervisor (SB and RP) were aware of their backgrounds and experiences and engaged in this process in a reflexive way.

3.2.8 Ethical Considerations

It is important that the participants' physical, emotional and psychological well-being, health and beliefs are respected at all times when conducting research (King, 2010). Research ethics exist to provide guidance to researchers on how research should be conducted in a moral, justifiable way (King, 2010). The ethical considerations which were applicable to this research are discussed below, with a brief explanation on the steps taken by the researcher to ensure participant wellbeing. Full ethical approval was obtained from Staffordshire University's ethics committee before starting data collection for each of the qualitative studies (March 2017), and proportionate ethics obtained for analysing the quantitative study (see Appendices 10 and 11 for confirmation of ethical approval). All the research followed BPS ethical guidelines (The British Psychological Society, 2018).

- *Informed Consent*

Written, informed consent was obtained before undertaking interviews. It was important to make sure participants were given enough opportunity to understand the purpose and potential consequences of taking part in this research. All participants were given an opportunity to read the study information sheets which were posted to them on our behalf by the local provider and also before conducting the interview (see Appendices 12 and 13 for the invitation letter and information sheet, and Chapter 5). When these participants were later contacted after completing/not completing the programme, invitation letters and information sheets were emailed to them by using the contact details participants had provided (see Appendices 14, 15 and Chapter 6). Once the researcher ensured the participant fully understood the nature of the study and their rights to withdraw at any time even after participation, an opportunity was given to ask any questions, and participants were then asked to sign a consent form before taking part (see Appendices 16 and 17 for consent forms).

- *Anonymity and Confidentiality*

Participants were informed that their identities would remain anonymous even when using their quotes to write up papers, reports or presentations, and that only the researcher was aware of their identities. Each participant was given a random number and a pseudonym to ensure anonymity, and any personal, identifiable information was not transcribed. Participants were informed that although 100% confidentially was not possible to maintain due to quotes being used to write up reports, papers and presentations, these quotes will be presented in an anonymous way.

- *Protection of Participants from any Harm*

A primary role of researchers is to protect their participants from any physical, emotional or psychological harm (King, 2010). When planning this research study, it was important to ensure all potential risks to participants were addressed and eliminated. Interviews took place in the same location after participants had attended their IA, this minimised any risks to their physical or psychological health as they knew and were familiar of their surroundings and the location of their interview, and it reduced participant burden. Participants were under no pressure to participate; they were given the opportunity to take part in the interviews after their IA or rearrange another day if they wished to do so. Detailed information was provided after their interview where they could access more programme information, contact counselling services or seek help. This also helped to minimise any risks to their physical and/or psychological health. The same procedure was followed when conducting telephone interviews (Chapter 6).

- *Right to Withdraw from the Research*

Participants were informed about their right to withdraw from this research at any time without having to provide a reason. They were reminded of this before, during and after completing their interviews. They were also informed they had the right to withdraw their data (up to 1 week after the interview had taken place) if they wished to do so, and if they did, their data would be destroyed in an appropriate manner, and they would not be disadvantaged in any way.

- *De-Briefing*

At the end of the interview, all participants were debriefed by the researcher, and they were encouraged to ask any questions which were addressed as fully as possible (see

Appendices 18 and 19 for debrief forms). They were informed again on how their data would be used, what further involvement in this research would entail and again they had complete choice if they decide to participate or not, and they were given contact details of appropriate services if they wished to seek help. In addition, the contact details of the researcher were given if they wished to ask any questions or if they wanted to see the study results before or after the final write up of reports, papers or presentations.

3.3 Quantitative Study (Chapter 7)

3.3.1 Data Collection Technique

The research detailed in Chapter 7 involved examining whether illness perceptions (IPs), self-efficacy (SE), and mental wellbeing (MWB) predict uptake and/or completion of the NHSDPP, independent from other possible confounders. The data used for this study were routinely collected by the local provider (in areas across the country) as part of their service evaluation and were classified as secondary data. Secondary data can be defined as sources of data that already exist which can be used for research purposes (Bowling, 2014). The data were routinely gathered in order to capture IPs, SE and MWB at the programme outset. Therefore, the researcher was not involved in the data collection processes, only with data processing and analyses.

A limitation of using service evaluation data is that the researcher has no or limited control over data collection or quality. However, a benefit of using service evaluation data is that usually these data are collected in a rigorous, systematic way as health organisations aim to assess the effectiveness of their services/programmes in achieving their predefined objectives (Bowling, 2014). In addition, involving organisations and practitioners in research is important to help bridge the gap between research and practice, and working more interdisciplinary and collaboratively can help with this process (Nyström et al., 2018). Before obtaining data from the local provider, a letter of support and a data agreement sharing form was provided (see Appendices 20 and 21).

The local provider used structured, validated, standardised questionnaires to measure IPs, SE and MWB before people started the programme. Structured questionnaires allow unambiguous and easily countable answers to be obtained, leading to quantitative data for analysis (Bowling, 2014). They are also economical and these questionnaires can be administered to large samples of people (Bowling, 2014). The three structured questionnaires have been validated in a variety of different settings and population groups (Broadbent et al., 2006; Chen et al., 2001; Stewart-Brown & Janmohamed, 2008). All three questionnaires asked participants to rate how they felt about a certain statement or question using a Likert scale. A Likert scale is a type of scale where participants are asked to indicate how much they agree or disagree with a particular issue/statement (McQueen & Knussen, 2013). An advantage of using a Likert scale is that instead of participants being asked to select a number which may lead to feelings of being unsure on how their feelings can convert to a number, or hesitant to select extreme values or uncertain of how one scale number differs from another, this is replaced using choice categories which can be more user-friendly (McQueen & Knussen, 2013).

3.4 Summary

This chapter has provided an overview on the methodologies and methods used, and how collaboration took place with the local provider. The reasons why semi-structured interviews were selected as the appropriate data collection techniques for the qualitative studies alongside important ethical considerations, as well as the advantages of using questionnaires to collect quantitative data were discussed. Finally, the rationale behind why thematic analysis was selected as the appropriate data analysis technique for the qualitative studies was discussed. The next chapter (Chapter 4) will provide context to this research by providing an overview of the NHSDPP, specific detail about the Local Provider NHSDPP and a brief introduction to the area of Southwark, from which participants were recruited for the qualitative studies.

Chapter 4: Contextualisation and Background to Research

4.1 Introduction

This chapter provides an overview of the Healthier You: NHS Diabetes Prevention Programme (NHSDPP) and specific detail on the Local Provider NHSDPP, setting the context for this research. A brief introduction to the area of Southwark, one of London`s boroughs in England will be covered, providing details relating to the demographic and health profile of the area.

4.2 Overview of the NHSDPP

In response to tackling the Type 2 Diabetes Mellitus (T2DM) crisis and the need to prevent T2DM, the National Health Service (NHS) in England developed the Healthier You: NHS Diabetes Prevention Programme (NHSDPP) in 2016, as part of the NHS Five Year Forward View report which highlighted the importance of prevention and public health (NHS England et al., 2014; Valabhji et al., 2020). Full population coverage of the NHSDPP was achieved just over 2 years later (Valabhji et al., 2020). The programme is a joint commitment from NHS England, Public Health England and Diabetes UK (Diabetes Prevention Team, 2015; NHS England Publications, 2016).

The NHSDPP aims to delay or prevent the onset of T2DM, by offering those with prediabetes (i.e., at high risk of T2DM), a behaviour change programme involving lifestyle modification (Diabetes Prevention Team, 2015). The primary objectives of the NHSDPP are to promote weight loss and reduce glucose levels among those with prediabetes (Diabetes Prevention Team, 2015). Some of the secondary objectives of the NHSDPP are to: reduce calorie intake, promote healthier diets, and increase physical activity levels (Diabetes Prevention Team, 2015). The programme long-term aims are to reduce: T2DM incidence; health inequalities linked with T2DM; and complications related with T2DM including stroke, kidney, eye and foot problems (NHS England Publications, 2016).

4.2.1 Early Stages and Development of the NHSDPP

The NHSDPP content was informed by evidence-based research including a commissioned review on effective behavioural interventions in preventing T2DM, and followed recommendations made by the National Institute for Health and Care Excellence (NICE) (National Institute of Clinical Excellence, 2012; NHS England, 2016a, 2020b; Nuzhat et al., 2015). A group of experts were involved in developing the service specification for programme delivery (NHS England, 2020b).

In the early phases of the NHSDPP, the programme was delivered in seven demonstrator sites including Southwark (NHS England Publications, 2016; Rodrigues et al., 2020). The findings from these demonstrator sites informed the design and delivery of the national programme (NHS England Publications, 2016; Penn et al., 2018). In May 2016, the first wave of the NHSDPP was rolled out nationally in 10 areas, with the NHSDPP being rolled out in the 17 remaining areas from June 2016 (Penn et al., 2018). An economic evaluation has shown the NHSDPP is likely to be cost-effective within 20 years, and cost-saving where programme costs are predicted to be retrieved within 12 years through NHS savings (Thomas et al., 2017).

At the time of writing, the NHSDPP is being delivered across England by four local service providers who were chosen after going through a national competitive process (Reed Wellbeing (previously known as Reed Momenta), Pulse Healthcare Limited trading as ICS Health & Wellbeing, Ingeus UK, and Living Well Taking Control) (Diabetes Prevention Team, 2015; NHS England Publications, 2016; Valabhji et al., 2020). Each provider follows a similar structure of an initial assessment, core and maintenance sessions, with at least 13 face-to-face group-based sessions with 16 hours contact time, over a minimum of 9 months (Diabetes Prevention Team, 2015; NHS England Publications, 2016; Valabhji et al., 2020). However, due to the global pandemic Coronavirus 2019 (Covid-19), there has been temporary changes to the delivery of the NHSDPP (Newbound & Valabhji, 2020). Since the 20th of March 2020, group-based face-to-face sessions are no longer taking place and they are now being delivered remotely with telephone-based coaching and digital services being offered (Newbound & Valabhji, 2020).

Individuals are eligible for the programme if they are identified as having prediabetes after undergoing an NHS Health Check, through routine clinical practice or obtaining qualifying blood test results through GP records (Barron et al., 2018; National Institute of Clinical Excellence, 2012; NHS England Publications, 2016). Due to current research on the negative impact of Covid-19 on T2DM outcomes, an eligible blood glucose reading is no longer required (Apicella et al., 2020; Holman et al., 2020; Ruiz-Roso et al., 2020; Sardu et al., 2020; Zhu et al., 2020). From August 2020, individuals have been able to self-refer onto the NHSDPP after completing an online Diabetes UK risk score assessment, which it is anticipated will help with increasing uptake rates (ICS Health & Wellbeing, 2020; NHS England, 2020a) (see Appendix 4 for further, updated information on the NHSDPP).

4.3 Details of the Local Provider NHSDPP

The local provider was one of four local providers originally commissioned to deliver the NHSDPP in England. They specialise in delivering evidence-based lifestyle and wellbeing programmes (Macmillan, 2016). At the time of data collection, the local provider trained local staff to deliver 18 face-to-face group-based sessions for up to 20 people (six weekly, six fortnightly and six-monthly sessions) (Macmillan, 2016). The duration of these sessions was one hour except for the first session which lasted 1.5 hours. At the time of writing, the local provider now delivers 13 one-hour group sessions over 40 weeks. The original programme consisting of 18 sessions will be referred to in this thesis.

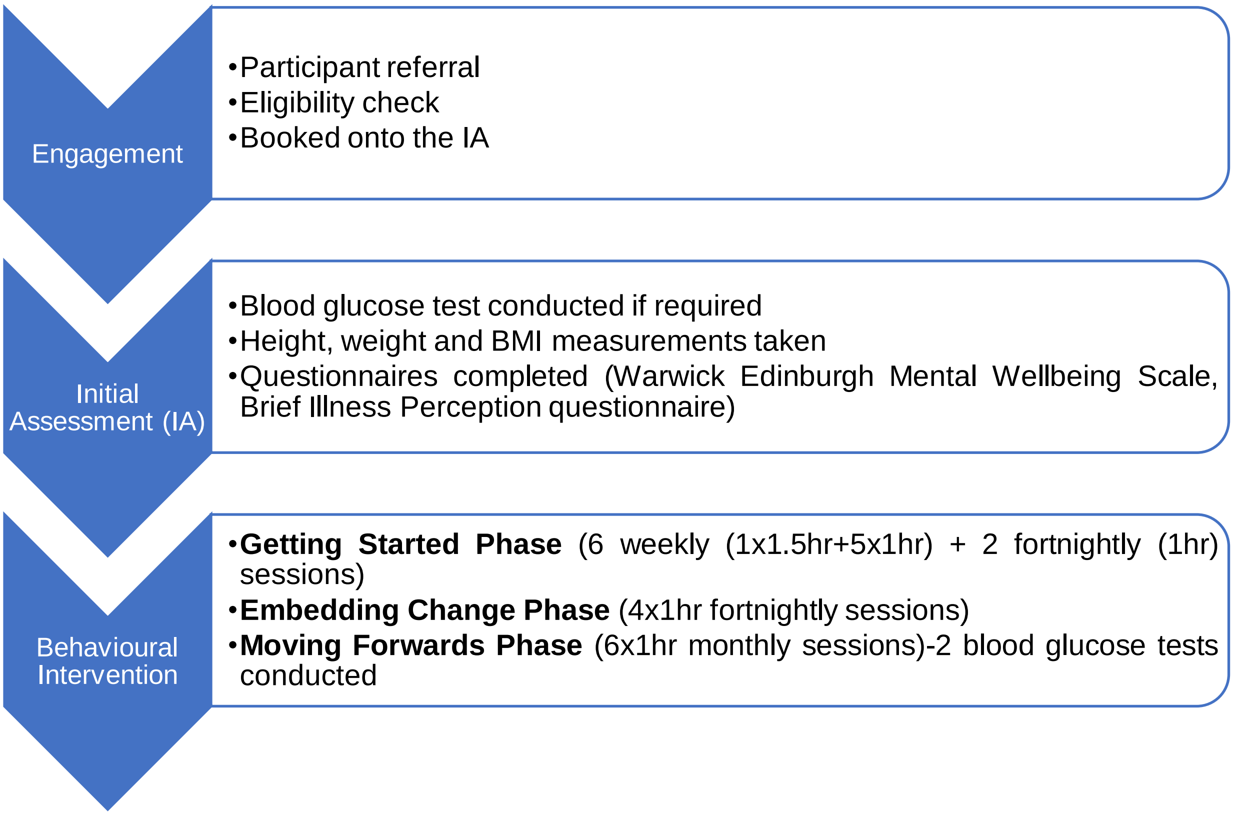
The patient journey consists of the engagement stage, the initial individual assessment (IA) followed by the behavioural intervention (see Figure 2) (adapted from Macmillan, 2016). The engagement stage involves the patient being referred and an eligibility check being undertaken, if eligible, the patient is booked onto the IA (Macmillan, 2016). The referral criteria patients need to meet include: being aged 18 years or older, registered with a relevant GP practice, not having a diagnosis of T2DM or being pregnant at the time of referral, and having an eligible blood reading (HbA1c of 42-47 mmol /ml (6.0 6.4%) or an Fasting Plasma Glucose (FPG) of 5.5-6.9 mmol /l) tested in the last 12 months (Macmillan, 2016).

The IA is a short 15–20-minute appointment patients are required to attend before programme commencement. This appointment involves (i) having a blood glucose test if the referral blood glucose reading is more than 3 months old, (ii) taking height, weight and BMI measurements, and (iii) completing questionnaires including the Warwick Edinburgh Mental Wellbeing Scale (WEMWBS) (see Appendix 5) and the Brief Illness Perception questionnaire (Brief-IPQ) (Macmillan, 2016).

Once on the programme, the behavioural intervention involves three phases: Getting Started, Embedding Change, and Moving Forwards (Macmillan, 2016). The Getting Started phase involves six weekly and two fortnightly sessions with a duration of one hour (except for the first session which lasts 1.5 hours). Some of the topics that are covered include introducing prediabetes, the Eatwell guide, having a healthy, balanced diet and cardiovascular activity (Macmillan, 2016). The Embedding Change phase involves four fortnightly sessions lasting an hour each (Macmillan, 2016). Some examples of topics covered include obtaining social support and eating healthily outside the home (Macmillan, 2016). The Moving Forwards phase involves six monthly sessions lasting an hour each where blood glucose tests are undertaken at six months (session 14) and nine months (session 18) of the programme (Macmillan, 2016). Relapse prevention and unhelpful thinking patterns are some of the topics covered in this phase (Macmillan, 2016).

The programme content was developed and reviewed by a group of experts (working for the local provider) in accordance with the national specification (Macmillan, 2016). The 18 sessions covered a variety of different topics on nutrition, physical activity and behaviour change. Various behaviour change techniques were incorporated into the programme such as instruction on how to perform a behaviour, self-monitoring of behaviour by using pedometers and recording steps, setting behavioural goals, problem solving, demonstrating the behaviour and behavioural practice. Some of these BCTs have been associated with higher retention such as problem solving and demonstrating and practising the behaviour (see Chapter 2). The area of Southwark will now be discussed as it is one of the places where the NHSDPP was delivered by the local provider, and where participants were recruited from for the qualitative studies (see Chapters 5 and 6). However, please note although at the time of data collection, the NHSDPP was delivered in Southwark, South London by the local provider (referred to in this thesis), from July 2018, this local provider was no longer a provider for East and South London.

Figure 2: Flowchart detailing the phases involved in the patient journey



Engagement

- Participant referral
- Eligibility check
- Booked onto the IA

Initial Assessment (IA)

- Blood glucose test conducted if required
- Height, weight and BMI measurements taken
- Questionnaires completed (Warwick Edinburgh Mental Wellbeing Scale, Brief Illness Perception questionnaire)

Behavioural Intervention

- **Getting Started Phase** (6 weekly (1x1.5hr+5x1hr) + 2 fortnightly (1hr) sessions)
- **Embedding Change Phase** (4x1hr fortnightly sessions)
- **Moving Forwards Phase** (6x1hr monthly sessions)-2 blood glucose tests conducted

4.4 Profile of Southwark, London

4.4.1 About Southwark

Southwark is a densely populated, diverse, inner London borough consisting of several different districts (see Figure 3) (New Policy Institute, 2016; Southwark Council, 2018).

Figure 3: A map of various boroughs within London (adapted from Neweb Creations, 2020)

The population of Southwark is growing faster than the national average with just over 314,200 people residing in Southwark compared to 230,000 in 1995 and 256,700 in 2001 (New Policy Institute, 2016; Southwark Council, 2018). In 2017, the median age of residents was 33.1 years resulting in the age profile of the Southwark population being younger in comparison to the London average (35.1 years) and national average (40.1 years) (New Policy Institute, 2016; Southwark Council, 2018). By 2030, it is projected that the population of Southwark will increase by almost 20% (with more young people, working age adults and older people) (Southwark Council, 2018).

Ethnicity

Southwark is an ethnically diverse borough consisting of individuals from various backgrounds where over 120 languages are spoken, and approximately 11% of households do not have any individuals with English as their first language (Southwark Council, 2018). Approximately 46% of the population belong to the Black, Asian and Minority Ethnic (BAME) group (25% Black, 11% Asian and 10% other), and 54% belong to the White ethnic group, resulting in Southwark being more diverse than the rest of London and the national average (New Policy Institute, 2016; Southwark Council, 2018).

Deprivation

There are high levels of deprivation in Southwark compared to the rest of England, where 39% of neighbourhoods are in the bottom fifth nationally resulting in Southwark being classified as one of the 20% most deprived districts in England (New Policy Institute, 2016; Public Health England, 2020b). Compared to the least deprived areas (i.e., more affluent) in Southwark, those living in more deprived areas have lower life expectancy where it is 7.4 years lower for men and 5.6 years lower for women (Public Health England, 2020b).

Prediabetes/T2DM

Compared to the national average, the estimated diabetes diagnosis rate in Southwark is significantly worse (Public Health England, 2020b). Approximately 5.1%-9.1% of the population in NHS Southwark Clinical Commissioning Group (CCG) have T2DM, with a higher diagnosed T2DM prevalence among men than women (NHS Digital, 2020a; O'Dowd, 2018; Shapo, 2018). Approximately 6.3%-10.2% of the population in NHS Southwark CCG have prediabetes (i.e., non-diabetic hyperglycaemia) (NHS Digital, 2020a; O'Dowd, 2018; Shapo, 2018).

Overall, Southwark is a young, densely populated, ethnically diverse, socioeconomically deprived London borough with higher than national average rates of T2DM. Exploring key factors influencing decisions to attend and complete a diabetes prevention programme will help to ensure uptake and retention in the

NHSDPP is optimised for this population. The following two chapters (Chapters 5 and 6) present the qualitative findings from two studies, which explore experiences of attenders/non-attenders and completers/non-completers of the NHSDPP in Southwark. Both chapters have been written up as papers and are presented in the thesis in the form of the submitted articles. Chapter 5 has been written up as a paper and published in *Diabetic Medicine*, and Chapter 6 is currently being prepared to be submitted to a journal. Please see pages vi – viii (List of Outputs) for further details.

Chapter 5: Influences of Decisions to Attend a National Diabetes Prevention Programme

5.1 Introduction

Type 2 Diabetes Mellitus (T2DM) prevention is a worldwide health care priority (Gray et al., 2016), with global levels of prediabetes (i.e., those at high risk of T2DM) predicted to rise from 374 million to 548 million between 2019-2040 (Saeedi et al., 2019). In England, levels of obesity and physical inactivity are escalating, leading to more adults being overweight or obese, and T2DM diagnosis increasing, costing the National Health Service (NHS) approximately £8.8 billion each year (direct costs of T2DM) (Hex et al., 2012). It is predicted that by 2034, 1 in 3 adults will be obese and 1 in 10 diagnosed with T2DM, highlighting the need for more preventative measures (Public Health England, 2014). Following other countries like Finland that have successfully implemented diabetes prevention programmes (DPPs) (Lindstrom et al., 2006), England has developed the Healthier You: NHS Diabetes Prevention Programme (NHSDPP) to delay or prevent the onset of T2DM (Diabetes Prevention Team, 2015). This involves offering those with prediabetes a behaviour change programme with lifestyle modification (Diabetes Prevention Team, 2015). The programme consists of at least 13 group sessions over a 9-month period (Diabetes Prevention Team, 2015).

For any DPPs, it is important that they are clinically effective and financially viable, especially when delivered at scale (Albright, 2012). Programme viability involves maximising attendance (Knowles et al., 2019). It is recommended that to develop future DPPs, an in-depth understanding of the reasons why participants choose not to attend is required (Gray et al., 2016). Individual factors associated with non-attendance, include smoking, taking blood pressure medication and consuming less fruit and vegetables (Laws et al., 2012). Attenders of DPPs on the other hand are more likely to be older, leaner, non-smokers, men or from less socioeconomically deprived areas than non-attenders (Gray et al., 2016). Barriers to attendance associated with the programmes themselves include inconvenient timing of sessions, location or lack of interest (Aziz et al., 2018).

The NHSDPP (2016-2018) found that 63% of individuals who attended the initial assessment (IA), a brief appointment before programme commencement, attended at least one intervention session (i.e., started) and 37% did not attend any sessions (Valabhji et al., 2020). Qualitative literature exploring service users' experiences of the NHSDPP (Rodrigues et al., 2020) highlighted that service users' confusion about their prediabetes diagnosis and the programme, could negatively affect attendance. They stated how the expected programme benefits such as making lifestyle improvements and reducing T2DM risk encouraged attendance. However, the sample was not ethnically diverse, and non-attenders were not interviewed. Overall, there is lack of qualitative evidence exploring reasons for both attendance and non-attendance.

Individual factors that have affected attendance at other preventive health programmes include illness perceptions (IPs). IPs are beliefs or cognitive perceptions held by individuals regarding their illness (Petrie et al., 2007). These IPs include beliefs about illness: identity, causes, timeline, consequences, and cure/control (Weinman et al., 1996). It is well established that IPs are important determinants of behaviour and various outcomes in individuals with different conditions such as T2DM (Petrie et al., 2007). Research exploring predictors of attendance at other health preventative programmes have shown IPs to predict uptake (Murray et al., 2012). For example, beliefs about the causes of illness were associated with attendance at lifestyle change programmes (Murray et al., 2012), and those who believed their condition was controllable were more likely to attend cardiac rehabilitation programmes (French et al., 2006). However, whether IPs reflect attendance at the NHSDPP is yet to be explored.

This present research is based in an area of South London, England where 46% of the population belong to Black, Asian and Minority Ethnic (BAME) groups (Southwark Council, 2018), known to be at a considerably higher risk for T2DM than White groups (Gholap et al., 2011). This area of South London is more socio-economically deprived than the national average (New Policy Institute, 2016), which is also linked with an increased T2DM risk (Mainous III et al., 2014). Exploring facilitators and barriers to attendance, especially with this under-researched at-risk population, could better inform programme recruitment and delivery. This study aimed to explore key influences of participants' decisions to attend the NHSDPP.

5.2 Material and Methods

5.2.1 Interview Schedule

Questions explored participants' perceptions of T2DM (questions were based around illness perceptions (Petrie et al., 2007)), T2DM risk, the NHSDPP and experience of the referral process. The interview schedule was piloted with 11 participants (five men) after attending their IA. Minor changes included adding prompts and simplifying wording for non-native English speakers (see Appendix 6 for interview schedule).

5.2.2 Sampling and Recruitment

Once ethical approval was gained from Staffordshire University, the local provider (LP) sent out invitation letters to those scheduled to attend the Initial Assessment (IA). The researcher recruited participants from the IA venue using opportunistic sampling, and aimed to recruit 25-30 attenders and 10-20 non-attenders as recommended for thematic analysis (Braun & Clarke, 2013). The researcher attended the IA venue on 11 days, spoke to 84 individuals in total and interviewed 43 participants (following written informed consent). After attending the IA, participants who did not start the programme were classified as "non-attenders" and those who attended at least one session, were classified as "attenders" (see Appendix 22 for the recruitment process).

5.2.3 Data collection and Analysis

Individual semi-structured interviews were conducted after the initial assessment (before the first NHSDPP session) (April - November 2017). Participants were interviewed and a brief questionnaire was completed to record demographic information (see Appendix 23 for demographic questionnaire). After these interviews had taken place, participants who did not start the programme were classified as "non-attenders" and those who attended at least one session, were classified as "attenders". This was determined through regular updates from the local provider (LP) regarding whether the interviewed participants had started the programme. Twenty-three were classified as "attenders" and 12 as "non-attenders" (Table 5). Attenders and non-attenders were then followed up with a short telephone call discussing reasons for their attendance or non-attendance (August 2017 to May 2018) (see Appendix 24 for reasons for non-attendance). Eight participants were excluded from analysis (two developed T2DM and ineligible to start; four were not identified on the LP database;

and two non-attenders were unavailable for a follow-up call). Participants were offered a financial incentive to thank them for their time.

All interviews were audio recorded, transcribed verbatim and analysed using inductive thematic analysis with an essentialist epistemological approach (Braun & Clarke, 2006). Analysis took place once both the interviews and follow-up calls had been conducted. Discussions took place with supervisors (RP and NE) on the analysis approach, and it was agreed that due to the follow-up interviews being brief, the baseline interviews were analysed first. Once all the interviews had been analysed, data from the brief follow-up interviews were included and themes generated. Comparisons were then made between the two groups (attenders and non-attenders). Interview transcripts were anonymised, and participants were given pseudonyms for reporting. Analysis was undertaken using NVivo.

The six phases of thematic analysis developed by Braun and Clarke (2006) were followed, starting with data familiarisation, initial coding, and development of possible sub-themes and themes, which were then discussed to refine and finalise the final themes (Braun & Clarke, 2006). Data coding and initial theme development were undertaken by the researcher (SB) and reviewed and discussed together with the supervisor (RP) to ensure sub-themes and themes were distinct, clear and compatible. Interviews were spilt into two groups, attenders and non-attenders. Both baseline and follow-up for each participant in each group were initially coded and analysed separately, then combined (i.e., follow-up data were included with the baseline data for each participant), synthesised, and final key themes were agreed by the two researchers. Comparisons were then made between the attenders and non-attenders groups where any differences and similarities between the two groups were explored. A model diagram of these themes was created and how they influenced attendance to the NHSDPP (Figure 4). A 15-point checklist of criteria for good thematic analysis was also followed (Braun & Clarke, 2006).

Regarding reflexivity, the two researchers acknowledge how their beliefs, interests in health psychology and their past experiences could have influenced the interpretation of the data. This was considered during analysis so both researchers engaged in this process in a reflexive way.

5.3 Results

Twenty-three attenders (mean age 51.8 years, range 34-64) and twelve non-attenders (mean age 49.3 years, range 25-69) were recruited (Table 5).

Table 5: Sample characteristics

	Attenders (*n* = 23) (%)	**Non-attenders** (*n* = 12) (%)
Gender		
Women	13 (56.5)	7 (58.3)
Men	10 (43.5)	5 (41.7)
Age		
20-29	0	1 (8.3)
30-39	1 (4.3)	0
40-49	7 (30.4)	6 (50.0)
50-59	12 (52.2)	3 (25.0)
60-69	3 (13.0)	2 (16.7)
Ethnicity		
White British	6 (26.1)	5 (41.7)
Black/Black British	11 (47.8)	3 (25.0)
Asian/Asian British	2 (8.7)	2 (16.7)
Mixed	1 (4.3)	1 (8.3)
Other	3 (13.0)	1 (8.3)
Deprivation quintile (1-5) *		
Quintile 1 (most deprived)	10 (43.5)	7 (58.3)
Quintile 2	8 (34.8)	1 (8.3)
Quintile 3	0	2 (16.7)
Quintile 4	1 (4.3)	1 (8.3)
Quintile 5 (least deprived)	0	0
Unable to calculate	4 (17.4)	1 (8.3)

*The index of multiple deprivation (IMD) was derived from participant home postcodes where possible (Ministry of Housing, 2019; New Policy Institute, 2016).

Across both groups, slightly more women than men were recruited, and the majority were from the most deprived areas (based on national rankings). The most common ethnicity was black/black British amongst attenders and white British amongst non-attenders, with majority of non-attenders being younger when compared to attenders.

There are seven themes derived from the data (Figure 4). To conserve words, sub-themes are detailed within each theme without being explicitly mentioned (see Appendix 25: Themes and sub-themes). Illustrative quotations are labelled with participant number (see Appendix 26: Participant details).

Some researchers have argued the inclusion of numerical information is useful for verifying findings and conclusions, and it can help make certain statements more precise (Maxwell, 2010). Therefore, due to having attendance data, some numerical information is presented (where appropriate), to indicate the proportion of participants that discussed a certain concept before starting the programme, and whether they went on to attend or not.

5.3.1 Understanding of T2DM

This theme details current participants' T2DM knowledge and some of the difficulties they experienced with understanding. This can affect motivation to attend.

Participants discussed aspects related to knowledge of T2DM. For example, they stated bodily parts and organs are affected, including that T2DM can "lead to blindness"[30] or "amputation"[1]. They expressed how "you've got it [T2DM] for life"[20], "it can last forever"[31]. Alternatively, some said "you can get rid of it [T2DM] …if you [are] willing to"[15], "prevention is better than cure"[14].

Attenders expressed how their "HbA1c levels were slightly high"[4] which encouraged them to start the programme, as they would "rather prevent it than manage it"[12] or felt they "don't wanna get type two [diabetes]"[27]. Non-attenders on the other hand, felt they already knew how to reduce their risk, or did not understand why they still had prediabetes if they had made the required lifestyle changes: "I know what sort of foods I can and…can't eat"[20], "how can I be on the borders [prediabetes] again?"[8]. Non-attenders also felt that they no longer had prediabetes, or that their prediabetes was under "control"[32] or "blood sugars down"[18]. This had resulted in them believing "I think I'm fine now"[19], and not feeling the need to attend: "if I was still on the prediabetic range I would consider [attending] but now that I'm below it [I won't attend]"[18].

Some participants expressed difficulties in understanding their T2DM risk or GP communication. Participants explained, “[I] don’t really understand [my] risk very well”[25] or felt their GPs did not explain about their prediabetes diagnosis: “the doctor is not telling you all [he/she] is supposed to tell you”[24]. Overall, the proportion of participants who expressed difficulties in understanding their T2DM risk or GP communication at pre-programme was higher in attenders than non-attenders (attenders *n*=11 (48% of attenders) vs. non-attenders *n*=1 (8% of non-attenders)).

5.3.2 Lifestyle Changes (Past and Present)

Participants discussed lifestyle changes they had already made or were trying to make with difficulties experienced since first hearing about their prediabetes diagnosis. This can affect their motivation to attend.

Participants discussed lifestyle changes associated with diet and exercise. For example, they “stopped taking sugar”[21], or were “trying to do exercises”[3]. Overall, the proportion of participants who had already made lifestyle changes before the programme (and after their IA), was higher in attenders than non-attenders (attenders *n*= 13 (57% of attenders) vs. non-attenders *n*= 5 (42% of non-attenders)).

Participants expressed difficulties with making lifestyle improvements associated with diet, for example “trying to look after my diet but it’s not easy”[3]. Others expressed difficulties with exercise, for example, “I don’t exercise that much”[15], or not being “too good with physical stuff like going to the gym”[22].

5.3.3 Comparison with Others

This theme involves participants making comparisons with their family, friends or other people with T2DM. This may feed into motivation and affect attendance. Participants made comparisons with family stating, “my father…was diabetic”[23], with some mentioning how their family members have “passed away”[8] from the effects of T2DM. Some attenders were “motivated to do something because…it’s in the family …I didn’t want that to happen to me”[5]. Other participants had a better understanding of T2DM due to knowing people with it such as family and friends: “a lot of it has been communicated…from the people who I see like friends and family I know whose got it”[8].

5.3.4 Support

This theme involves support from family, friends, group members or those involved in programme delivery, which may affect motivation to attend. Participants discussed how family and friends provide positive support, including encouragement “my family tend to give me a kick up the backside!”[28]. In contrast, others discussed how family and friends did not provide sufficient support such as “life we [are] living…is not that easy especially with family”[15], or they gave incorrect dietary advice, for example, if you have T2DM then “you should keep [a] sweet in your pocket [for] when you are hungry…[that’s] not the way I understand [it now]”[7].

Some participants felt they would get support from other people on the programme “it’s good to meet new people”[3] as “you learn from each other”[8] and by talking to others, you get “to see what they do”[4]. This can help with “motivating each other”[10] leading to “better understanding”[7]. Participants felt “reassured”[28], “appreciate…there are others concerned about us”[8], it will be “good to have other people around supporting me”[18] so are “looking forward to…getting help”[8].

5.3.5 Self-Perceptions

This theme only applied to participants that became attenders. They commented how “you think you are healthy [before prediabetes diagnosis], then your [diagnosis] proves you’re not healthy”[24]. They felt like “[their current] lifestyle what you’re doing at the moment is right [although it is] wrong [as proven by their diagnosis][15]”.

Participants also discussed their body image in relation to perceptions about their weight, from others or their own perceptions. Some expressed how they “used to be very slim”[3] and have “now put on weight”[3] or how they perceived themselves as being “overweight”[13]. Others expressed cultural expectations of weight before and after marriage: “this is [a] culture when you’re young and single you like to have that body because you’re gonna find a nice girl get married…you need someone to look at you [being] in…good shape [but] now I’m happy I got wife…kids I can’t be bothered [about weight]”[15].

5.3.6 Accessibility and Practicalities

This theme gives insight into participants’ experiences of programme access. Some described difficulties when booking their IA: “they wouldn’t pick up for weeks, I kept ringing”[2] or “it was going straight to voicemail”[3] with some “never [getting a] reply”[3]. Some experienced problems with leaving messages being told “it’s full”[4]. This left participants feeling “concerned it was taking too long”[5], “it was very hard to get a place”[2], “it wasn’t a positive start”[6]. Two participants described problems with their IA: “they [IA instructors] didn’t show up”[11] which led them needing to rearrange and take “a whole day off work to come[34]”, making them feel “pissed off”[11], although they attended another IA later, but then became non-attenders of the programme.

After the IA, the negative experience of booking continued with some attenders and non-attenders: “you gotta keep leaving them a message”[8] “no-one answers”[12]. This resulted in participants feeling “stressed[7]”, “fed up”[9], “it drives me mad”[8] or feeling that it was “badly organised”[9] and best to “give up[7]” and did not attempt again to book their first session. One non-attender felt “if I managed to get in contact with them, I would definitely like to go on the programme”[10]. It seems like attenders kept “persevering”[6] and managed to start.

A few participants were “very flexible”[14] with session times, but for some it “depended on…[work] schedule”[15]. Some non-attenders were not able to attend session times due to “work”[16]. Others could not start as “they didn’t have the times I wanted”[17]. Some felt they were given at “short notice”[19] and “they expect you to go the next day…life does not work like that”[9].

Some participants stated it would be better to have sessions “closer to home”[4]. A few who expressed before the programme they need “to make time to come”[21] became attenders as they prioritised time which is in contrast to non-attenders who discussed they have “a lot less time”[18]. The proportion of participants who stated they accessed the programme through “GP referral”[22] or “GP [recommendation]”[26] was higher in attenders than non-attenders (attenders *n*= 9 (39% of attenders) vs. non-attenders *n*= 1 (8% of non-attenders)). Some attenders also said “the letter from the GP”[27] made them think “I must do it”[2] motivating them to start. Overall, non-attenders commonly discussed organisational issues and inconvenience as reasons for their non-attendance when attempts were made to book onto the NHSDPP (Appendix 24).

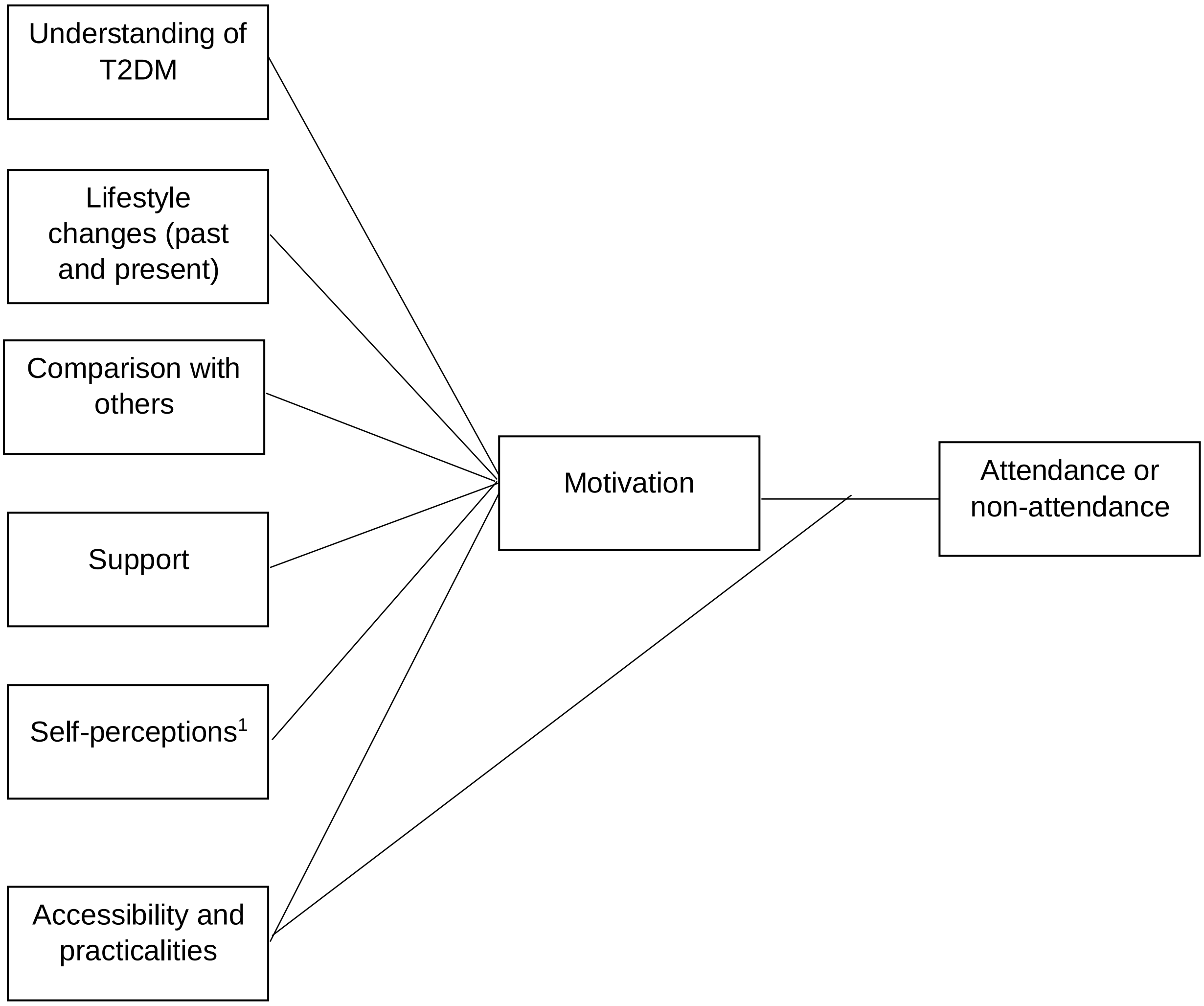
5.3.7 Motivation

This theme links to all other themes and involves participants expressing their desire to self-care, how family play a role in motivation, and how committed they are to start. Many participants discussed the importance of self-care: “it’s my health I’m here to look after myself”[29]. Many discussed their desire to make positive lifestyle changes and improve health. For example, they wanted “good health”[4] as “[they] don’t wanna be diabetic”[34] or engaged in self-talk: “you have to tell yourself ‘*no this is not good for my health’*”[21] when faced with unhealthy choices. The proportion of participants who expressed a desire to improve their health was higher in attenders than non-attenders (attenders *n*= 12 (52% of attenders) vs. non-attenders *n*= 4 (33% of non-attenders)).

Generally, participants expressed their desire to “learn new [knowledge]”[3] including “what to do to reduce [blood sugar]”[14] or “find out what have I been eating wrong”[8]. Attenders explained the idea of having: “mind over matter”[28] and thinking positively in order to make relevant lifestyle changes. Also, attenders discussed how their family was a motivator to attend: “I have to be fit for my children”[35], or “my family…[are] having a hard time with it [T2DM]”[5]. Neither of these were discussed by non-attenders.

Participants discussed their level of commitment to start which “depends on…programme [content like] learning things…to improve lifestyle…which is motivating me to come”[3], and some said “it depends how useful”[4] the programme is. Participants expressed how they were motivated to start: “absolutely committed to this…want to come”[22]. Attenders also expressed wanting “to get rid of [being] prediabetic”[3] or “desperate to get off that red zone”[22]. Some participants said they wanted to “start soon”[5] as they were “curious to start”[33], and some “attended out of curiosity”[25].

Figure 4: Model overview of key influences affecting attendance



[1] Applies to attenders only.

5.4 Discussion

Exploring the views and experiences of participants deciding whether to attend the NHSDPP is important to improve uptake and programme viability (Gray et al., 2016; Knowles et al., 2019), especially in those from ethnically diverse backgrounds and/or from more deprived areas as they are at increased risk of developing T2DM (Gholap et al., 2011; Mainous III et al., 2014). We report key influences of participants' decisions to start the NHSDPP. The results demonstrate how understanding T2DM, making lifestyle changes, comparing themselves with others, having support and certain self-perceptions can all affect motivation, influencing NHSDPP attendance. Accessibility and practicalities were also important in influencing both motivation and attendance.

How individuals understand their illness plays an important role in motivation and behaviour (Dickinson et al., 2017). Participants discussed their T2DM knowledge, such as what bodily parts are affected or whether T2DM is irreversible. Individuals' knowledge and understanding of their illness like T2DM prior starting a health prevention programme can influence decisions to attend (French et al., 2006). Those who believe T2DM is preventable, may be more likely to attend. Illness perceptions such as these could be assessed at the IA to gain a deeper understanding about participants' perceptions of prediabetes and T2DM, and specific-tailored information could be provided to ensure participants have a correct understanding about these conditions, which could affect motivation to attend.

Some participants discussed difficulties they experienced with understanding their T2DM risk or GP communication. Interestingly, a higher proportion of those who expressed more difficulties in their understanding before the programme went on to attend the NHSDPP. It is possible that they were more motivated to start in order to improve their understanding, as research has shown that providing health advice and individualised information can increase participation to a lifestyle intervention (Barter-Godfrey et al., 2007). However, this finding highlights that understanding and good communication, particularly amongst a population where English may not be the first language, is fundamental to improving attendance.

Some choosing not to attend the NHSDPP felt that they were no longer at risk or were able to control their risk independently. This suggests that some participants did not see the need to attend as they felt able to control their prediabetes. This contradicts other research that found those who believed their condition was controllable, were *more* likely to attend cardiac rehabilitation programmes (French et al., 2006). It highlights the need for clinicians and programme organisers to ensure effective communication and understanding of prediabetes, so participants fully understand their diagnosis and risk before making an informed decision regarding attendance.

Participants discussed lifestyle changes they had already made or were attempting to make since first hearing about their prediabetes diagnosis. Those who had already made lifestyle changes prior to starting the programme were more likely to attend. Having already made lifestyle changes can sometimes act as a deterrent and discourage people from starting health promotion programmes (Van Dongen et al., 2016). However, in this study, those who had already made changes seemed to have increased motivation to attend, possibly through wanting to find out more on how to make changes, achieve their long-term goals such as weight loss, and improve health.

Having family members with T2DM can reduce confidence in preventing T2DM (Barry et al., 2018). Many participants discussed family, with some regarding family as a motivator and providing support. Others discussed their family as unsupportive and some made comparisons with their family members with T2DM. Research has shown individuals with prediabetes who have family history of T2DM, are more motivated to attend a DPP (Laws et al., 2012). At the IA, it would be helpful to ask questions regarding family commitments and family experience so that these can be considered when allocating suitable session times and venues, as well as signposting to appropriate support if necessary.

Only attenders discussed self-perceptions, specifically their body image in terms of their own perceptions of their weight, or from others. Perhaps these negative self-perceptions and body image dissatisfaction provided motivation to start the programme to improve their body image and lose weight in line with NHSDPP core goals (Diabetes Prevention Team, 2015).

Issues with accessibility influenced motivation and attendance. These left participants feeling frustrated and led some to not attend, even when they were motivated. Location of the session was also identified as a barrier for both attenders and non-attenders, this may be particularly important for those living in socioeconomically deprived areas, due to access to and cost of transport. Offering a flexible range of times and local venues, giving participants more opportunity to attend should increase accessibility. Accessibility issues could be explained partly due to the unexpectedly large number of referrals received for the NHSDPP. In 2016-18 referrals were 16% higher nationally than expected and consequently there was a higher than expected uptake (Barron et al., 2018; Valabhji et al., 2020). Recently as part of England government's COVID-19 response, attempts have been made to increase uptake to the NHSDPP by enabling self-referral to the programme (NHS England, 2020a), which could also lead to increased levels of uptake. To prevent the service being overwhelmed, the LP must ensure that they have the capacity to book participants onto the programme efficiently, with good communication to participants. It is noteworthy that this study only interviewed participants and not staff. It would be helpful to interview staff to hear about their experiences in order to find out what challenges were faced from the healthcare professional perspective.

The referring healthcare professionals and how participants access the programme can affect motivation to attend. Those who stated that they had received GP recommendations were more likely to attend. This demonstrates the crucial role of GPs who are involved in first informing individuals of their prediabetes. Collaborative working between community and clinical services is needed to ensure programmes like the NHSDPP are effectively implemented (Knowles et al., 2019).

One of the strengths of this study is collection of data from a high number of non-attenders, who are usually difficult to recruit (Gray et al., 2016; Rodrigues et al., 2020). We also recruited a sample including individuals from ethnically diverse backgrounds and from socioeconomically deprived areas, and both of these factors (ethnicity and deprivation) are known risk factors for T2DM (Gholap et al., 2011; Mainous III et al., 2014). Consequently, limitations in English speaking were a drawback in some cases. However, the researcher piloted the interview schedule beforehand with a sub-group of participants, to ensure that questions were easily understood.

Overall, this study provides an important insight into the views and experiences of NHSDPP attenders and non-attenders from ethnically diverse backgrounds in a socio-economically deprived area. Motivation, and accessibility and practicalities influenced participants' decisions to attend, and motivation was influenced by a range of different factors. Programme organisers and healthcare professionals should consider these factors when recruiting participants onto diabetes prevention programmes in order to ensure attendance at these programmes are maximised, and strategies implemented to minimise non-attendance, so that diabetes prevention programmes are both clinically effective and financially viable. Further in-depth exploration of the reasons why participants go on to complete or not complete the NHSDPP would be beneficial. This study also highlights the important role of the GP initial communication, as well as the IA, where healthcare staff are able to communicate diabetes risk and programme content to participants *before* they enrol on the programme.

Chapter 6: “It’s a Bad Sickness”: A Qualitative Study of Completers’ and Non-Completers’ Experiences of a Diabetes Prevention Programme in England

6.1 Introduction

Prediabetes prevalence (i.e., those at high risk of Type 2 Diabetes Mellitus (T2DM)) is projected to increase from 374 million to 548 million between 2019-2040 (Saeedi et al., 2019), making T2DM prevention an international health care priority (Gray et al., 2016). In England, diagnosis of T2DM is escalating, resulting in estimated annual direct costs to the National Health Service (NHS) of approximately £8.8 billion (Hex et al., 2012). Following the successful implementation of diabetes prevention programmes (DPPs) in other countries such as Finland (Lindstrom et al., 2006), the Healthier You: NHS Diabetes Prevention Programme (NHSDPP) was implemented in England in 2016 (Valabhji et al., 2020). The NHSDPP aims to delay or prevent the onset of T2DM by offering those with prediabetes a lifestyle behaviour change programme consisting of at least 13 group sessions over a 9-month period (Valabhji et al., 2020).

It is vital that DPPs are clinically effective and financially viable (Alva, 2019a). Programme viability depends on retaining sufficient numbers of the target population; i.e., retention (Alva, 2019a). Retention relates to maintaining participant involvement, preferably until programme completion (NHS England, 2016b; Valabhji et al., 2020). Between 2016-2018, completion rates for the NHSDPP have been reported as 19-22% (Howarth et al., 2020; Valabhji et al., 2020). Challenges or issues with low retention are commonly observed in DPPs, and it has been recommended more needs to be done to optimise programme retention by exploring what influences whether participants complete DPPs (Gray et al., 2016).

Individual factors associated with non-completion include being in employment, lack of time, work commitments, family responsibilities or ill health (Gilis-Januszewska, Lindström, et al., 2018; Lim et al., 2017; Realmuto et al., 2018). Influences on completion also include positive factors such as: finding the group setting beneficial

(Bozack et al., 2014), coaches being motivating (Bozack et al., 2014), social support received from programme groups (Hawkes et al., 2020; Penn et al., 2018; Rodrigues et al., 2020), family and friends (Penn et al., 2018), and in contrast negative experiences relating to structural issues like session scheduling and venue (Hawkes et al., 2020). Completers of DPPs are more likely to be older, female, from white ethnic backgrounds or from less socioeconomically deprived areas than non-completers (Bozack et al., 2014; Gilis-Januszewska, Lindström, et al., 2018; Howarth et al., 2020; Valabhji et al., 2020). It is therefore important to explore perceptions from people with ethnically diverse backgrounds, living in more socioeconomically deprived areas who are shown to be less likely to complete the NHSDPP (Valabhji et al., 2020).

Factors that have influenced completion in other health programmes include illness perceptions (IPs). Illness perceptions are beliefs or cognitive perceptions that individuals have about their illness (Petrie et al., 2007). They comprise beliefs concerning illness: identity, causes, timeline, consequences, and cure/control (Weinman et al., 1996). Illness perceptions are vital determinants of behaviour in individuals with various medical conditions such as T2DM (Petrie et al., 2007). Research to support the influence of IPs on completion for other health prevention programmes, reported that non-completion was associated with a lower number of illness consequences, low perceptions of controllability (Whitmarsh et al., 2003; Yohannes et al., 2007) and high levels of personal control (Yohannes et al., 2007). However, whether IPs have a role in influencing completion in diabetes prevention programmes is not yet known.

This present study is based in an area of South London, England where 46% of the population identify themselves as belonging to the Black, Asian and Minority Ethnic (BAME) group (Southwark Council, 2018), known to be at a higher T2DM risk than White groups (Gholap et al., 2011). Compared to the national average, this area of South London is more socio-economically deprived (New Policy Institute, 2016), and high deprivation has also been associated with increased T2DM risk (Mainous III et al., 2014). Exploring facilitators and barriers to completion, particularly with this at-risk population, could better inform programme delivery and retention strategies. This study aimed to explore key influences on whether participants living in an ethnically diverse, socioeconomically deprived area complete the NHS Diabetes Prevention Programme.

6.2 Material and Methods

6.2.1 Sampling and Recruitment

This study was ethically approved by Staffordshire University. The researcher emailed invitation letters to those participants who had taken part in a previous study where they were interviewed by the researcher (SB) as those attending a diabetes prevention programme (Begum et al., 2022). The aim was to recruit 10-20 completers and non-completers as recommended for thematic analysis (Braun & Clarke, 2013). The researcher received monthly updates from the local provider (LP) as to when the attenders became completers or non-completers. Those who attended at least 75% of sessions (14/18) were classified as completers; this was in line with the definition used by NHS England for payment by completion (NHS England, 2016b). The researcher contacted 22 individuals in total (eight completers; 14 non-completers) and 17 responded (seven completers; 10 non-completers). Telephone interviews were then conducted with these participants after obtaining their informed consent.

6.2.2 Data Collection and Analysis

Seventeen individual semi-structured telephone interviews were conducted. Participants were interviewed, (their demographic information was obtained when they were initially interviewed as attenders, and information was clarified for accuracy). Questions in the interview schedule were based around illness perceptions and explored participants' understanding of T2DM, T2DM risk, and the NHSDPP (see Appendix 7). Open-ended questions were used, and non-directive prompts to follow up from participants` responses. A financial incentive was offered to individuals to thank them for their time.

All interviews were conducted by the researcher (SB), a female, British Asian PhD researcher in her 20`s, with a background in qualitative research. Participants were aware of the reasons for conducting this research. Field notes were made after each interview. All interviews were audio recorded, transcribed verbatim and analysed using inductive thematic analysis with an essentialist epistemological approach (Braun & Clarke, 2006). Interview transcripts were anonymised, and pseudonyms were assigned to participants for reporting. Transcripts were coded using NVivo software and relevant themes and sub-themes were formulated from the data. Interviews were spilt into two groups, completers and non-completers, and then analysed. Comparisons were made between the two groups where any differences and similarities between the two groups were explored. Braun and Clarke’s (2006) six phases of thematic analysis were followed where data familiarisation was undertaken, initial codes were developed, and potential sub-themes and themes were generated, reviewed, discussed, refined and defined, resulting in the final themes and sub-themes (Braun & Clarke, 2006). Data coding and initial theme development were undertaken by the researcher (SB) and reviewed and discussed together with the supervisor (RP). A meeting took place where final key themes and sub-themes were agreed. The two researchers took a reflexive approach where they acknowledged how their own beliefs, backgrounds and past experiences could influence the interpretation of the data, so they engaged in a reflexive way during the process of data analysis.

6.3 Results

Seven completers (mean age 55.7 years, range 42-66) and 10 non-completers (mean age 54.3 years, range 44-62) were recruited (Table 6). Across both groups, most were aged 50-59 years, from a black/black British ethnic group, in employment and from deprived areas (most deprived 40% based on national rankings). Interview duration ranged from 19.10 to 71.24 minutes (mean= 36.16 minutes).

Table 6: Sample characteristics

	Completers (*n*=7) (%)	**Non-completers** (*n*=10) (%)
Gender		
Women	4 (57.1)	7 (70.0)
Men	3 (42.9)	3 (30.0)
Age		
40-49	1 (14.3)	2 (20.0)
50-59	5 (71.4)	6 (60.0)
60-69	1 (14.3)	2 (20.0)
Ethnicity		
White British	1 (14.3)	3 (30.0)
Black/Black British	4 (57.1)	4 (40.0)
Asian/Asian British	1 (14.3)	0
Mixed	0	1 (10.0)
Other	1 (14.3)	2 (20.0)
Deprivation quintile (1-5) *		
Quintile 1 (most deprived)	0	1 (10.0)
Quintile 2	3 (42.9)	8 (80.0)
Quintile 3	0	0
Quintile 4	1 (14.3)	0
Quintile 5 (least deprived)	0	0
Unable to calculate	3 (42.9)	1 (10.0)
Employment status		
Fulltime	4 (57.1)	5 (50.0)
Part-time	0	2 (20.0)
Look after home/family	1 (14.3)	0
Unemployed/Long-term sickness	1 (14.3)	3 (30.0)
Retired	1 (14.3)	0

*The index of multiple deprivation was calculated (measure of socioeconomic status based on residential postcodes) where possible (Ministry of Housing, 2019; New Policy Institute, 2016).

Seven main themes were derived from the data (see Figure 5).

1. Motivation

This theme only applied to completers. Here they discussed their level of motivation and explained reasons behind their motivation for attending the NHSDPP. Some of the motivation for completers may have come from their fear of and perceived severity of T2DM (see theme 2. Illness threat). Many discussed how they do not want prediabetes/T2DM which influenced motivation to continue attending as they had increased concern about their diagnosis:

> "my aim is to make sure I gain something for me…hearing you are high risk…motivates me to no I don't want to have it" (Jafari, 56-year-old black British man, completer).

Some completers stated how it is up to the individual to be willing to make changes to remove T2DM risk, and this showed the importance of self-motivation:

> "it's up to me to work on it…if you don't work on it, it will be there so for it to stop it depends on you" (Precious, 54-year-old black British woman, completer).

Some motivation for completers also came from the programme itself. The programme encouraged completers to keep going, increasing their motivation to complete:

> "every time you go to a programme you got reminded that you need to do it" (Shanice, 42-year-old black British woman, completer).

2. Illness threat

This theme discusses how the threat of getting T2DM influenced whether or not participants completed the programme. Non-completers discussed diabetes in terms of a "bad disease" or "sickness" which can cause death, highlighting their understanding of the severity of T2DM. The following quote shows that Ebony viewed diabetes as an illness threat, and that by going on the programme, she stopped herself becoming a "victim" of diabetes:

> “I know it’s a bad sickness especially when you don’t take control of what you eat or you don’t do exercise…a very bad disease…it can even lead to somebody`s death…the programme was good I really benefit from it, especially the teacher taught me what to eat what not to eat … the portion I will be eating the exercise I will be doing…how to treat myself so that I will not be victim of diabetes you know so I really liked it [the programme]” (Ebony, 53-year-old black British woman, non-completer).

Others stated how T2DM is for life, it can be hereditary and not curable. Although, as Holly describes in the quote below, it is possible to control diabetes, she believes it is not possible to “get rid of it” completely. The belief regarding the inevitability of getting diagnosed with diabetes due to genetic makeup, and that it is not possible to “get rid” of it once diagnosed, may make people feel that the programme is pointless, influencing their motivation to complete:

> “once you had it you got it for life…it could be heredity cos my mum and my nan both got it… you can control it you can keep it down low…watch what you eat but I don’t think you can ever get rid of it, not if you`re insulin controlled” (Holly, 56-year-old white British woman, non-completer).

The threat of T2DM sometime led to fear, as Precious illustrates below. The fear of T2DM sometimes motivated participants to attend and complete the NHSDPP:

> “the reason why I start it was I fear it…I panic so I immediately straightaway I started I shouldn’t wait for anybody to motivate you…I didn’t miss any lesson because I want to do it and then get out of it [prediabetes]” (Precious, 54-year-old black British woman, completer).

3. Programme perceptions

Participants’ perceptions of the programme influenced whether or not they went on to complete the programme, including whether the programme met their expectations, whether they learnt knew knowledge, and their experiences of the group and the instructor.

3.1. Learning and knowledge

This sub-theme applied to both completers and non-completers. Completers discussed how they learnt a lot from the programme or learnt new knowledge relating to diet and exercise, which helped to increase understanding, encouraging them to complete:

> “I learn a lot of things … I was learning how to look after myself properly not to be diabetic…I learnt how to be very smart about food” (Shanice, 42-year-old black British woman, completer).

Interestingly, some participants also stated that they learnt a lot from the programme, including how to reduce their T2DM risk. Through this new knowledge, they improved their blood sugar levels which is encouraging.

> “At the end my HbA1[c] whatever level has gone down so I suppose it [the programme] must have had a positive effect…it has actually worked…I’m not borderline type two anymore” (Mark, 57-year-old black British man, completer).

However, paradoxically, the improvement in blood sugar levels influenced some participants’ decisions *not to attend* the rest of the programme, as they felt that it was no longer required:

> “Just to learn and find out…what can cause diabetes type two and so I learnt from that I then do this and that, and after I didn’t have it that bad… my levels gone to normal so I thought I don’t need to go back” (Yusuf, 55-year-old Arab man, non-completer).

Although some non-completers discussed how they learnt a lot from the programme, others stated how they did not, which led them to not completing as programme expectations were not met:

> “I didn’t feel that I was learning anything … I was expecting to be taught something that maybe I didn’t know or reminded of something I forgotten a long ago” (Kathryn, 62-year-old white British woman, non-completer).

Kathryn goes on to explain how unmet programme-related needs left her feeling disappointed, and this led her to not completing the full programme:

> “getting on the programme I was quite disappointed about it…at the first meeting it just felt very negative “well you can’t do this you can’t eat this”...if

> you're encouraging people to change their lifestyle you know you don't start off telling them what they can't do…it was a waste of time" (Kathryn, 62-year-old white British woman, non-completer).

3.2. Instructor manner and delivery

The instructor delivering the sessions may have influenced motivation to complete the programme. Completers had a positive view of their instructor and described them as good, informative, knowledgeable, or friendly as described by James:

> "She was very friendly…she was great always explained everything…our session leader was very good" (James, 58-year-old white British man, completer).

With non-completers, the findings were more mixed: although some non-completers expressed how their instructor was a good role model and motivating, others stated how their instructor was nervous, unprepared, or not experienced enough:

> "the first session I felt that she wasn't really well prepared…I was just unfortunate that the course leader I got wasn't experienced enough" (Kathryn, 62-year-old white British woman, non-completer).

3.3. Group perceptions and experience

The perceptions of the group setting made a difference to people's experience of the programme, influencing their decisions whether or not to complete. Completers discussed how there was a good group atmosphere and group members were supportive, as discussed by James below. This motivated participants to continue and complete the programme:

> "everybody in the session was really nice we were all very supportive it was a nice atmosphere… you know you're in a sort of a team…you don't want to be the one that doesn't improve but equally you know it's always inspiring to have other people doing well at the same time" (James, 58-year-old white British man, completer).

Although some non-completers expressed positive group experiences and perceptions of group members, other non-completers had negative experiences of the group environment influencing their motivation to attend, as discussed by Yusuf below:

> “he was controlling the class it was like he was the one teaching the class...people who attend can sometimes make it boring… I don’t have to attend this” (Yusuf, 55-year-old Arab man, non-completer).

This extract shows how important it is for the programme leads to manage group dynamics and expectations within health-related group interventions, such as the diabetes prevention programme.

4. Communication

This theme only applied to non-completers where they discussed poor communication with the local provider which discouraged them to complete:

> “I was told “oh you will hear from us in two three weeks”. It took over three, four months or longer…most times like I went there [to the venue] for over three, four times and I’m told “it’s happening” and nothing happened and that frustrated me…they have one number that no one answers… one time when I turned up at the place all I saw on the door was “oh sorry we we’re not having the session here today we’re having it…” they write an address I don’t know the area then it means me having to wander all over the place…I don’t need this…I need help in achieving what I wanna achieve” (Diamond, 46-year-old black British woman, non-completer).

Although some non-completers found the instructor informative, others found that the instructor did not communicate well as discussed by Kathryn, which can lead to non-completion of the programme:

> “the whole thing seemed to be just her reading out of the book, well I’m sorry I can take the book home and read it myself she didn’t add anything” (Kathryn, 62-year-old white British woman, non-completer).

5. Influence from family, friends and others

Some completers discussed how family members had T2DM, suffered from T2DM complications or had died from T2DM. This experience demonstrated their understanding of the severity of T2DM and influenced their motivation to complete:

> “I didn’t want to be diabetic because I have my sister who pass away…when I was on the programme she was diabetic…I didn’t want to be like [that]” (Shanice, 42-year-old black British woman, completer).

Some non-completers also discussed family, such as family members having T2DM or having family responsibilities that made it difficult for them to attend sessions and complete the programme. They also expressed how friends and others do not know what T2DM is, so they are giving advice or sharing knowledge with them:

> “a lot of my friends I know or people… they don’t know what is diabetes or what they have to do…even now for my friends when I see them taking a lot of sugars or cake or something I give them advice” (Mehdi, 61-year-old mixed ethnicity man, non-completer).

6. Lifestyle changes

This theme discusses how participants made healthier lifestyle changes as a result of the programme and explores the healthier lifestyle changes made as well as difficulties making lifestyle changes. Both completers and non-completers discussed making healthy lifestyle changes, for example James made changes to his eating habits and increased his exercise:

> “I’ve replaced sort of things like bread and pasta with things like pulses and lentils… I’ve lost weight I feel healthier I don’t worry about getting diabetes anymore…I exercise, go to the gym… I’ve fixed the problem” (James, 58-year-old white British man, completer).

Non-completers also discussed making healthy changes, paradoxically this may have led them to not complete, particularly if these changes made them feel better and they no longer needed the programme:

> “I do generally eat much less sugar than I did…I’ve lost weight my joints stopped hurting I’ve felt so much fitter so much younger I had so much more energy I

> just felt absolutely amazing…" (Olivia, 59-year-old white British woman, non-completer).

As well as making healthy lifestyle changes, completers and non-completers also discussed difficulties in making lifestyle changes. Completers discussed mainly challenges related to diet or weight, but discussed how the programme helped them overcome these, for example Shanice explained how she could change her eating habits:

> "in African countries we like baguette it's something we enjoy a lot and it's difficult for you to cut the baguette down definitely… but learning that I can have the brown bread or wholemeal bread is good" (Shanice, 42-year-old black British woman, completer).

Some non-completers also expressed difficulties in making exercise or dietary-related changes. Olivia below explains how incorporating exercise into her lifestyle made her exhausted:

> "it was difficult staying off all the booze and the sugar… I got up at 4am went to the gym then went to work and all day people were saying "You alright? You look terrible!" I was completely exhausted" (Olivia, 59-year-old white British woman, non-completer).

7. Practicalities

This final theme involves participants discussing the practicalities associated with attending the programme, which are associated with time and work-related issues and the venue.

7.1. Time and work-related issues

This sub-theme only applied to non-completers where many discussed they had work commitments or changes to work schedules which contributed to non-completion of the programme. For example, Olivia describes how, although she enjoyed the sessions, she could not organise time off at work to enable her to go to them:

> "going to the sessions inspired me very much to go back to the gym and so I started sort of working flexi hours and I started being bullied by a workmate for

> not being at work… then one of my team left and so I had to be at work all the time…all of this ganged up and it meant that I just couldn't not be at work and so then I stopped going to the gym and I stopped going to the diabetes sessions and everything and it was a real shame" (Olivia, 59-year-old white British woman, non-completer).

Most non-completers expressed issues with time such as timing of sessions, having a lack of time or being too busy to attend which can lead to non-completion of the programme:

> "I didn't have time to attend the [full] course… I was so busy to attend all [of] the course" (Yusuf, 55-year-old Arab man, non-completer).

7.2. Venue and practicalities

Some non-completers had issues finding the correct venue or were given late notice of venue changes, which made them feel frustrated, and lose interest in the programme, as described by Mehdi below:

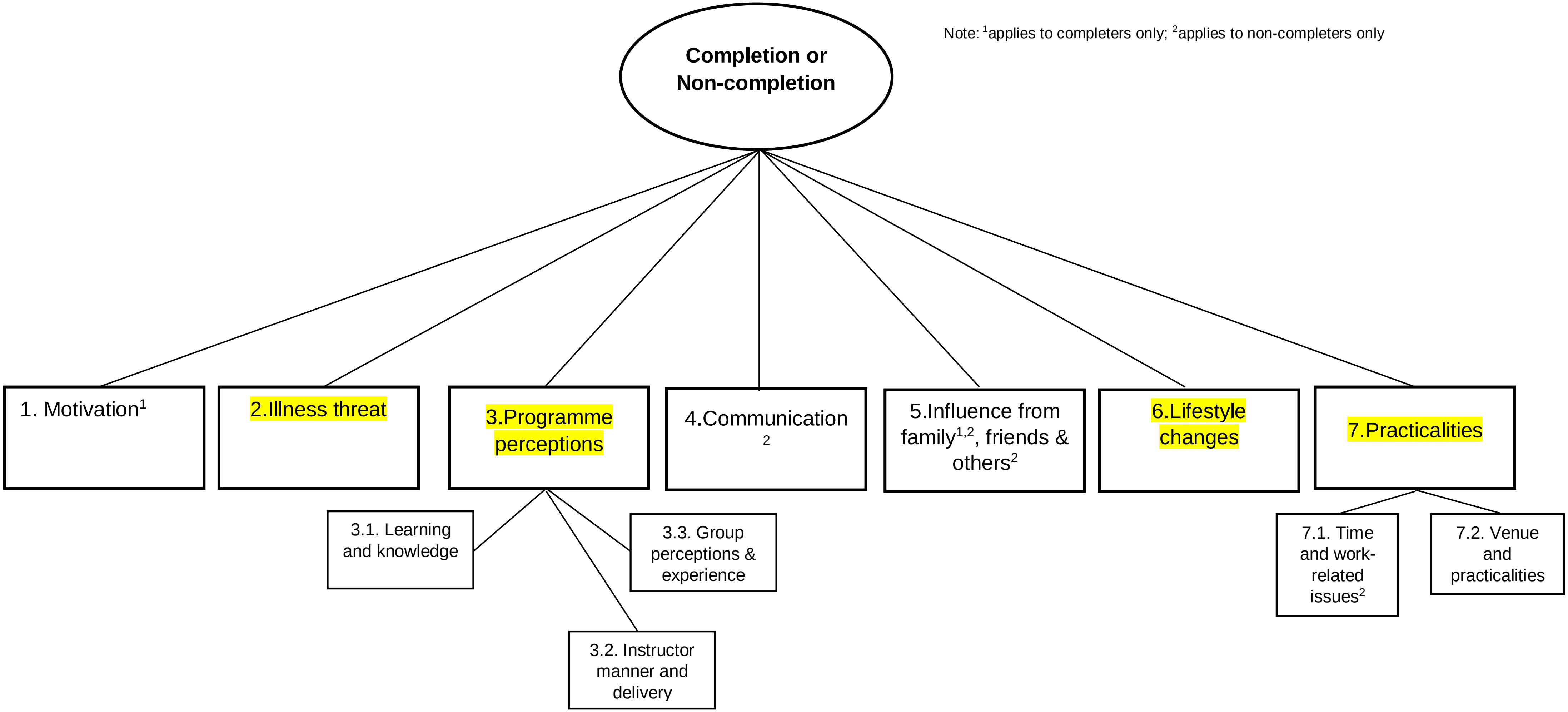
> "sometimes we just look for the classroom…we ask security or reception "where [is] the diabetes classroom?" they said "its room fifty two" you go to fifty two you don't find anyone…you look here look around I don't know where [so] you just say ok let me go home…you lost the interest then…its better if they can find one place [venue room]" (Mehdi, 61-year-old mixed ethnicity man, non-completer).

Although some completers also had issues such as finding the venue, or finding it difficult to travel to the venue, others found the venue good and convenient, encouraging them to attend and complete:

> "The venue was great it was very nice… very convenient for me" (Yasmeen, 57-year-old Asian British woman, completer).

Other practicalities issues reported included travelling abroad (for both completers and non-completers) and poor health (for non-completers) which led to missing some sessions.

Figure 5- Model overview of key influences affecting completion and non-completion


Note: [1]applies to completers only; [2]applies to non-completers only

6.4 Discussion

Exploring the influences on whether people complete the NHSDPP is vital to improving retention rates and programme viability (Alva, 2019a; Gray et al., 2016), especially among those from ethnically diverse backgrounds and/or from more deprived areas as they are at increased risk of developing T2DM (Gholap et al., 2011; Mainous III et al., 2014). The results demonstrate how having beliefs related to illness threat, perceptions of the programme, influence from family, friends, and others, making lifestyle changes, and practicalities can all influence NHSDPP completion. In addition, motivation can promote completion, and communication issues can result in non-completion.

Completers discussed their motivation behind attending the NHSDPP due to not wanting to have T2DM, and focused on themselves making the changes to reduce risk. Non-completers did not discuss motivation. It is not surprising that completers would be more motivated to attend than non-completers as motivation is considered to be an important driver for behaviour change (Michie et al., 2014). Incentives to continue to motivate participants during the programme could be good ways to keep motivation high amongst participants (Begum et al., 2020). Some of the motivation for completers may come from their fear of and perceived severity of T2DM. Some fear can be helpful as a motivator to drive change, although this needs to be carefully managed. This supports research from other preventative health programmes which has found those who considered their condition as having less severe consequences are more likely to drop-out (Whitmarsh et al., 2003; Yohannes et al., 2007).

Other influences on completion are associated with the programme itself. For example, both completers and non-completers expressed that they had learnt how to reduce their T2DM risk and felt their blood sugar levels had gone back to normal. Yet despite this improvement, some people did not complete the programme. One reason may be that non-completers may have felt confident in making lifestyle changes to reduce their risk, and therefore perceived they no longer needed the programme. This would accord with evidence that participants with higher self-efficacy levels are less likely to complete diabetes prevention programmes (Begum et al., 2021).

Also relating to the programme, some non-completers discussed how negative experiences of their instructor, other group members or unmet programme expectations and needs led them to not complete. This contrasts with completers in this study who had an overall positive programme experience with their groups and instructors. Positive social influences of group-based delivery such as having a supportive leader, are important influences of continued engagement in group-based weight management programmes (Gidlow et al., 2018). Ensuring that the group instructor is supportive, and activities are included that encourage support between group members is essential (Gidlow et al., 2018).

Communication was an important theme for non-completers as they experienced difficulties with miscommunication with the venue or session times, reflecting other findings (Hawkes et al., 2020). Taking into consideration that participants in this study were from an ethnically diverse group, and for some, English may have not been their first language, appropriate communication is even more important for this group. Programme organisers need to ensure that communication strategies are in place and on a practical level, participants are aware in advance of any changes to sessions times and or/venue.

Completers and non-completers made positive lifestyle changes which is in line with NHSDPP research (Hawkes, Cameron, Cotterill, et al., 2020). Despite making these changes, it seems like completers were still motivated to continue attending the programme whereas non-completers left due to possibly feeling they have already made the required lifestyle changes, thus no longer needing to complete the programme. Instructors could emphasise during their sessions the importance of completing the programme to ensure they are able to fully benefit from it.

Both completers and non-completers discussed influence from their family members such as family members having T2DM, which supports evidence that family members' T2DM affects completion (Gilis-Januszewska, Lindström, et al., 2018). Some non-completers also discussed family responsibilities which may influence practicalities of attending and feed into decisions regarding availability and timing of sessions. Non-completers expressed how friends and others do not know what T2DM is, so they are giving advice or sharing knowledge, which is positive if they feel empowered to share their learning and knowledge from the programme. However it may also suggest limited support and understanding from social networks which has been found to be a barrier to continued engagement with group-based weight management programmes (Gidlow et al., 2018).

There were some practicalities which influenced programme completion. For example, work-related issues were reported by non-completers. The difficulty with taking time “off” work in order to attend a health programme may be an important challenge, particularly for those living in a socioeconomically deprived area, where taking time off may be unpaid (Gilis-Januszewska, Lindström, et al., 2018; Howarth et al., 2020; Lim et al., 2017; Realmuto et al., 2018). Future research could explore work challenges in greater depth, particularly for those participants from a deprived area. Issues such as having a lack of time and venue issues were commonly discussed by non-completers, and are frequently reported reasons for non-completion in other research (Gilis-Januszewska, Lindström, et al., 2018; Hawkes, Cameron, Cotterill, et al., 2020; Lim et al., 2017). This demonstrates that although non-completers may have been initially motivated to attend, communication and practicality issues can prevent completion.

Strengths of this study relate to the sample. First, this was the first study of the NHSDPP to explore the views and experiences of non-completers as well as completers. Second, the sample consisted of individuals from ethnically diverse backgrounds living in a socioeconomically deprived area, and both of these factors (ethnicity and deprivation) are known risk factors for T2DM (Gholap et al., 2011; Mainous III et al., 2014). Limitations include the ethnically diverse sample presented some issues such as English speaking which may have affected participants’ abilities to fully express themselves in some cases. However, the researcher was sensitive to this and ensured questions were understood by the interviewee by repeating or rewording some questions and using appropriate prompts.

To conclude, this research demonstrates how different beliefs and experiences influence whether participants complete the NHSDPP. Programme organisers and instructors should consider these factors when organising and delivering sessions to maximise retention and inform strategies to minimise drop-out, in turn, improving programme viability. This study highlights the important role of the instructors and programme organisers, to ensure participants are incentivised, that the group is coherent, and that practicalities and communication issues are considered. Further in-depth exploration of the views and experiences of instructors who deliver the

NHSDPP, and their experiences of facilitators and barriers of the programme would be beneficial.

The next chapter (Chapter 7) takes a quantitative approach and aims to explore whether modifiable, psychological factors (i.e., illness perceptions, self-efficacy, and mental wellbeing) predict uptake and/or completion of the NHSDPP, independent from other possible confounders. This study expands beyond Southwark, and presents findings from questionnaires completed by participants living in six different areas of England. This chapter has been written up as a paper and is currently being prepared to be submitted to a journal (please see pages vi – viii (List of Outputs) for details).

Chapter 7: The Effects of Illness Perceptions, Self-Efficacy and Mental Wellbeing Scores on Uptake and Completion of a Diabetes Prevention Programme in England

7.1 Introduction

Type 2 Diabetes Mellitus (T2DM) prevention is a global healthcare priority (Saeedi et al., 2019). Levels of prediabetes (i.e., those at high risk of T2DM) are predicted to rise from 374 million (in 2019) to 548 million by 2045 (Saeedi et al., 2019). Obesity and physical inactivity are important risk factors for T2DM (Saeedi et al., 2019) and in England, approximately 33% of adults are considered insufficiently active (NHS Digital, 2020b) and 62% of adults are classified as overweight or obese (Nuzhat et al., 2015). By 2034, it is forecast that 1 in 3 adults will be obese and 1 in 10 will have T2DM, highlighting the need for more preventative measures (Public Health England, 2014). The successful implementation of diabetes prevention programmes (DPPs) in countries like Finland and USA (Diabetes Prevention Program Research Group, 2009; Lindstrom et al., 2006), has led England to develop the Healthier You: NHS Diabetes Prevention Programme (NHSDPP). This offers those with prediabetes a behaviour change programme to modify their lifestyle and reduce their T2DM risk (Diabetes Prevention Team, 2015; HM Government, 2019; Valabhji et al., 2020).

It is important that DPPs are clinically effective and financially viable when delivered at scale (Albright, 2012). Programme viability is dependent on reaching and retaining adequate numbers of the target population; i.e., uptake and retention (Alva, 2019a). Uptake is defined as participants attending the first or at least one session of the programme, and retention refers to sustained participant involvement, ideally until programme completion (NHS England, 2016b; Valabhji et al., 2020). The NHSDPP (2016-2018) found 63% of individuals who attended the initial assessment (IA), a short appointment they are required to attend before starting the programme, attended at least one session (i.e., ‘uptake’) (Valabhji et al., 2020). Over half of those that attended the first session (53%) completed the programme, equating to an overall 19% completion rate (Valabhji et al., 2020). By understanding the factors involved that affect participants’ decisions as to whether to start or complete a programme, uptake and retention can be further improved. When compared with uptake, completion of lifestyle behaviour change programmes has received less attention, and factors that predict uptake are not necessarily the same for completion (Murray et al., 2012).

It is important for DPPs to identify demographic factors (i.e., non-modifiable risk factors) like ethnicity that can potentially influence uptake and completion (Aujla et al., 2019; Valabhji et al., 2020). Current research has shown the importance of T2DM to Coronavirus 2019 (Covid-19) outcomes (Apicella et al., 2020), and how the Black, Asian and Minority Ethnic (BAME) groups are disproportionately affected (Apicella et al., 2020; Public Health England, 2020a). This indicates that their risk of T2DM can play a critical role, making it vital to explore demographics. In light of Covid-19, self-referral to the NHSDPP after completing an online risk assessment is now acceptable which will help increase uptake (NHS England, 2020a). Also, there are plans to double the NHSDPP (HM Government, 2019). This further highlights the need to explore factors influencing uptake and completion.

Modifiable factors, such as psychological factors (i.e., the way people think about their condition and their ability to change), could play a role in uptake and/or completion. Illness perceptions (IPs), self-efficacy (SE) and mental wellbeing (MWB) are important factors for DPPs to consider as they have been identified as influencing uptake and/or completion for other health programmes (Bernier & Avard, 1986; Broadbent et al., 2006; Cassidy et al., 2014; Cooper et al., 1999; French et al., 2006; Jancey et al., 2007; Kampshoff et al., 2016; Khalil et al., 2012; Marmarà et al., 2017; Murray et al., 2012; Petrie et al., 1996; Selzler et al., 2019; Whitmarsh et al., 2003; Yohannes et al., 2007). Illness perceptions are beliefs or organised cognitive and emotional perceptions held by individuals regarding their illness (Petrie et al., 2007). These IPs include illness: consequences, timeline, personal control, treatment control, identity, coherence, concern, emotional response and causes (Broadbent et al., 2006).

Illness perceptions have been established as determinants of behaviour and outcomes in individuals with medical conditions like T2DM (Petrie et al., 2007). Research on other health preventative and lifestyle behaviour change programmes has shown some IPs, such as illness consequences or coherence, predict higher uptake (Marmarà et al., 2017; Murray et al., 2012). Studies have shown that attenders have higher illness identity or controllability scores than non-attenders (Broadbent et al., 2006; Cooper et al., 1999; French et al., 2006; Petrie et al., 1996; Whitmarsh et al., 2003). There is less evidence to support the impact of illness perceptions on completion, although two studies of cardiac rehabilitation programmes reported that non-completion was associated with a lower number of illness consequences and lower perceptions of controllability (Whitmarsh et al., 2003; Yohannes et al., 2007) or treatment control (Yohannes et al., 2007), and higher levels of personal control (Yohannes et al., 2007). However, there is to date, a lack of research investigating if IPs predict uptake and/or completion of DPPs.

Self-efficacy is another important factor for DPPs to consider (Smith et al., 2010). General SE relates to beliefs in one's overall capacity to perform tasks (Smith et al., 2010), and higher levels of SE have been linked to increased behavioural change (Miller et al., 2016). Many DPPs have recommended and demonstrated improved levels of SE (Borek et al., 2019; Miller et al., 2016) or have found that increased SE (as a result of the programme) leads to improvements in physical activity (Block et al., 2016; Leung et al., 2019), healthy eating (Block et al., 2016; Leung et al., 2019; Miller et al., 2016) and reduction in risk of developing T2DM by promoting healthier lifestyles (Chen & Lin, 2010). However, there is limited research on whether SE predicts uptake and/or completion of DPPs. Research on cardiac rehabilitation and lifestyle behaviour change programmes have shown SE was related to attendance (Murray et al., 2012; Selzler et al., 2019), and those with lower levels of SE were more likely to become non-completers (Bernier & Avard, 1986; Grace et al., 2002; Jancey et al., 2007; Kampshoff et al., 2016). However, whether SE predicts uptake and/or completion of the NHSDPP is unknown.

Mental wellbeing (MWB) refers to positive mental health, which includes the subjective experience of happiness and life satisfaction, positive psychological functioning and developing and sustaining good personal and social relationships (Stewart-Brown & Janmohamed, 2008). Maintaining a sense of autonomy, self-acceptance, personal growth and self-esteem is also incorporated in the definition of MWB (Stewart-Brown & Janmohamed, 2008). There have been studies showing that MWB can affect uptake and attendance of lifestyle behaviour change programmes (Khalil et al., 2012; Murray et al., 2012) and cardiac rehabilitation programmes (Deskur-Śmielecka et al., 2009). Some have also indicated that MWB can positively affect completion or encourage continued attendance (Cassidy et al., 2014; Khalil et al., 2012). For DPPs, some have found that as a result of programme participation, MWB significantly improved or self-esteem increased (Castro Sweet et al., 2018; Kulzer et al., 2009; Quiñones et al., 2018), but whether MWB predicts uptake and/or completion of a diabetes prevention programme like the NHSDPP remains unclear.

To date, there is a lack of literature on the effects of psychological factors on uptake and/or completion of diabetes prevention programmes. This study aimed to explore whether illness perceptions, self-efficacy, and mental wellbeing predict uptake and/or completion of the NHS Diabetes Prevention Programme in England, independent from other possible confounders.

The research questions were:

- Do certain illness perceptions predict uptake and/or completion of diabetes prevention programmes?
- Do self-efficacy scores predict uptake and/or completion of diabetes prevention programmes?
- Do levels of mental wellbeing significantly predict uptake and/or completion of diabetes prevention programmes?

7.2 Subjects, Materials and Methods

7.2.1 The Local Provider Diabetes Prevention Programme

At the time of the study, the NHSDPP was delivered by four different providers under a framework agreement with NHS England (Diabetes Prevention Team, 2015; Valabhji et al., 2020). This study uses data from one of these providers. The programme consisted of 18 sessions delivered over nine months (Macmillan, 2016). Potential participants were referred to the programme from primary care and invited to an initial assessment (IA). The IA aimed to establish eligibility, allow participants to learn more about the intervention and take baseline measurements (Diabetes Prevention Team, 2015; Macmillan, 2016).

7.2.2 Design and Participant Selection

Data were collected by the local provider as part of their service evaluation, and ethical approval was then gained from Staffordshire University to conduct this study. Data were collected from 10,739 participants attending IAs in various areas of England (April 2016 to January 2018). Convenience sampling was used whereby those who attended the IA were asked to complete measures of IPs, SE and MWB.

7.2.3 Data Collection and Variables

At the IA, a range of data were collected for each participant:

- *Blood glucose levels*: glycated haemoglobin (HbA1c) was measured using a blood finger prick test.

- *Demographic:* Age, gender, ethnicity (UK Government, 2018), programme area and postcode were recorded. Deprivation was calculated using the index of multiple deprivation, derived from participant postcode and reported as quintiles (Ministry of Housing, 2019).

- *Illness perceptions*: The nine-item Brief Illness Perception Questionnaire (Brief IPQ) (Broadbent et al., 2006) was used to measure IPs, with the term "illness" replaced by "prediabetes" (i.e., the illness of interest) as recommended (Broadbent et al., 2006). Illness perception scores were calculated for the following items of the Brief-IPQ: consequences, timeline, personal control, treatment control, identity, coherence, concern and emotional response, as well as the total scores for each item (Broadbent et al., 2006).

- *Self-efficacy:* The eight-item New General Self-Efficacy Scale (NGS-ES) (Chen et al., 2001) was used to measure general SE, calculated as a summary score (Smith et al., 2010).

- *Mental wellbeing*: The 14-item Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS) (Stewart-Brown & Janmohamed, 2008) was used to measure MWB. The total score was calculated and categorised as low (14-42), medium (43-59) or high (60-70) in accordance with guidelines (University of Warwick, 2020). This avoided violating assumptions of linearity of the logit in logistic regression (see Appendix 5).

- *Uptake and completion*: Those who attended the first session (or at least one session) of the NHSDPP following their IA were classified as attenders (i.e., successful uptake). Those who attended at least 75% of sessions (14/18) were classified as completers, in line with the criterion definition used by NHS England for payment by completion (NHS England, 2016b). This led to dichotomous outcome variables for uptake (yes/no), and completion (yes/no).

7.2.4 Statistical analysis

Data were checked for normal distribution, errors and extreme values. Binomial logistic regression models were used to explore predictors of uptake and completion, entering variables sequentially. Demographic variables (age, gender, ethnicity, programme area and deprivation) were included in step one, IPQ items in step two, NGS-ES total scores in step three, and WEMWBS scores in step four.

Models were tested for assumptions of linearity, independence of errors and multicollinearity. Assumptions of linearity were tested for all three questionnaires (i.e., using the scores of the IPQ items, NGS-ES and WEMWBS). Following exploration of data transformations, variables were categorised as detailed in 7.2.3. The significance level used was .05%. To determine which variables to include in logistic regression, Mann-Whitney U Tests were conducted to explore differences between IPQ item scores for participants who took up the programme/completed the programme and those who did not (see Appendix 27: test for differences of IPQ item scores). As a result of these tests, only those IPQ items that were found to show significant differences for uptake (consequences, timeline, treatment control, and illness concern,) and for completion (consequences and personal control) were included in the logistical regression models respectively. Mann-Whitney U and Multi-Dimensional Chi-Square Tests were conducted to determine whether participants included in the regression versus those excluded in the regression for uptake differed in terms of key characteristics (see Appendix 28: test for differences of variables included and excluded in LR).

Multiple imputation was conducted to investigate the effect of missing data (Eekhout et al., 2017; Jakobsen et al., 2017). Data were imputed for variables with more than 10% missing (Bennett, 2001; Dong & Peng, 2013). Binomial logistical regression analyses were repeated using imputed data sets and these results were compared to the original analyses. SPSS version 27 was used for data analyses.

7.3 Results

7.3.1 Demographic and Clinical Characteristics

From the available data (before analyses), 5,387 started the NHSDPP (56.9% uptake, excluding missing data) and 791 participants completed the programme (14.7% completion). Out of the 10,739 individuals referred to the NHSDPP who attended the IA across six areas, complete outcome data were available for 3,756 participants; (5,026 participants were missing brief-IPQ data, 4,506 were missing NGS-ES data, 2,392 were missing ethnicity data and 1,272 were missing uptake data).

The only statistically significant differences between the 3,756 participants included in the logistic regression for uptake and the 6,983 excluded due to missing data were for programme area, WEMWBS and the IPQ item timeline (Appendix 27). A total of 2,344 participants were included in the logistic regression analysis for completion from a total of 3,756 (Table 7).

Table 7: Sample characteristics

			Included in LR for uptake (n=3,756)	**Included in LR for completion (n=2,344)**
			Frequency (%)	**Frequency (%)**
Participant Characteristics	Gender	Female	2,047 (54.5)	1,318 (56.2)
		Male	1,709 (45.5)	1,026 (43.8)
	Age	Mean (SD)	62.5 (12.5)	64.1 (11.7)
		<40	166 (4.4)	65 (2.8)
		40-44	166 (4.4)	74 (3.2)
		45-49	245 (6.5)	126 (5.4)
		50-54	405 (10.8)	236 (10.1)
		55-59	480 (12.8)	292 (12.5)
		60-64	473 (12.6)	289 (12.3)
		65-69	609 (16.2)	416 (17.7)
		70-74	583 (15.5)	419 (17.9)
		≥ 75	629 (16.7)	427 (18.2)
	Ethnicity	White British/White	2,378 (63.3)	1,571 (67.0)
		Black	701 (18.7)	414 (17.7)
		Asian	505 (13.4)	260 (11.1)
		Mixed	96 (2.6)	66 (2.8)
		Other	76 (2.0)	33 (1.4)
	Programme area	South London	1,627 (43.3)	992 (42.3)
		North East London	354 (9.4)	174 (7.4)
		Berkshire	569 (15.1)	331 (14.1)
		Cumbria	548 (14.6)	398 (17.0)
		Herefordshire	451 (12.0)	297 (12.7)
		West Yorkshire	207 (5.5)	152 (6.5)
	Deprivation quintile	1 (most deprived)	865 (23.0)	492 (21.0)
		2	899 (23.9)	509 (21.7)
		3	801 (21.3)	499 (21.3)
		4	579 (15.4)	397 (16.9)
		5 (least deprived)	612 (16.3)	447 (19.1)
Uptake		Yes	2,263 (60.3)	-
		No	1,493 (39.7)	-
Number of Completers		Yes	-	515 (22.0)
		No	-	1,829 (78.0)

Key: LR=binomial logistic regression

7.3.2 Predictors for Uptake

Data were checked for independence from errors. For uptake, the chi-squared goodness-of-fit statistic showed there was no overdispersion (χ^2 (8): 4.844, p = .774). There was no evidence of collinearity between the predictor variables. Assumptions of linearity between the continuous predictors (IPQ, GS-ES) and the logit of the outcome variable were met (Field, 2018). The programme area with the lowest uptake was used as the reference category (North East London: 51.2%, n=608). Overall, the model had a good fit against the null model (χ^2 (29): 223.931, p =<.001), but explained just 8% of variance (Nagelkerke R^2=.078).

Higher scores on the IPQ item related to treatment control (view treatment as being effective in controlling their prediabetes) and illness concern (more concerned about their prediabetes), were associated with significantly increased odds of starting the NHSDPP (treatment control OR=1.03; CI=1.01-1.06; illness concern OR=1.06; CI=1.04-1.09) (Table 8). Compared with individuals with high WEMWBS scores, those with medium WEMWBS scores (moderate MWB), had an 18% higher odds of starting (OR=1.18; CI=1.01-1.39). There were no associations between uptake and low WEMWBS, or self-efficacy.

Compared to participants living in North East London, the odds of starting the NHSDPP was significantly higher in those living in Cumbria (OR=1.69; CI=1.22-2.34), and West Yorkshire (OR=1.80; CI=1.20-2.69). As age increased, there was a significant increase in the odds of a person starting the NHSDPP when compared to the under-40s. Those who were ≥75 years of age had a significant 187% increased odds of starting when compared to the under-40s (OR= 2.87; CI=1.95-4.22). Compared with participants classified as White British/White, the odds of starting was 34% significantly higher in those from a Black ethnic group (OR=1.34; CI=1.07-1.68), and higher in those from a mixed ethnic group (borderline significant) (OR=1.60; CI=1.00-2.54). Compared with participants from more deprived areas (quintile 1), the odds of starting was higher in those who lived in more affluent areas (quintile 4 - OR=1.34; CI=1.05-1.73; quintile 5 - OR=1.62; CI=1.25-2.10).

Table 8: Results of the binomial logistic regression model exploring predictors of uptake of the NHSDPP

	Step 1	Step 2	Step 3	Step 4
	OR (95% CI)			
Programme area [North East London]				
Cumbria	1.56 (1.13-2.15)**	1.68 (1.21-2.33)**	1.67 (1.21-2.32)**	1.69 (1.22-2.34)**
Herefordshire	1.18 (0.84-1.65)	1.23 (0.88-1.72)	1.21 (0.86-1.70)	1.21 (0.86-1.71)
Berkshire	0.92 (0.68-1.26)	0.95 (0.70-1.30)	0.95 (0.69-1.29)	0.96 (0.70-1.31)
South London	1.15 (0.89-1.48)	1.15 (0.89-1.49)	1.14 (0.88-1.48)	1.15 (0.89-1.49)
West Yorkshire	1.61 (1.08-2.40)**	1.80 (1.20-2.69)**	1.80 (1.20-2.69)**	1.80 (1.20-2.69)**
Gender [Male]: Female	1.14 (1.00-1.31)*	1.09 (0.95-1.25)	1.09 (0.95-1.25)	1.08 (0.94-1.24)
Age [<40]				
40-44	1.19 (0.77-1.86)	1.23 (0.79-1.91)	1.23 (0.79-1.92)	1.22 (0.78-1.91)
45-49	1.55 (1.03-2.33)**	1.59 (1.05-2.39)**	1.59 (1.05-2.39)**	1.59 (1.05-2.39)**
50-54	2.03 (1.39-2.96)***	2.05 (1.40-3.01)***	2.05 (1.40-3.01)***	2.05 (1.40-3.00)***
55-59	2.09 (1.44-3.04)***	2.11 (1.45-3.07)***	2.11 (1.45-3.07)***	2.10 (1.45-3.06)***
60-64	2.00 (1.38-2.92)***	2.09 (1.43-3.06)***	2.09 (1.43-3.06)***	2.09 (1.43-3.06)***
65-69	2.75 (1.89-4.00)***	2.87 (1.97-4.20)***	2.87 (1.97-4.20)***	2.89 (1.98-4.23)***
70-74	2.85 (1.94-4.18)***	3.14 (2.13-4.63)***	3.14 (2.13-4.63)***	3.17 (2.15-4.68)***
≥75	2.52 (1.73-3.68)***	2.85 (1.94-4.19)***	2.85 (1.94-4.19)***	2.87 (1.95-4.22)***
Ethnicity [White]				
Black	1.30 (1.05-1.62)**	1.30 (1.04-1.63)**	1.31 (1.05-1.63)	1.34 (1.07-1.68)
Asian	0.95 (0.76-1.20)	0.94 (0.75-1.19)	0.94 (0.75-1.19)	0.95 (0.75-1.20)
Mixed	1.63 (1.03-2.56)**	1.59 (1.00-2.53)*	1.59 (1.00-2.52)*	1.60 (1.00-2.54)*
Other	0.71 (0.44-1.15)	0.75 (0.46-1.22)	0.75 (0.46-1.23)	0.77 (0.47-1.25)
Deprivation Quintile [1 most deprived]				
Quintile 2	0.93 (0.76-1.14)	0.92 (0.75-1.12)	0.92 (0.75-1.12)	0.91 (0.74-1.11)

Table 8: Results of the binomial logistic regression model exploring predictors of uptake of the NHSDPP				
	Step 1	Step 2	Step 3	Step 4
Quintile 3	1.10 (0.88-1.38)	1.08 (0.87-1.36)	1.09 (0.87-1.36)	1.08 (0.86-1.36)
Quintile 4	1.36 (1.07-1.74)**	1.34 (1.05-1.72)**	1.35 (1.05-1.73)**	1.34 (1.05-1.73)**
Quintile 5 (least deprived)	1.66 (1.28-2.14)***	1.62 (1.26-2.10)***	1.64 (1.26-2.12)***	1.62 (1.25-2.10)***
Brief IPQ				
Question 1: consequences	-	0.98 (0.95-1.01)	0.98 (0.95-1.01)	0.98 (0.95-1.01)
Question 2: timeline	-	1.02 (0.99-1.04)	1.02 (0.99-1.04)	1.01 (0.99-1.04)
Question 4: treatment control	-	1.03 (1.01-1.06)**	1.03 (1.01-1.06)**	1.03 (1.01-1.06)**
Question 6: illness concern	-	1.06 (1.04-1.09)***	1.06 (1.04-1.09)***	1.06 (1.04-1.09)***
NGS-ES score	-	-	1.00 (0.99-1.01)	1.00 (0.99-1.01)
WEMWBS [High score]	-	-	-	
WEMWBS: Medium score	-	-	-	1.18 (1.01-1.39)**
WEMWBS: Low score	-	-	-	1.09 (0.87-1.37)

Step 1: programme area, gender, age, ethnicity, deprivation; Step 2: brief IPQ questions 1, 2, 4,6; Step 3: NGS-ES score; Step 4: WEMWBS. * *p*=near significance (0.05-0.06); ** *p*=<0.05; *** *p*=<0.001; Nagelkerke R^2= 0.056 (step 1); 0.077 (step 2); 0.077 (step 3); 0.078 (step 4); R^2 change=0.022 (steps 1-4). Abbreviations: OR= Odds Ratio (Exp(B) value); CI= 95% confidence interval; IPQ=Brief Illness Perceptions Questionnaire; NGS-ES= New General Self-Efficacy Scale; WEMWBS= Warwick-Edinburgh Mental Wellbeing Scale; [ ]=Referent.

Multiple imputation was conducted to investigate the effect of missing data for all variables with more than 10% missing data (ethnicity, IPQ items, NGS-ES scores and uptake; Appendix 29: results from LR for uptake using imputed data). In the logistic regression using imputed data, most statistically significant predictors in the complete case analysis remained significant in the imputed analysis (no substantive changes in direction and magnitude). There were some minor changes with some of the demographic variables.

7.3.3 Predictors of Completion

Data were checked for independence from errors. For completion, the chi-squared goodness-of-fit statistic showed there was no overdispersion (χ^2 (8): 4.963, *p* = .761). There was no evidence of collinearity between the predictor variables. Assumptions of linearity between the continuous predictors (IPQ, NGS-ES) and the logit of the outcome variable were met (Field, 2018). The programme area with the lowest completion was used as the reference category (West Yorkshire: 1.1%, n=9). Overall, the model had a good fit against the null model (χ^2 (27): 194.482; *p* =<.001) but explained just 12.2% of variance (Nagelkerke R^2=.122).

Higher NGS-ES scores (higher self-efficacy) were associated with significantly decreased odds of completing the NHSDPP (OR=0.97; CI=0.96-0.99) (Table 9). Compared with individuals with high WEMWBS scores, those with low scores (low MWB), had 28% lower odds of completing (although not reaching significance) (OR=0.72; CI=0.50-1.05). There were no associations between completion and medium WEMWBS scores, or any IPQ items.

Compared with those attending programmes in West Yorkshire, those attending programmes in other areas (Cumbria, Herefordshire, Berkshire, South London, North East London) had significantly higher odds of completing the NHSDPP, but with wide confidence intervals. Participants aged 70-74 years had approximately twice the odds of completing, compared to the under-40s (OR=2.98; CI=1.30-6.84). Compared with participants classified as White British/White, the odds of completing was 36% significantly lower in those from a Asian ethnic group (OR=0.64, CI=0.43-0.98), and lower in those from a Black ethnic group (although not reaching significance) (OR=0.72; CI=0.50-1.04). Compared with participants from more deprived areas (quintile 1), the odds of completing was significantly higher in those who lived in more affluent areas (quintile 4 - OR=1.48; CI=1.02-2.15).

Table 9: Results of the binomial logistic regression model exploring predictors of completion of the NHSDPP

	Step 1	Step 2	Step 3	Step 4
	OR (95% CI)			
Programme area [West Yorkshire]				
Cumbria	11.14 (4.42-28.07)***	11.15 (4.42-28.10)***	10.67 (4.23-26.91)***	10.82 (4.29-27.32)***
Herefordshire	19.41 (7.67-49.13)***	19.49 (7.70-49.36)***	17.50 (6.90-44.41)***	17.43 (6.86-44.27)***
Berkshire	8.89 (3.48-22.68)***	8.93 (3.50-22.80)***	8.49 (3.32-21.68)***	8.48 (3.32-21.68)***
South London	10.08 (4.02-25.23)***	10.08 (4.03-25.26)***	9.12 (3.63-22.88)***	9.15 (3.64-22.96)***
North East London	28.56 (10.62-76.80)***	28.44 (10.57-76.53)***	28.29 (10.50-76.22)***	29.00 (10.75-78.21)***
Gender [Male]: Female	1.01 (0.82-1.24)	1.02 (0.83-1.25)	1.01 (0.82-1.24)	1.02 (0.83-1.26)
Age [<40]				
40-44	0.94 (0.32-2.73)	0.94 (0.33-2.74)	0.97 (0.33-2.81)	0.95 (0.33-2.78)
45-49	1.12 (0.44-2.84)	1.10 (0.43-2.81)	1.12 (0.44-2.86)	1.13 (0.44-2.90)
50-54	1.30 (0.56-3.04)	1.28 (0.55-3.01)	1.31 (0.56-3.08)	1.30 (0.55-3.06)
55-59	1.54 (0.67-3.54)	1.52 (0.66-3.50)	1.53 (0.66-3.53)	1.50 (0.65-3.47)
60-64	1.85 (0.81-4.24)	1.82 (0.79-4.18)	1.87 (0.81-4.31)	1.85 (0.80-4.26)
65-69	2.05 (0.90-4.65)*	2.00 (0.88-4.55)	2.00 (0.88-4.56)	1.90 (0.83-4.36)
70-74	3.13 (1.37-7.11)**	3.04 (1.33-6.94)**	3.13 (1.37-7.17)**	2.98 (1.30-6.84)**
≥75	2.10 (0.92-4.80)*	2.04 (0.89-4.69)*	2.05 (0.89-4.72)*	1.97 (0.85-4.53)
Ethnicity [White]				
Black	0.71 (0.50-1.03)*	0.71 (0.49-1.03)*	0.73 (0.51-1.06)*	0.72 (0.50-1.04)*
Asian	0.65 (0.43-0.98)**	0.66 (0.44-0.99)*	0.65 (0.43-0.99)**	0.64 (0.43-0.98)**
Mixed	0.77 (0.39-1.49)	0.76 (0.39-1.48)	0.71 (0.36-1.39)	0.68 (0.35-1.35)
Other	0.63 (0.24-1.71)	0.64 (0.24-1.71)	0.70 ().26-1.88)	0.72 (0.26-1.94)
Deprivation Quintile [1 most deprived]				
Quintile 2	0.91 (0.64-1.28)	0.90 (0.64-1.28)	0.89 ().63-1.27)	0.86 (0.61-1.23)

Quintile 3	1.16 (0.81-1.65)	1.14 (0.80-1.63)	1.14 (0.80-1.64)	1.12 (0.78-1.61)
Quintile 4	1.45 (1.00-2.10)*	1.45 (1.00-2.10)*	1.49 (1.03-2.17)**	1.48 (1.02-2.15)**
Quintile 5 (least deprived)	1.23 (0.84-1.79)	1.22 ().84-1.78)	1.28 (0.88-1.88)	1.26 (0.86-1.84)
Brief IPQ Question 1: consequences	-	0.99 (0.95-1.03)	0.99 (0.95-1.02)	0.99 (0.95-1.02)
Brief IPQ Question 3: personal control	-	1.03 (0.99-1.06)	1.03 (0.99-1.06)	1.03 (0.99-1.06)
NGS-ES score	-	-	0.98 (0.96-0.99)***	0.97 (0.96-0.99)***
WEMWBS [High score]	-	-	-	
WEMWBS: Medium score	-	-	-	1.10 (0.86-1.40)
WEMWBS: Low score	-	-	-	0.72 (0.50-1.05)*

Step 1: programme area, gender, age, ethnicity, deprivation; Step 2: brief IPQ questions 1, 3; Step 3: NGS-ES score; Step 4: WEMWBS. * *p*=near significance (0.05-0.09); ** *p*=<0.05; *** *p*=<0.001; Nagelkerke R^2= 0.108 (step 1); 0.109 (step 2); 0.118 (step 3); 0.122 (step 4); R^2 change=0.014 (steps 1-4). Abbreviations: OR= Odds Ratio (Exp(B) value); CI= 95% confidence interval; IPQ=Brief Illness Perceptions Questionnaire; GS-ES= New General Self-Efficacy Scale; WEMWBS= Warwick-Edinburgh Mental Wellbeing Scale; [ ]=Referent

Multiple imputation was conducted to investigate the effect of missing data for all variables included in logistic regression for completion (Appendix 30: Results from LR for completion using imputed data). Logistic regression using imputed data showed that some statistically significant predictors in the complete-case analysis remained significant in the imputed analysis (e.g., all programme areas, age (70 to 74 years) and NGS-ES scores). Regarding the modifiable psychological variables, WEMWBS (low score) was a significant predictor in the imputed analysis but not in the complete-case analysis.

7.4 Discussion

Identifying non-modifiable socio-demographic and modifiable psychological factors affecting uptake and completion of the NHSDPP can inform strategies to optimise uptake and retention. We report the first study exploring whether illness perceptions (IPs), self-efficacy (SE) and mental wellbeing (MWB) predict uptake and/or completion of the NHS Diabetes Prevention Programme (NHSDPP), independent of participant socio-demographics. Main findings are discussed, with a cautious approach taken by focusing only on associations that were significant in logistic regression for both the original and imputed datasets.

7.4.1 Uptake

Overall, illness perceptions related to treatment control and illness concern, and mental wellbeing (among the psychological factors), and age and deprivation (among the demographic factors) were found to predict uptake. Participants who saw treatment as being effective at controlling their prediabetes were more likely to start the NHSDPP. They may have considered the programme as being appropriate and helpful treatment for their prediabetes, and felt their condition was controllable, whereas those who did not start, may have favoured other treatments (e.g., medication), or may have felt their condition was less controllable. This is in line with research that found non-attenders of a cardiac rehabilitation programme were significantly less likely to feel their condition was controllable compared with attenders (Cooper et al., 1999; French et al., 2006; Petrie et al., 1996). This demonstrates the importance of ensuring that participants understand diabetes prevention programmes as appropriate and effective treatment for prediabetes, either before or during the IA, and that their prediabetes is controllable.

Those more concerned about their prediabetes were more likely to start the programme. Supportive evidence from other DPPs found that participants commonly reported concern for personal health or wanting to improve health as reasons for participating (Borek et al., 2019; Parikh et al., 2010). This indicates concern about prediabetes may be a motivator for people to attend diabetes prevention programmes. In order to improve uptake, it is key to ensure that participants understand the seriousness of prediabetes without instilling too much fear.

Those with moderate mental wellbeing were more likely to start the NHSDPP than those with high levels (i.e., those with greater positive wellbeing). Those with high MWB may not have felt the need to attend due to already feeling psychologically well and happy in making the required lifestyle changes. Perhaps for those who have moderate mental wellbeing, this was related to their concern about their prediabetes, which was also found to be a predictor of uptake. Although it is encouraging that those people who do not have high levels of mental wellbeing are accessing the programme, it would be interesting to explore this finding further, and in particular for programme organisers to highlight the importance of attending the programme and the support that will be offered regardless of whether one is already feeling psychologically well.

Older individuals were more likely to start the programme which is line with other DPP research (Gray et al., 2016; Zigmont et al., 2018) which has argued that older adults may have more time to take part through having fewer work or caring responsibilities (Gray et al., 2016; Zigmont et al., 2018). As the age of onset for T2DM is decreasing, especially among certain ethnic groups (National Institute for Health and Care Excellence (NICE), 2011), it is important for diabetes prevention programmes to focus on improving uptake in younger adults. Also, those from the most affluent areas were more likely to start compared with those from the most deprived areas, which is in line with other DPP research (Gray et al., 2016; Valabhji et al., 2020; Zigmont et al., 2018). To allow diabetes prevention programmes to contribute to narrowing, rather than widening the health gap between the most and least deprived groups, this socio-economic bias in access should be addressed to better engage with the more disadvantaged groups, who have the greatest health need and higher T2DM risk (Mainous III et al., 2014).

7.4.2 Completion

Overall, self-efficacy (among the psychological factors), and age (70-74 years) and programme area (among the demographic factors) were found to predict completion. Participants with higher SE levels (felt more confident in making lifestyle changes), were less likely to complete the NHSDPP. This finding was surprising, as it contrasts with research on other lifestyle behaviour change programmes, which reports that those with lower SE were more likely to drop out (Bernier & Avard, 1986; Grace et al., 2002; Jancey et al., 2007; Kampshoff et al., 2016). A possibility is that it could reflect people with higher SE feeling that they already had the skills to make the required lifestyle changes, so no longer needed the programme. It would be helpful to explore different techniques of encouraging people to complete whole programmes, for example, providing incentives for participating at different points in the programme (Begum et al., 2020). It would also be interesting to explore more deeply the views of completers and non-completers using qualitative data, and reasons why people leave the programme before completing.

Similar to attendance, older adults (aged 70-74 years) were more likely to complete the programme than younger adults. Again, this could be due to having fewer work or caring commitments, allowing more time to complete a 9-month programme (Aujla et al., 2019). Further qualitative exploration would be helpful to provide an insight as to the challenges to completing for those aged under 40. West Yorkshire was found to have the lowest completion rates in this study which is interesting, as data from the National Diabetes Audit that found West Yorkshire to have the highest uptake rates out of the programmes areas included in this study (NHS Digital, 2020a). This demonstrates that although uptake to the programme might be high, this does not necessarily mean high completion rates will be achieved. Those living in other programme areas were more likely to complete the NHSDPP when compared to West Yorkshire and further exploration as to why this is the case would help improve completion rates at a local level.

7.4.3 Strengths, Limitations and Future Research

This is the first study to show the extent to which psychological factors influence uptake and completion of a diabetes prevention programme. Study strengths include the large sample, the use of validated measures and the geographical spread.

Limitations are recognised. First, a substantial proportion of uptake, ethnicity, IPQ and SE data were missing. The study results may not be representative of the wider cohort, however, in order to account for this, we took a cautious approach through using multiple imputation and focusing on associations that held in analysis of both original and imputed datasets. Second, some caution should be taken with the results as in many cases, wide confidence intervals, particularly for age and programme areas (for completion only), indicate that the estimates were not very precise. Multi-level logistic regression could not be conducted as there was not a sufficient number of areas or homogeneity in delivery across the areas. Third, it is worth noting that regression models accounted for a relatively small amount of variance (8% for uptake, 12.2% for completion), meaning that there are other important predictors that were not measured.

The data used for this study were routinely collected by the local provider as part of their service evaluation and were classified as secondary data. Secondary data can be defined as sources of data that already exist which can be used for research purposes (Bowling, 2014). One limitation of using service evaluation data is that the researcher has no or limited control over data collection or quality. There were a lot of missing data, particularly questionnaire data (brief-IPQ and NGS-ES), and out of the 10,739 individuals referred to the NHSDPP who attended the IA, complete outcome data were only available for 3,756 participants. This could mean results may not be representative of the wider cohort. However, a large sample was still used for the analysis, there were no major differences between those included and excluded in the logistic regression analysis for uptake, and associations that held in analysis of both original and imputed datasets were discussed. Furthermore, a benefit of using service evaluation data is that usually these data are collected in a rigorous, systematic way as health organisations aim to assess the effectiveness of their services/programmes in achieving their predefined objectives (Bowling, 2014).

Finally, this study only used quantitative data. Although, using a quantitative approach can generate objective, replicable data, it has limits in providing a richer insight into the facilitators and barriers of attendance and completion, and in-depth information on individual motivations, beliefs and experiences (Willig, 2013). Future qualitative work could explore in depth the factors associated with illness perceptions, self-efficacy and mental wellbeing that impact the decisions of participants to start and continue with attending DPPs like the NHSDPP.

7.4.4 Conclusion

Overall, this study demonstrated the importance of modifiable psychological factors, particularly illness perceptions and mental wellbeing, in predicting uptake and self-efficacy predicting completion of a diabetes prevention programme. By programme organisers and clinicians taking these factors into consideration when recruiting participants and developing strategies to optimise uptake and retention, diabetes prevention programmes should become more effective and viable.

The next chapter and final (Chapter 8) will summarise the findings from this thesis, evaluate the thesis aims and objectives, include theoretical implications, strengths and limitations of this research, implications for future research as well as recommendations for practice and researcher reflections.

Chapter 8: Discussion

The aim of this chapter is to summarise the findings presented in Chapters 2, 5, 6 and 7, to provide an overall evaluation of the aims and objectives of the thesis as well as outlining the theoretical implications. Following on from this, the strengths and limitations of this research will be discussed, and implications for future research and recommendations for practice will be made. Finally, researcher reflections regarding the research process will be considered.

8.1 Summary of Findings

From the systematic review (Chapter 2) findings, and the studies described in Chapters 5, 6 and 7, the following are the key findings regarding uptake and retention of DPPs.

8.1.1 Uptake

A range of recruitment strategies were used making it difficult to discern associations with uptake rates (Chapter 2). However, regarding individual-level factors (Chapter 5), it was found that understanding type 2 diabetes, making lifestyle changes, comparisons with others, having support and certain self-perceptions can all affect individuals' motivations to attend a diabetes prevention programme. Accessibility and practicalities also influenced both motivation and attendance. By exploring individual-level factors further through a quantitative approach (Chapter 7), illness perceptions related to treatment control and illness concern, mental wellbeing, age and deprivation were found to be significant predictors of uptake. This meant that those individuals who saw treatment as being effective at controlling their prediabetes, were more concerned about their prediabetes, those with moderate mental wellbeing levels, who were older and/or were from more affluent areas were significantly more likely to start the NHSDPP.

8.1.2 Retention

Behaviour change techniques that were more commonly found in high retention programmes included problem-solving, demonstrating the behaviour, using behavioural practice, reducing negative emotions and providing incentives for participation (Chapter 2). Regarding individual-level factors (Chapter 6), it was found that having beliefs related to illness threat, perceptions of the programme, influence from family, friends, and others, making lifestyle changes, and practicalities can all influence NHSDPP completion. In addition, motivation can promote completion, and communication issues can result in non-completion of the programme. By exploring individual-level factors further through a quantitative approach (Chapter 7), those with higher self-efficacy levels, who were younger and/or from a specific area (West Yorkshire) were less likely to complete the NHSDPP. The following section will now evaluate the aims and objectives of this research in turn.

8.2. Evaluation of Aims and Objectives

The first aim of this research was to investigate which factors associated with recruitment and the programme itself, are associated with higher uptake and retention of DPPs in general. Associated with this was the following objective which will be discussed in further detail:

1. *To identify important recruitment and programme-level factors (e.g., recruitment strategies and common behaviour change techniques) in group-based DPPs that are associated with high response, uptake and retention in the published literature.*

This objective was explored by the systematic review (Chapter 2) which found that it was difficult to identify trends or associations between recruitment methods and response or uptake rates, due to being able to calculate the response rate for only two DPPs, and uptake rates for only 36% of included DPPs. This highlights the need for more consistent and detailed reporting of recruitment methods to better understand which recruitment strategies are most effective in promoting initial responses to address the common challenges in recruiting to DPPs (Dunbar et al., 2015), as well as highlighting the need for robust reporting (Ahmad & Crandall, 2010).

The qualitative study (Chapter 5) provided an insight into programme-level factors that could influence decisions to start a specific DPP in Southwark. It was found that programme accessibility issues influenced motivation and attendance, where location of the session and lack of time were also identified as barriers for attendance. These accessibility issues included difficulties booking onto the programmes, and could be partly explained due to the unexpectedly large number of referrals received for the NHSDPP (Barron et al., 2018; Valabhji et al., 2020). Local providers of the NHSDPP must ensure they are able to book participants onto the programme efficiently, with good communication to participants. The important role of referring healthcare professionals was also highlighted, as a higher proportion of those participants who stated that they had received GP recommendations to start the programme managed to attend. This demonstrates the crucial role of GPs who are involved in first informing individuals of their prediabetes and 'making every contact count', however brief (Penn et al., 2018).

Regarding important programme-level factors that are associated with high retention in group-based DPPs, the systematic review found that programmes with high levels of retention were more likely to provide incentives for participation, use problem-solving, demonstrate the behaviour, use behavioural practice/rehearsal and use techniques to reduce negative emotions. These behaviour change techniques (BCTs) can be considered by programme designers to ensure that these are incorporated into their programmes to optimise retention (see sections 8.3: Theoretical implications and 8.6: Recommendations for practice). Following a recent top-up search (articles published 22nd October 2019-14th June 2021), six additional papers were found (Chambers et al., 2019; Griauzde et al., 2020; Kitzman et al., 2021; Lotfaliany et al., 2020; Smith et al., 2019; Valabhji et al., 2020). These papers also reported interventions which contained BCTs such as problem-solving (Griauzde et al., 2020; Kitzman et al., 2021; Smith et al., 2019; Valabhji et al., 2020), reducing negative emotions (Kitzman et al., 2021; Smith et al., 2019), incentives for participation (Kitzman et al., 2021), demonstration of the behaviour, and behavioural practice/rehearsal (Kitzman et al., 2021; Lotfaliany et al., 2020; Smith et al., 2019) (see Appendix 31). This further strengthens the findings in Chapter 2 that these BCTs are important for retention.

The “BCT taxonomy v1” is an extensive hierarchical taxonomy consisting of 93 distinct BCTs that were agreed through consensus (Michie et al., 2013). Developers of the BCT taxonomy v1 have expected that further development and refinement of this taxonomy will take place in light of feedback from researchers and practitioners (Michie et al., 2013). The BCT “providing incentives for participation” was commonly found in programmes with high retention. However, this BCT did not fit into any of the 93 BCTs from the taxonomy as it referred to using incentives/rewards to encourage taking part, rather than rewards to encourage performing the health behaviour i.e. changing diet or increasing exercise (referred to as 10.1 Material incentive (behaviour) or 10.2 Material reward (behaviour) in the BCT taxonomy (Michie et al., 2013)). More recent studies (Alva et al., 2019; Chin et al., 2020) investigating the role of financial incentives to motivate engagement in DPPs have also found that financial incentives improve DPP completion. This suggests that providing incentives for people to participate in behaviour change programmes (not necessarily financial) is a novel Behaviour Change Technique that should be considered in order to promote retention in behaviour change programmes by motivating participants to continue attending. Feedback has also been provided to the developers of the BCT taxonomy v1 regarding this novel BCT, so it can be taken into consideration when developing and refining the taxonomy.

The systematic review also highlighted that although goal setting is an important BCT for diabetes prevention programmes, focusing on the outcome of the behaviour change may not be helpful (as those programmes with lowest retention tend to focus on the goal setting outcome such as weight, rather than the behaviour). Furthermore, programmes with lowest retention included self-monitoring of behaviour which could be time-consuming or burdensome for participants, particularly if a high level of self-monitoring was required. These findings could be explored further in research.

The qualitative study (Chapter 6) also provided an insight into programme-level factors that could influence DPP completion in a specific programme. Some non-completers reported negative experiences of their instructor or other group members (group experience), or that their programme expectations and needs were not met. This was in contrast to completers who had an overall positive programme experience with their groups and instructors. Positive social influences of group-based delivery such as having a supportive leader, was found to be one of the main drivers of continued engagement in group-based weight management programmes (Gidlow et al., 2018).

Another programme-level factor was communication. This was an important theme but only for non-completers as they experienced difficulties with miscommunication about the venue or session times, and phone calls not being answered when help was needed, reflecting other findings from research on the NHSDPP (Hawkes et al., 2020). Practicalities such as venue issues can also influence motivation to complete. If participants are finding it difficult to attend when venue issues are experienced such as venue changes with short notice, or issues with finding the correct venue/session room, this can remove opportunity to complete programmes like the NHSDPP due to physical environmental barriers, leading to non-completion. Overall, the systematic review and qualitative studies found a range of different programme-level factors which influenced uptake and retention and helped to address the first aim and objective of this research.

The second aim of this research was to focus in on a DPP in a socioeconomically deprived area, and explore what influences participants to attend and complete the programme. Associated with this were two related objectives:

2. *To explore key influences of participants' decisions to start and attend the NHSDPP in a socioeconomically deprived area.*
3. *To explore key influences on why participants complete/do not complete the NHSDPP in a socioeconomically deprived area.*

The above aim and objectives were met through conducting the qualitative studies (Chapters 5 and 6), which identified many similarities and differences in key influences of attendance and completion. These will be briefly discussed. Motivation was important for both attendance and completion, but this was presented in different ways (Chapters 5 and 6). Both attenders and non-attenders seemed motivated as they discussed different aspects related to motivation such as how committed they were to start the programme. However, for non-attenders, other factors appeared to influence their non-attendance regardless of how motivated they were (which will be discussed more later). In terms of completion, the theme of motivation only applied to completers. Here they discussed their motivation behind attending the NHSDPP which involved reasons like not wanting prediabetes/T2DM, how it was up to them to make changes to remove T2DM risk, or how the programme encouraged them to keep going. Qualitative data confirmed that completers were more motivated to complete the programme than non-completers. Research has shown motivation is important, not only for initial attendance but also continued motivation is important for completion of DPPs (Alva, 2019a).

Participants in both studies expressed their current T2DM knowledge such as T2DM is for life and it is hereditary which was a similarity (Chapters 5 and 6). It is important to note that how individuals understand their illness plays a vital role in motivation and behaviour (Dickinson et al., 2017). Those attending the IA generally showed some knowledge of T2DM, although a higher proportion of attenders than non-attenders stated difficulties with understanding their risk and with GP communication. Perhaps this lack of understanding resulted in motivating them to attend the DPP to improve their understanding. This finding also highlights that understanding risk and having good communication, particularly amongst a population where English may not be the first language, is key to improving attendance. Non-completers discussed T2DM as a "bad sickness" which can cause death, and completers stated how fear and severity of T2DM encouraged them to complete the programme. Although this suggests both completers and non-completers viewed T2DM as a severe condition, completers may have been more motivated to complete due to being fearful of T2DM. This demonstrates some fear can be helpful as a motivator to drive change, although this needs to be carefully managed (refer to section 8.3: Theoretical implications).

The idea of learning to reduce risk or being able to control T2DM risk successfully influenced attendance and completion in different ways (Chapters 5 and 6). Some non-attenders felt that they were no longer at risk or were able to control their risk independently, suggesting that they did not see the need to attend as they were able to control their prediabetes. In terms of completion, both completers *and* non-completers expressed that they had learnt how to reduce their T2DM risk and felt their blood sugar levels had gone back to normal. Although this is a positive outcome for completers, it also suggests non-completers may have felt confident in making the required lifestyle changes to reduce their risk. Therefore, non-completers may have perceived the programme to no longer be of benefit and decided not to continue.

The idea of group support was present across both studies. In Chapter 5, participants anticipated group support and felt they would get support from other people on the programme and in Chapter 6, completers discussed how group members were supportive. However, differences were present in discussions of support as participants in Chapter 5 focused on additional support from family and friends, whereas non-completers in Chapter 6 focused on negative experiences of support from their instructor and other group members (group experience), leading them to not complete. This contrasted with completers who had an overall positive experience with their groups and instructors, indicating positive support received.

Family was an important social influence across this research, influencing both attendance and completion. For example, in both studies, participants made comparisons with their family members with T2DM or discussed how they had influence from their family. Attenders in particular were motivated to do something as T2DM was in the family, and had a better understanding of T2DM due to knowing people with it such as family and friends. Non-completers were influenced by their family in different ways such as having family responsibilities which can create barriers, reducing opportunities to complete, or they expressed how friends and others did not know what T2DM is, so they were giving advice or sharing knowledge with their friends. This research demonstrates the importance of social influences such as from group members, family or friends in influencing attendance and completion.

Making lifestyle changes and experiencing difficulties whilst making these changes may mean different things in relation to attending and completing a diabetes prevention programme. All participants across this research expressed how they have made or are making lifestyle changes, as well as some of the difficulties they had experienced when making them. In particular, those who had already made lifestyle changes prior to starting the programme were more likely to attend and become attenders (Chapter 5). Perhaps previous experiences increased motivation to attend, possibly through wanting to find out more on how to make changes, achieve their long-term goals such as weight loss, and improve health (Borek et al., 2019).

Effective communication in primary prevention of T2DM is key, in order to ensure those who are hardest to reach and most at risk such as those from certain ethnic groups and/or from lower socio-economic status are able to access appropriate services (Breuing et al., 2019). Non-completers discussed communication issues in the context of delays between the initial assessment and starting the programme, miscommunication with the venue, or poor communication with the local provider. Chapter 5 also highlighted the importance of initial communication from GPs. Taking into consideration that participants in these studies were from an ethnically diverse group, and for some, English may have not been their first language, appropriate communication is even more important in influencing both attendance and completion. Perhaps different ways of communicating with these groups would be helpful such as making use of diagrams, images or videos when communicating T2DM risk, but this would need further exploration.

Finally, regardless of how motivated individuals are, important practical issues can hinder attendance and/or completion. Practicalities were found to be important in both studies, where participants discussed how they experienced venue or location issues, time constraints such as lack of time or being too busy to attend, and issues with timing of sessions. These findings are in line with previous research (Gilis-Januszewska, Lindström, et al., 2018; Lim et al., 2017; Seear et al., 2019).

Overall, this research demonstrated that motivation is important for both initial attendance and completion of the NHSDPP. This can be affected by participants' understanding of T2DM, social influences from others such as group support or family, and their previous experiences such as making lifestyle changes. Communication and practical issues can affect motivation to attend and motivation to complete, but equally can directly affect uptake and completion rates regardless of how motivated individuals are.

The third aim of this thesis was to examine the role of modifiable psychological factors in predicting uptake and completion of the NHS diabetes prevention programme in England. Associated with this was a final, fourth objective:

4. *To examine whether illness perceptions, self-efficacy, and mental wellbeing predict uptake and/or completion of the NHSDPP, independent from other possible confounders (i.e., non-modifiable factors).*

This objective was mainly answered through the quantitative study (Chapter 7), with further insights from the qualitative studies (Chapters 5 and 6). This research found that modifiable psychological factors predicted uptake and influenced decisions to attend the NHSDPP. Perceptions of illness controllability was found to influence attendance (Chapters 5 and 7). Controllability is the extent to which an individual believes that they can control their illness (Weinman et al., 1996), and this can be divided into personal and treatment control. Personal control specifically relates to how much an individual feels they have control over their illness (Broadbent et al., 2006).

Chapter 7 highlighted that participants who saw treatment as being effective at controlling their prediabetes were more likely to start the NHSDPP. This is in line with other research on attendance of cardiac rehabilitation programmes (Cooper et al., 1999; French et al., 2006; Petrie et al., 1996). Regarding personal control, it was found that some non-attenders felt that they were able to control their risk independently. This suggests that they did not see the need to attend as they felt able to control their prediabetes without external help. Furthermore, the quantitative study (Chapter 7) found those more concerned about their prediabetes were more likely to start the programme, which supports evidence from other DPPs (Borek et al., 2019; Parikh et al., 2010) (see section 8.3: Theoretical implications).

Another modifiable psychological factor that was found to predict uptake was mental wellbeing (MWB). This research demonstrated that those with moderate mental wellbeing were more likely to start than those with high or low levels (i.e., those with greater/lower positive wellbeing) (Chapter 7). This is an unexpected finding. One possible explanation could be that those with low MWB may have had low mood, felt depressed or perhaps too anxious to start, as research has shown those with depression are less likely to start lifestyle change programmes (Murray et al., 2012). It would be helpful to explore whether a different approach would be more suitable for people with low levels of MWB (i.e., if you are feeling anxious or depressed you may not want to attend a group intervention). Those with high MWB may not have felt the need to attend due to already feeling psychologically well and confident in making the required lifestyle changes. Those who had moderate mental wellbeing may have had more concern about their prediabetes which encouraged them to start, which relates to the study findings in Chapter 7 where concern about prediabetes was also a predictor of uptake.

This research found non-modifiable factors including age, deprivation and programme area predicted uptake and/or completion of the NHSDPP. Older individuals were more likely to start and complete the programme compared to the under 40s. One explanation for this could be that older adults have more time to take part through having fewer work or caring responsibilities (Aujla et al., 2019; Gray et al., 2016; Zigmont et al., 2018). The qualitative studies (Chapters 5 and 6) support this finding, as it was also found that majority of attenders were older when compared to non-attenders, and non-completers discussed having work-related issues.

Those from the most affluent areas were more likely to start compared with those from the most deprived areas (Chapter 7). Those from more deprived areas may have been less able than those living in more affluent areas to start the programme due to practicalities such as, not being able to afford to take time off work or having a lack of time. This is supported by the qualitative study (Chapter 5) in which the sample consisted of participants living in a socioeconomically deprived area. It was found some non-attenders were not able to start due to work, and location of the session was also identified as a barrier for both attenders and non-attenders. This may have resulted in access and cost of transport being an important factor for those living in socioeconomically deprived areas. Other prevention programmes like screening programmes have found lower uptake amongst those from low socioeconomic status was due to having fatalistic attitudes, previous experiences of ill-health, and distrust in the medical system (Wagner et al., 2011). Programme organisers should take these factors into consideration and ensure appropriate strategies are in place to encourage those who are less likely to start diabetes prevention programmes, such as younger adults and those living in the most deprived areas.

Finally, programme area was also found to be a significant predictor for completion (Chapter 7), and further research as to why those living in certain programme areas were more likely to complete the NHSDPP when compared to a specific area (West Yorkshire) would help improve completion rates at a local level. Although the same programme was delivered across each of the six areas, inter-area differences in delivery such that local adaptation (for example, accommodating for differences in availability of venues not being possible), are likely to influence participant engagement in ways that could not be captured through this research for some of those areas. More research on this would provide further insights into other factors which could impact completion at a local level.

Modifiable psychological factors such as self-efficacy are important for DPPs to consider as they can influence completion (Smith et al., 2010). Chapter 7 highlighted that participants with higher self-efficacy levels (i.e., felt more confident in making lifestyle changes), were less likely to complete the NHSDPP which was unexpected and not in line with previous research on other health programmes (Bernier & Avard, 1986; Grace et al., 2002; Jancey et al., 2007; Kampshoff et al., 2016). This finding could be due to the result of those participants with higher SE feeling already confident in making the necessary lifestyle changes, so no longer needing the programme. This is also reflected in the qualitative data reported in Chapter 6, where it was shown that some non-completers stated that they had already learnt how to make lifestyle changes and reduce their T2DM risk and therefore did not need the programme. Levels of SE could be measured at different points during the NHSDPP so techniques such as incentives for participation which were commonly found in higher retention studies (Chapter 2) could be used to encourage completion.

Overall, both modifiable psychological factors and non-modifiable factors were found to predict uptake and completion. Individuals who saw treatment as being effective at controlling their prediabetes, who were more concerned about their prediabetes, who had moderate mental wellbeing levels, who were older and/or were from more affluent areas, were significantly more likely to start the NHSDPP. Also, those with higher self-efficacy levels, who were younger and/or from a particular programme area (West Yorkshire) were less likely to complete the NHSDPP. The theoretical implications for this research will now be considered.

8.3. Theoretical Implications

8.3.1 Behaviour Change Techniques and the COM-B

The NHSDPP content is outlined within a published service specification which was informed by research, including a commissioned review on effective behavioural interventions in preventing T2DM, and followed recommendations made by the National Institute for Health and Care Excellence (NICE) (National Institute of Clinical Excellence, 2012; NHS England, 2016a, 2020b; Nuzhat et al., 2015). A group of experts were involved in developing the service specification for programme delivery (NHS England, 2020b) (see Chapter 4 for more information on the NHSDPP). The NHSDPP service specification requires providers to specify behaviour change theory and techniques that are utilised, and the expected mechanism of action (NHS England, 2016a). Behaviour change frameworks which could be used include the CALO-RE taxonomy, a 40-item BCT taxonomy used to help people change their physical activity and healthy eating behaviours (Michie et al., 2011), or the widely used BCT taxonomy v1, an extensive taxonomy of 93 distinct BCTs (Michie et al., 2013; NHS England, 2016).

The 93 BCTs taxonomy is part of the Capability, Opportunity, Motivation, Behaviour (COM-B) model (Michie et al., 2014). By changing one or more of these components (i.e., capability, opportunity, motivation) which are related to the actual behaviour or behaviours that support or compete with it, this can lead to behaviour change of an individual, group or population (Michie et al., 2014). Capability can be either psychological (e.g., knowledge) or physical (e.g., skills); opportunity can be either social (e.g., interpersonal influences) or physical (e.g., environmental resources); and motivation can either be automatic (e.g., desires, impulses) or reflective (e.g., beliefs) (Michie et al., 2014). This model describes how an interaction of these components can lead to behaviour change (Michie et al., 2014). COM-B is central to the Behaviour Change Wheel (BCW), a tool kit utilised for developing behaviour change interventions (Michie et al., 2014). Components of the COM-B model can be mapped onto the BCW and 93 BCTs taxonomy, which can assist in the process of identifying appropriate intervention strategies that are most likely to be effective in addressing the barriers and facilitators for each component (Michie et al., 2014).

The “BCT taxonomy v1” is an extensive taxonomy and a methodological tool used to offer a way of specifying intervention content (and does not itself make links with theory) (Michie et al., 2013). Behaviour change techniques (BCTs) are the “active ingredients” of behaviour change and can be described as observable, replicable and irreducible components (Abraham & Michie, 2008; Michie et al., 2014; Michie et al., 2013). These BCTs can be used alone or combined with other BCTs (Michie et al., 2013).

The systematic review from this research (Chapter 2) explored the BCTs which are commonly found in high retention diabetes prevention programmes. Programmes with high levels of retention were more likely to provide incentives for participation, use problem-solving, demonstrate the behaviour, use behavioural practice/rehearsal and use techniques to reduce negative emotions. Table 10 summarises how these specific BCTs map to the COM-B model.

Table 10- Summary of mapping of Behaviour Change Techniques for high retention onto COM-B

COM-B	**BCTs associated with high retention**
Physical capability	*8.1 Behavioural practice/rehearsal:* for example, participants were given the opportunity to cook healthy foods or take part in exercise during DPP sessions.
Psychological capability	*1.2 Problem solving:* for example, participants identified barriers to making lifestyle changes, for example by using activity logs, and devising strategies to overcome them. *11.2 Reduce negative emotions:* for example, stress-management was used where DPPs informed their participants of finding ways to reduce stress.
Physical opportunity	n/a
Social opportunity	*6.1 Demonstration of behaviour:* for example, participants were shown how to perform the behaviour such as healthy eating being shown through healthy cooking methods/portion sizes.
Reflective motivation	n/a
Automatic motivation	*Incentives for participation:* for example, participants were being given cash, gift vouchers or certificates for participating at various points in the programme.

Please note that the numbers assigned at the start of each BCT represent their number in the BCT Taxonomy v1 (Michie et al., 2013).

Table 10 demonstrates how these specific BCTs which were found in high retention DPPs, mainly improved physical and psychological capability, and to some extent automatic motivation and social opportunity. By participants being shown how to perform the ideal behaviour such as healthy eating through healthy cooking methods, and then given the opportunity to practice and rehearse this behaviour as part of the behaviour change strategy, for example by cooking healthy foods, this can lead to participants feeling more confident and physically capable in making the required lifestyle changes thus encouraging continued attendance (Dixon, 2008).

By using problem solving as a BCT where participants are asked to identify barriers to making lifestyle changes, for example by using activity logs, and devising strategies to overcome them, this can increase their cognitive ability and psychological capability in overcoming lifestyle challenges when faced with them. This BCT is important for improving retention as it allows participants to have an active involvement in making the desired changes, which can encourage them to continue with group-based weight management programmes (Gidlow et al., 2018).

When participants were asked to reduce their negative emotions through stress-management and finding ways to reduce stress, this can increase their psychological capability in managing their emotions whilst participating in DPPs, as they are given the correct tools to deal with any negative emotions when making lifestyle changes. This can increase motivation to change which can help encourage them to complete DPPs (DeSteno et al., 2013; Dixon, 2008). Although providing incentives for participation is a technique that did not fit with the BCT taxonomy, by offering incentives which can be non-monetary as a reward for participating at different points in the programme, this can motivate participants to continue attending and complete DPPs.

To summarise, physical and psychological capability in engaging with lifestyle behaviour change programmes can be increased by demonstrating and rehearsing the health behaviour, informing participants how to solve problems and educating them how to reduce any negative emotions when faced with lifestyle behaviour change challenges. When physical and psychological capability is increased, together with providing incentives for participating, and demonstrating the behaviour, this can increase opportunities and motivation to make the required lifestyle changes, thus increasing motivation to remain in and complete DPPs.

Although the programme specification for the NHSDPP recommends that problem solving and behavioural practice/rehearsal should be included in the programme design of each of the four NHSDPP providers, reducing negative emotions and demonstration of behaviour is not specified (Hawkes et al., 2020). However, the current research links these BCTs with high retention in DPPs, making them an important consideration for the NHSDPP (Chapter 2). Furthermore, research has found that NHSDPP providers were not training their staff in all key BCTs detailed in their programme plans, as they were only trained in 66% of specified BCTs (Hawkes, Cameron, et al., 2021). Training staff in all key BCTs will ensure those commonly found in high retention studies (Chapter 2) are implemented in practice. Other research found considerable under-delivery of BCTs designed to improve self-regulation of behaviour, such as problem solving, which was the least commonly used (French et al., 2021). This should be considered and incorporated within the NHSDPP particularly as it was found problem solving was one of the BCTs commonly found in high retention programmes (Chapter 2).

8.3.2 Illness Perceptions and the Common-Sense Model

Illness perceptions are an example of individual-level factors that can predict uptake and retention in health prevention programmes. Illness perceptions are central to the Common-Sense Model (CSM) (Leventhal, 1970; Leventhal et al., 1992, 1980). The CSM model provides a theoretical basis to allow individuals' emotional and cognitive responses to a health threat to be explored (Leventhal et al., 1980). The CSM is a health-specific model which has three main components. Firstly, individuals generate cognitive representations and emotional responses when they are faced with a health threat or illness and are trying to make sense of these threats or illnesses (Leventhal et al., 1992). Secondly, to cope with this or self-regulate, individuals will make efforts to find ways to manage these cognitions and emotions (Leventhal et al., 1992). These efforts will result in individuals participating in 'common-sense' health behaviours such as seeing a doctor, taking medication or attending a DPP that is offered to them after diagnosis. Finally, illness appraisal takes place where individuals evaluate the effectiveness of their coping strategy, which affects cognitions, emotional responses and future selection of coping strategies (Leventhal et al., 1992).

Illness perceptions (IPs) which are a key part of this model, are cognitive and emotional perceptions individuals have regarding their illness (Leventhal, 1970; Leventhal et al., 1992, 1980). When individuals are first diagnosed with an illness or experience an injury, they develop IPs to make sense of their illness (Petrie & Weinman, 2006). These IPs are vital in influencing coping strategies and specific behaviours related to the illness such as treatment adherence (Petrie & Weinman, 2006). Illness perceptions consist of five main, broad components including illness beliefs related to: identity, causes, timeline, consequences and control/cure (Petrie & Weinman, 2006; Weinman et al., 1996).

Research has found IPs to predict higher uptake and retention/completion in other health preventative programmes (Broadbent et al., 2006; Cooper et al., 1999; French et al., 2006; Marmarà et al., 2017; Murray et al., 2012; Petrie et al., 1996; Whitmarsh et al., 2003; Yohannes et al., 2007), so are important for DPPs to consider. This was the reason why IPs were explored as part of this research. The components found to be most influential in uptake and retention with this thesis were illness controllability/curability and emotional responses (particularly illness concern). These will now be discussed in turn.

Beliefs Related to Control or Cure of an Illness.

These beliefs relate to the extent to which individuals believe they can control or recover from their illness (Broadbent et al., 2006; Cooper et al., 1999; Weinman et al., 1996). These beliefs are closely related to timeline and casual beliefs (Petrie & Weinman, 2006). Control beliefs involve how the illness is susceptible to personal control and how well treatment can be used to control it (Petrie & Weinman, 2006).

This thesis found some non-attenders (i.e., those who chose not to start the NHSDPP) felt that they were no longer at risk of T2DM or were able to control their risk independently (Chapter 5). However, other findings highlighted that participants who saw treatment as being effective at controlling their prediabetes were more likely to start the NHSDPP (Chapter 7). They may have considered the programme as being helpful treatment for their prediabetes, and felt their condition was controllable. Overall, this is in line with other research on attendance to cardiac rehabilitation programmes which found attenders had stronger, more positive beliefs that their condition is controllable/curable (Cooper et al., 1999; French et al., 2006; Petrie et al., 1996). By healthcare professionals ensuring that participants understand DPPs as being appropriate and effective treatment for their prediabetes, and that their prediabetes is controllable, this will help them make sense of their illness, encouraging them to start.

Emotional Responses/Representations

The emotional response component was added to IPs later on and this included perceptions individuals held on the emotional effects of their illness (Moss-Morris et al., 2002). This also included negative reactions such as fear, anger, and distress (Broadbent et al., 2006). Emotional representations are assessed by looking at illness concern and emotions (Broadbent et al., 2006).

This thesis found individuals who were more concerned about their prediabetes were more likely to start the NHSDPP (Chapter 7). Other findings from this thesis found that some of the motivation for completers could be due to their fear of T2DM (Chapter 6). Having this concern may have motivated them to start and/or complete the NHSDPP, particularly considering T2DM can have severe, long-term complications compared to other illnesses. Supportive research from other preventative health programmes have found those who considered their condition as having less severe consequences (so may have feared it less) are more likely to drop out and become non-completers (Whitmarsh et al., 2003; Yohannes et al., 2007). Fear can act as a crucial motivator to take action and a certain level of threat and fear is essential in order to lead to consistent protective health behaviours (Leventhal et al., 1980). This research demonstrates the importance of having some fear as a motivator for completion, but this would need to be carefully managed as instilling too much fear is not always beneficial.

Overall, the components found to be most influential in uptake and retention with this thesis were illness controllability/curability and emotional responses (particularly illness concern). Since these IPs can be modifiable, it would be helpful to explore these perceptions in depth to see if improvements are made to uptake and retention levels. The strengths and limitations of the research included in this thesis will now be discussed.

8.4. Strengths and Limitations of this Research

There are many key strengths of this research. Firstly, the studies described in Chapters 2, 5, 6 and 7 were the first to explore whether recruitment and programme-level and/or individual-level factors influence uptake and retention of diabetes prevention programmes. Secondly, the sample of participants used in this research was a key strength. Recruiting both non-attenders and non-completers was a strength as it is often difficult to recruit from these groups as they are reluctant to participate (Borek et al., 2019; Gray et al., 2016; Rodrigues et al., 2020). Recruiting those from ethnically diverse backgrounds living in a socioeconomically deprived area was another strength as both of these factors (ethnicity and deprivation) are known risk factors for T2DM (Gholap et al., 2011; Mainous III et al., 2014). Third, this research includes large sample sizes; a large qualitative sample in Chapter 5 and a large quantitative dataset to explore the role of IPs (Chapter 7). The study sample in Chapter 7 also included a good geographical spread where participants were from different areas of England. Fourth, the researcher piloted and refined the interview schedule for the qualitative interviews (Chapter 5). Fifth, questionnaires used to measure illness perceptions, self-efficacy and mental wellbeing were all validated (Chapter 7).

However, there are some key limitations of this research which should be considered. First, missing data or lack of reported data is a limitation of this research which could affect the results obtained. For example, lack of reported information in the published literature prevented response and uptake rates from being calculated and possible BCTs from being coded (Chapter 2). Also, missing uptake data from the local provider as well as missing questionnaire data was a limitation (Chapter 7). These limitations were acknowledged in the respective chapters, and possible explanations for these given alongside steps that were taken to reduce some of the impact of these limitations.

Second, the sample used to conduct qualitative interviews (Chapters 5 and 6) was strong in terms of ethnic diversity, but this presented some issues such as difficulty with English speaking. This may have affected participants' abilities to fully express themselves in some cases. However, the researcher was sensitive to this and ensured questions were understood by the interviewee by repeating or rewording some questions and using appropriate prompts. In relation to language and literacy issues, some participants were unable to take part due to their lack of spoken English. Despite multiple attempts to explain information in different ways, the researcher was not sure if they understood the research or the study information that was being conveyed. Taking into consideration that Southwark (the area from which participants were recruited) is an ethnically diverse area where over 120 languages are spoken, and approximately 11% of households do not have any individuals with English as their first language (Southwark Council, 2018) (see Chapter 4), individuals with poor English and literacy may find it difficult to access and fully benefit from the NHSDPP or other health prevention programmes, or participate in important research to improve uptake and retention. Furthermore, as these people were unable to take part due to the language barrier, their views about the programme may not be represented within the results presented in this thesis. In the future, if resources were available, it would be useful to have an interpreter, and consider alternative ways of reaching these participants, in order to gain access to the views from this part of the non-English speaking population, to hear their views, and to represent their beliefs.

Third, when recruiting for the qualitative studies, some participants were lost to follow-up due to not being identified on the local provider database (Chapter 5) or being unavailable/not responding for a follow-up call (Chapters 5 and 6). This resulted in the sample not being as large as initially planned/hoped but it was large enough for conducting thematic analysis for a PhD thesis.

8.5. Future Research

This section considers areas for future research that have emerged from the work in this thesis. Firstly, interventions could be tested to explore their effectiveness in improving uptake or retention. For example, a randomised controlled trial could be conducted where participants in the intervention group receive an initial assessment (IA) involving discussion of expectations and illness perceptions (compared with usual care). Also, the effectiveness of different methods of recruitment could be compared. Due to being unable to explore recruitment methods with response and uptake rates as they were poorly reported, or these rates were not possible to calculate for most of the DPPs (Chapter 2), a study exploring the reach and effectiveness of primary care recruitment strategies would be beneficial.

Randomised controlled trials could also be designed to explore the different factors and influences that can affect retention. For example, different methods of incentivisation could be compared within different arms of the trial. This can include monetary and non-monetary incentives such as cash, gift vouchers or certificates.

Also, those BCTs found in high retention programmes such as demonstrating and rehearsing the ideal behaviour, problem solving or reducing negative emotions could be compared with usual practice. At the end of the programme, completion rates can be assessed to see whether they have improved.

Secondly, the thesis focused on the participant perspective only regarding the factors or influences which affected uptake and retention. Future research would benefit from exploring the experiences of the staff involved to explore their experiences of programme delivery, participant recruitment, uptake and retention, and focusing on some of the key processes that could be improved. This could be done qualitatively, by interviewing IA instructors and session instructors, and staff responsible for logistics and administration such as booking participants onto sessions, organising delivery of programme material, and booking venues. This qualitative exploration of staff would provide a detailed picture from the perspectives of programme staff operating at different levels, whether they are in line with participant views or not, and will enable triangulation of these research findings. Thirdly, more qualitative research would be valuable to explore the issues associated with non-attendance within specific demographic groups, such as those in younger age groups, those with low (or high) levels of mental wellbeing and those living in West Yorkshire.

8.6. Recommendations for Practice

In light of these research findings the following recommendations are made for practice in order to improve uptake and retention in diabetes prevention programmes.

8.6.1 Improving Uptake

Researchers and programme organisers should ensure there is more consistent and detailed reporting of recruitment methods, as well as more robust reporting of response and uptake rates. This would enable improved evaluation of DPPs where, for example, it can be identified which recruitment strategies are associated with higher response and uptake rates, so strategies can be developed and implemented to improve these rates.

Specific strategies need to be developed to focus on improving uptake in younger adults and those from more deprived areas as they were less likely to start. The following recommendations are for healthcare professionals/clinicians, programme organisers and staff involved in referring or delivering DPPs:

- Healthcare professionals including GPs and/or programme staff (before/during the IA) should ensure that participants understand diabetes prevention programmes as appropriate and effective treatment for prediabetes, and that their prediabetes is controllable.

- Specific-tailored information should be provided to ensure effective communication and that participants have a correct, full understanding about their diagnosis and risk, before making an informed decision regarding attendance. It is key to ensure that participants understand the seriousness of prediabetes without instilling too much fear. The importance of attending DPPs and the support that will be offered regardless of whether one is already feeling psychologically well should be emphasized.

- At the IA, it would be helpful to ask questions regarding family commitments and responsibilities so that these can be considered when allocating suitable session times and venues, as well as signposting to appropriate support if necessary.

- To prevent the service being overwhelmed, local providers must ensure that they are able to book participants onto the programme efficiently, with good communication to participants.

8.6.2 Improving Retention

Researchers and programme organisers need to develop specific strategies that focus on retaining more younger adults ideally until programme completion, and increasing retention rates, particularly in areas with lower completion rates. The following recommendations are for programme organisers and/or instructors involved in delivering DPPs to help improve retention:

- The accessibility of sessions for different populations needs to be regularly reviewed, ensuring appropriate venues are booked, participants are aware in advance of any changes to session times and or/venue, and flexibility in session times is considered particularly for those with work commitments or family responsibilities. By ensuring communication and practicality issues are resolved, with strategies in place to resolve such issues swiftly, it should be possible to improve completion rates.

- Effective communication strategies need to be put in place particularly for those whose first language may not be English. Although the use of translators could be beneficial, this needs to be carefully considered as it may be difficult to accommodate for all languages. Other strategies such as the use of online and/or written resources in other languages might be more feasible, particularly for large scale, national programmes. This will improve accessibility and benefit all population groups including those whose first language is not English.

- Programme instructors should be supportive, aware of group dynamics, and include activities in their sessions that encourage support between group members.

- During sessions, some fear of T2DM can be helpful as a motivator to drive change and encourage completion, although this needs to be carefully managed. It is important to educate people, and for them to understand the consequences of T2DM, but also that there are things they can do to manage their diabetes. The programme will help them do this.

- Instructors should ensure they provide encouragement to participants throughout their sessions, so they feel confident in their abilities to continue in their efforts to make positive lifestyle changes particularly when challenges are experienced.

- Focus more on encouraging participants to set goals related to improving dietary and/or exercise behaviour, rather than too much focus on goal setting outcomes such as weight.

- Ensure that moderate levels of self-monitoring of behaviour is incorporated into programmes and participants are regularly asked how they are finding monitoring their behaviour, so appropriate support can be offered.

- Providing incentives for people to participate in behaviour change programmes should be considered to promote retention in DPPs by motivating participants to continue attending. However, providing monetary incentives to participants may not be feasible or sustainable, so non-monetary rewards, such as certificates would be worth considering.

- Include activities such as activity logs where participants are asked to identify barriers to making lifestyle changes and are encouraged to devise strategies to overcome them. This should be done at various stages of the programme especially in cases where DPPs are delivered over longer periods of time.

- Provide a demonstration on how to perform specific behaviours such as certain exercises during physical activity sessions or demonstrate portion sizes and healthy cooking methods. This could be implemented by the programme instructor or shown through video clips which would help to save time, cost and resources.

- Give an opportunity to participants to rehearse the ideal behaviour by participating in physical activity and/or preparing or planning healthy meals within the sessions. This could be done in a variety of different ways such as rehearsing low intensity exercises within sessions or incorporating practical cooking sessions within the programme. These could be delivered by the instructors themselves or by liaising with external organisations within communities that are already offering physical activity and/or cooking sessions such as gyms or social enterprises/community initiatives or charities. This will also help to improve self-efficacy through these skill-building activities, promoting retention, as well as supporting local third sector organisations and initiatives.

- Include psychological support within programmes, such as using techniques to reduce negative emotions. For example, include activities around stress-management where participants are encouraged to find ways to reduce stress. Also, techniques to deal with times when participants have not managed to follow the guidelines and feel as though they have let themselves down. This should be done at various stages of the programme especially in cases where DPPs are delivered over longer periods of time. Including a psychologist as part of the programme delivery team would be helpful. This will also contribute to improving mental wellbeing of participants and encourage them to continue attending.

8.7 Impact of Research

As well as practical recommendations, there is already a broader impact of this research beyond the NHSDPP. For example, a scoping review of existing evidence on the NHSDPP used the qualitative study exploring influences of decisions to attend (Chapter 5) in their analysis (Whelan & Bell, 2022). Also, a paper written to develop the BCT taxonomy v1 into a more elaborate knowledge structure (Corker et al., 2022), included the findings from the systematic review paper (Chapter 2), and in particular the finding of the “providing incentives for participation” behaviour change technique. Finally, a diabetes educator from Canada requested if she could present the systematic review paper (Chapter 2) to other diabetes educators and found it very useful. There is also potential for further broader impact of this research as other DPPs around the world and other health preventative programmes (particularly those which use group work), can take into consideration the findings and recommendations highlighted in this research when developing their programmes.

8.8. Researcher Reflections

By being a reflective researcher, one is able to evaluate and identify how one’s beliefs, interests and experiences can influence the research journey. The following briefly describes each stage of the PhD journey with some important reflections and is written in the first person.

8.8.1 Research Planning Stage

Although the area of diabetes prevention was already selected before I started my PhD, there were opportunities to share my ideas and design the research alongside the supervisory team and the clinical lead for the local provider. Despite some initial delays with finding a local provider to work with (which was outside of our control), being involved in conducting a review as part of a report that was published by Public Health England (Gidlow et al., 2018), further improved my confidence, knowledge and understanding of writing systematic reviews which was useful when it came to conducting one in relation to this research.

8.8.2 Data Collection

Working collaboratively with the local provider (LP) to ensure appropriate procedures were in place for me to attend IA dates to recruit for participants did take some time, but this was an important step for me to build good relationships with staff, and share my research aims. During data collection and whilst recruiting for participants (Chapter 5), I spoke to many individuals, sharing my research, having good conversations but also experiencing some challenges. Some individuals spoke poor English and it was not possible for me to interview them as I was not sure if they understood the research or what I was conveying, despite multiple attempts to explain information in different ways. Although some did have translators or family members/friends with them, it made me think how these group of individuals would find it difficult when attending and understanding DPP sessions, so it is important for programme organisers to consider language barriers and communication issues when delivering sessions. The more baseline interviews I conducted (Chapter 5), the more confident I became, and it was a good experience building these relationships with participants, particularly when they shared how excited they were to start and eager in improving their lifestyles.

The follow-up calls (Chapters 5 and 6) were difficult at times as it was hard to arrange suitable interview times with participants, and others I could not get in touch with when using the details they had provided. Issues were also experienced with the LP when I tried requesting for regular updates regarding participant status (attender or non-attender, completer or non-completer); for example, some interviewed participants were not recognised on their database. However, overcoming these barriers, remaining patient and keeping regular contact with the provider as well as being persistent when trying to contact participants, helped me to collect sufficient data.

Once a suitable date and time was organised with participants, it was interesting to conduct the follow-ups. When interviewing completers and non-completers, as I was already familiar with participants and had built a good rapport, they recognised and remembered me too and were happy to help and share their views. It was great to hear about how participants had positive experiences with the NHSDPP and how their lifestyles had changed. However, it was difficult at times to listen to some individuals who had experienced issues with accessing the programme, or had issues when they had attended, but I felt I was understanding and had empathy and was able to make them feel comfortable in sharing their honest views and opinions. I was able to signpost them and encourage them to contact the LP to share any issues or concerns they had. Due to me being from a BAME background, this may have helped with data collection as some researchers have suggested that by ensuring face-to-face recruitment of individuals from BAME backgrounds is conducted by a researcher from a similar ethnic background, this may increase the likelihood of recruiting participants from such backgrounds when conducting interviews (Rockliffe et al., 2018).

Although data for the study in Chapter 7 were already collected by the LP as part of their service evaluation, it was a long process in obtaining the data due to LP processes (i.e., having their systems updated meant there were delays inputting the data on a spreadsheet so it was accessible to us, then we had to obtain permission from the LP and ethics from the university before obtaining the data). The LP was already going through huge stress, organisational difficulties, and changes to staff at the time of data collection. However, this was something not explored in this thesis but as recommended for future research, exploring the perspectives of staff would be beneficial.

8.8.3 Data Analyses

I had conducted some thematic analysis (TA) during my MSc studies but after attending some lectures and doing some reading, I further developed my understanding. Being a British Pakistani female health psychology researcher with experiences of working with patients with long term conditions like T2DM, as well as having a family member who was informed of being at high risk of T2DM, I took some time to be reflective when conducting interviews and analysing data. A reflexive diary was helpful to keep when conducting these interviews, and by being aware of my background and experiences, this helped me when analysing the data to ensure I engaged in this process in a reflexive way. Once I had conducted TA for study 1, I felt much more confident about the process of analysis when analysing the data for study

2. It was a very engaging, interesting and reflexive process in order to make sense of the data and obtain patterns. Conducting the analysis for Chapter 7 was daunting at first due to the huge dataset, but after familiarising myself with the data and working closely with my supervisors to determine the best approach for analysing the data, I found it an interesting process. Learning new skills and knowledge such as conducting multiple imputation was enlightening.

8.8.4 Write up of Results/Publication

At first, I found it difficult to write my results up in a concise way as I have a tendency to include a lot of information. However, after experiencing writing for publication alongside my supervisors and having the first paper published, I have grown as a much better academic in writing concisely within the strict word limits and journal guidelines. My first publication boosted my confidence that someone like me could reach this level. Working with my supervisors and the research team during my PhD journey has been a great experience and I look forward in progressing in my career as a researcher. Overall, there had been many challenges along the way but staying positive has really helped me to push through including encouragement and support from my supervisors, colleagues and family.

8.9. Conclusions

Overall, the research reported in this thesis has highlighted a number of factors that can influence uptake and retention of diabetes prevention programmes. The findings have demonstrated the importance of modifiable psychological factors, particularly illness perceptions and mental wellbeing, in predicting uptake and have identified a range of different influences on decisions to attend a diabetes prevention programme. These influences include how understanding type 2 diabetes, making lifestyle changes, comparing oneself with others, having support and self-perceptions can all affect individuals' motivation to attend a DPP. The findings have also demonstrated the importance of modifiable psychological factors, particularly self-efficacy, in predicting completion and have identified a range of different influences on completion such as beliefs, social influences and practicalities. Factors associated with the programmes themselves including incentives for participation, problem-solving, reducing negative emotions, behaviour demonstration and practice have found to be influential in completion of diabetes prevention programmes.

By clinicians, healthcare professionals, programme organisers and staff focusing their efforts on identifying effective recruitment strategies and incorporating ideal behaviour change techniques into their programmes, uptake and retention levels should improve. Understanding in greater depth the various influences on attendance and completion when organising and delivering sessions will contribute towards maximising response, uptake and retention rates, thus improving programme viability.

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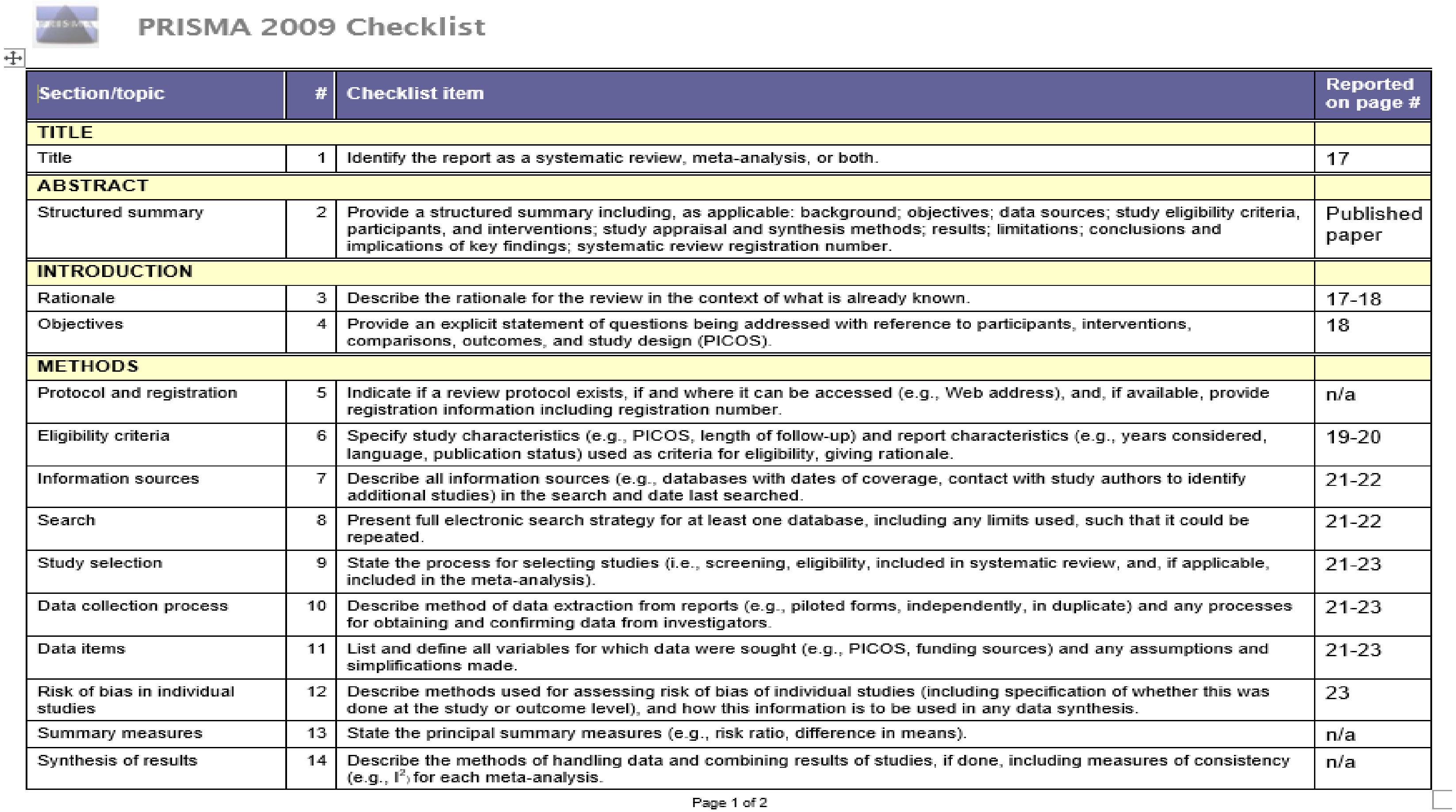
Appendices

Appendix 1: PRISMA checklist (Chapter 2)



PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	17
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Published paper
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	17-18
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	18
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	n/a
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	19-20
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	21-22
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	21-22
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	21-23
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	21-23
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	21-23
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	23
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	n/a
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	n/a

Page 1 of 2

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	23
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	23
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	24
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	24-29; Appendix 2.
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	25
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	29-41
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	n/a
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	25
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	n/a
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	42-45
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	45-46
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	46
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	n/a

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit: www.prisma-statement.org.

Appendix 2: Data extraction table (Chapter 2)

Author/s	Country	Study Design/ Setting	Intervention & Group component (size, frequency, content)	Length of follow up	Recruitment method	Sample (age, gender, ethnicity)	Response rate (RR)	Uptake rate	Retention and/or Dropout rate (DO)
Aekplakorn et al. (2019)	Thailand	Matched-pair cluster randomized controlled trial Primary care units	Size & frequency: 3-day workshop followed by a half-day workshop once a month for 6 months. For following 18 months, P`s engaged in group activities every 2 months for a total of 6 sessions and every 3 months for the last 2 sessions. Content: topics covered included: smart food choices, spiritual and mindfulness, exercise and physical activity, weight management, and emotional management, D+E	Baseline; post-intervention	Recruitment strategies included meeting with community leaders and village health volunteers to inform and recruit members. Announcements/presentations	Age: mean age 50.9 (6.3) years Ethnicity: n/a Gender: majority female 809 (78.5%)	n/a	n/a	1903 individuals participated in the study (873 were in the control group and 1,030 in the intervention group). At end of intervention, 111 P`s in the intervention dropped out Retention=89.22% DO=10.78%
Almeida et al. (2010)	USA-Colorado	Matched cohort longitudinal study The Kaiser Permanente Colorado (KPCO)-integrated health care organization	Size: approx. 10-20 P`s Time: 90-minute session Frequency: 4-6 classes offered monthly from 04-05. Content: targeted personal action planning for healthful eating, physical activity, and weight management. Twelve months intervention. D+E	Baseline; post-intervention	Classes advertised through KPCOs magazine with all health promotion offerings, KPCOs website, doctor referrals and medical records	Age: Overall mean age is 63 Gender: 53% Female Ethnicity: not stated	n/a	1030 attended diabetes class 12,468 were eligible for the program Uptake= 8.26%	n/a
Alva (2019) (Alva et al, 2017)	USA	Community-based-17 participating YMCAs across the nation	Time & frequency: 24 1-hour sessions over 12 months (16 weekly core sessions, then 8 monthly maintenance sessions). Content: core sessions were about healthful eating, physical activity, and motivation, P`s received continued support and focus on maintaining lifestyle changes during maintenance sessions D+E	Baseline; post-intervention	Centers for Medicare and Medicaid Services funded YMCA to provide a DPP to Medicare beneficiaries Referrals/medical records	Age: mean age 69 (SD 4) years, Gender: predominantly female (79%) Ethnicity: majority white (82%).	n/a	n/a	3317 P`s started & 1764 completed (16 or more sessions) Retention=53.18% DO= 46.82%
Bernstein et al. (2014)	USA-Cleveland	Pilot parallel randomized controlled trial. Family health centre	Time & Frequency: 6-week program, P`s met for 1.5 hours each week. Content: Every other week, P`s had either nutrition education and cooking, or exercise and behavioural therapy D+E	Baseline; post-intervention	N/A	At baseline (27 P`s): Age: mean= 56 (10.4) years Gender: all female Ethnicity: 100% African-American	n/a	n/a	27 P`s participated (14 P`s randomly assigned to intervention; 13 P`s to control) At follow up, 26 P`s (12 usual care; 14 LS) Retention= 100%
Boltri et al. (2011)	USA-Georgia	Pilot study African American Baptist churches	Two group-based 6-session and a 16-session program (4 months). Two sessions from each of the 3 core areas of the curriculum were chosen: nutrition, physical activity, and behaviour change Size: Aimed to have group size of 8-15 P`s. Frequency & time: Intervention sessions occurred on a weekly basis for 1.5 hours except for the first and last sessions, which were for 13 hours. Group leader facilitated a discussion for 60-90 minutes. D+E	Baseline, post-intervention, 6 months, 12 months	2 weeks prior to implementing the Diabetes Risk Assessment (DRA), weekly announcements were placed in the Sunday bulletin detailing the dates of the DRA. Those with a score of at least 10 were invited to obtain a fasting glucose at the church.	Age: 57.2 years ± 9.0 Gender: 11 (30%) male and 26 (70%) female Ethnicity: African-American	n/a	74 P`s had elevated glucose (prediabetes range) 37 P`s took part in the 6-session and 16-session church based DPP Uptake=50.00%	n/a
Chen et al. (2017)	Taiwan	Randomized control trial Health examination center of a hospital	ABC Empowerment education intervention Intervention included: 8 2-hour sessions delivered biweekly over 4 months in groups of 7-8 P`s. Topics covered: nutrition, PA, health responsibility, self-actualization, interpersonal relations and stress management D+E	Baseline; 1 week and 3 months	P`s recruited by convenience sampling from health examination center of a hospital and researcher reviewed medical records of those consented to participate so recruitment method is unclear.	Those with prediabetes (experimental group): Mean age: 51.47 (8.46) years Gender: 24 (63.2%) female; 14 (36.8%) male Ethnicity: N/A	n/a	n/a	40 P`s started the intervention 38 P`s completed study at 3 months follow up Retention=95%
Coppell et al. (2017)	New Zealand	Pragmatic non-randomized pilot study	A 6-month community-based group education program. Six weekly sessions of 1-1.5 hours each	Baseline; post intervention	Identified eligible P`s from practice patient management systems (medical records) and	For 85 intervention P`s at baseline:	n/a	n/a	157 eligible P`s enrolled (85 intervention and 72 control)

Author/s	Country	Study Design/ Setting	Intervention & Group component (size, frequency, content)	Length of follow up	Recruitment method	Sample (age, gender, ethnicity)	Response rate (RR)	Uptake rate	Retention and/or Dropout rate (DO)
		Primary care-general practices and community settings	D+E		then were sent an invitation letter and follow up phone call	Age: 49% were 50-64 years; 35% ≥ 65 years Gender: 46 (54%) female; 39 (46%) male Ethnicity: 27 (32%) Maori; 52 (61%) NZ European & other; 6 (7%) Pacific			End of 6 months, 67 P`s in intervention Retention=78.82%
Davies et al. (2016) (Gray et al, 2012)	UK-Leicestershire	Cluster randomised control trial Primary care practices	Let's Prevent (tailored DESMOND) group structured education programme with an annual refresher course, and regular phone contact. Size, time & frequency: Delivered to groups of ten over 6 hours, either over a full day or two half-days, by two trained educators D+E	Baseline; 6 months, 12 months, 24 months and 36 months	Mailing of invitations	Mean age: 63.9 years (7.8) Gender: 560 (64%) male Ethnicity: 84% White European; 16% south Asian	n/a	n/a	880 P`s recruited (433 standard care, 447 intervention) Retention=76% DO= 23.94%
Davis-Smith (2007)	USA-Georgia	Pilot project African American church	Six-session program was designed from the 16-session intensive lifestyle arm of the DPP. Themes of these sessions included: nutrition, physical activity and behaviour change. Size, frequency: 1 group consisted of 10 P`s, 6 group sessions over 7 weeks D+E	Baseline, post-intervention, 6 months, 12 months	Announcement made in the church bulletin & pastor made an announcement. During service, member of research team explained the project. Letters were mailed to remind P`s of study (those eligible to take part)	Age: 18 years and over Gender: 7 (70%) women; 3 (30%) men Ethnicity: can assume African American	n/a	29 received FBG test 11 in the prediabetes range 10 agreed to participate in program Uptake=90.00%	Data collected on 9 P`s at both follow-ups DO=10% Retention= 90%
Duijzer et al. (2017) (Duijzer et al, 2014)	Netherlands	Randomized control study Dutch public health and primary healthcare, GP Practices and sports clubs	SLIMMER combined lifestyle 10-month intervention. Dietary intervention: 5-8 individual sessions and 1 group session. PA intervention: weekly group based combined aerobic and resistance training sessions (average 38 sports lessons per P). Three months maintenance phase: sports clinics, meetings and return session with PA group D+E	Baseline; post intervention; 6 months	Identified from patient registration database-electronic medical records	Adults aged 40-70 years without diabetes mellitus For 139 intervention P`s: Mean age: 61.1 (6.1) years Gender: 54% male, 46% female Ethnicity: 88% Dutch, 9% western non-Dutch, 3% non-western non-Dutch	1009 P`s initially identified from patient registration database, 590 fulfilled criteria and invited to participate 316 P`s randomised after baseline measurement RR= 53.56%	155 P`s started the intervention group at baseline (but in the baseline table n=139-actually started) Uptake= 89.68%	In the table, 118 P`s from baseline-18 months Retention=84.89%
Fianu et al. (2016) (Favier et al, 2005)	Reunion Island (French territory) south west Indian ocean)	Follow up study of REDIA-prev1 cohort study- quasi-experimental design	Time & frequency: Group walks around the neighbourhood (2 hours long on average, 3 times a week, 68 sessions in total) and hikes (9 of them, 4-6 hours long, occurring roughly once a month), over 1 year. Support groups that allow P`s to express their questions on nutrition, physical activity, the body and health (6 in total). D+E	Baseline, 7 years	Informed of workshops during screening, with reminders sent by mail or telephone	Men and women, aged 18–40, Median age: 33 years Gender: 74% women, 26% men Ethnicity: NS	n/a	212 in the intervention group and 227 in the control group. In the intervention group, 12 secondary exclusions = 200 P`s. Also, 14 refusals (did not start the intervention). Uptake=93.00%	At the end of the intervention, 175 in the intervention group and 176 in the control group. The 37 subjects not seen in the intervention group were divided into 14 refusals, 11 lost to follow-up and 12 secondary exclusions Retention= 94.09%
Gagnon et al. (2011)	Canada	Weight management programmes, P`s randomly assigned The Centre hospitalier universitaire de Sherbrooke (CHUS)	Time, content: Invited to attend a series of 25 group seminars of 45 minutes' duration over 1 year covering diet, exercise, behavioural modification, and general information about obesity and lifestyle modification. Frequency: P`s enrolled in the group approach were only invited to participate in group seminars every 2 weeks for 1 year D+E	Baseline, post-intervention	Recruited through advertisements or by physicians' referrals.	Men and women with prediabetes Mean age: 56.6 (11.2) years Gender: 26 (54%) females; 22 (46%) males Ethnicity: 100% Caucasian	n/a	n/a	48 P`s participated (22 individual group and 26 group approach) and 41 completed study (17 in group I and 24 in group G) Retention= 92.31% DO= 7.69% (2 P`s)

Author/s	Country	Study Design/ Setting	Intervention & Group component (size, frequency, content)	Length of follow up	Recruitment method	Sample (age, gender, ethnicity)	Response rate (RR)	Uptake rate	Retention and/or Dropout rate (DO)
Gilis-Januszewska et al. (2018) (Gilis-Januszewska et al, 2017; Gilis-Januszewska et al, 2011)	Poland	DPP lifestyle intervention Local primary healthcare	Intervention followed Diabetes Prevention Study (DPS) modified. 10-month intervention involved initial intensive phase (4 months) which involved 10 group sessions (10-14 P`s) on diet and PA. From week 4, P`s offered PA sessions (aqua aerobics and gymnastics / football) twice weekly D+E	Baseline, 2 months In 2017 paper: baseline; 2 months; 2 years and 2 months	Study information and leaflets with the FINDRISC questionnaire distributed in co-operating practices In 2017 & 2011 papers: Advertisements were placed alongside self-screening questionnaires in the GPs waiting rooms In 2011 paper: patients with known risk factors were approached by nursing and medical staff	Men and women over the age of 25 years For 175 P`s: Mean age: 56.1 (10.9) years Gender: 22% male Ethnicity: NS	800 FINDRISC questionnaires distributed, 566 were completed RR cannot be calculated as advertisements used in waiting rooms	n/a	184 participants completed the intervention Retention= 70.23%
Jiang et al. (2013)	USA-Alaska	DPP lifestyle intervention Health care programs	They were offered the 16-session Lifestyle Balance Curriculum. Curriculum was delivered in group settings within 16–24 weeks (6 months) after baseline assessment and typically was taught by the program dietitian and/or health educator. D+E	Baseline; post-intervention, 1 year; 2 years; 3 years	P`s identified mainly through community events such as health fairs and from local clinics or by provider referral	Baseline for 2553 P`s: Age: 29% 18-39 years; 30% 40-49 years; 25% 50-59 years; 16% 60 years and above Gender: 1901 (75%) female; 652 (26%) male Ethnicity: American Indians and Alaska natives	n/a	18,134 P`s identified for screening and recruitment 3142 signed consent forms 2615 met inclusion criteria, enrolled and completed baseline assessments 2553 started intervention Author clarified uptake is: 31%	2553 started intervention 1891 completed post curriculum assessment Retention= 74.07%
Katula et al. (2013) (Katula et al, 2011; Katula et al, 2010; Blackwell et al, 2011)	USA-North Carolina	Randomised control trial Lifestyle weight-loss intervention conducted in community-based sites (e.g. parks and recreation centres)	P`s randomized to either a CHW led lifestyle intervention or an enhanced usual care intervention. A 13 DVD series was developed covering core content such as a) nutrition and physical activity basics, b) energy balance, c) healthy eating, d) goal setting, and e) problem solving. Frequency: P`s met weekly for group sessions during Phase 1 (Months 1-6), and all sessions were coordinated and facilitated by the CHW. Size: 14 different groups of 8-12 p`s were conducted at various community sites. P`s also received 3 personalized consultations with a registered dietician (during months 1, 3, and 6). During Phase 2 (Months 7-24)-2 years, P`s received 2 scheduled contacts with CHW each month, 1 group session and 1 phone contact. D+E	Baseline; post-intervention	Primary recruitment method involved mass mailings to local ZIP codes to target a sample representative of the local population. Other methods included: in-person presentations to community organizations, community health fairs and workplace screenings and participant and provider referrals; brochures, posters, and fliers also used	P`s with prediabetes and overweight/ obese Age: mean= 57.9 (9.5) years Gender: 128 (43%) male; 173 (58%) female Ethnicity: 74 (25%) African American; 222 (74%) White; 5 (2%) other/refused	n/a	n/a	301 P`s randomised (150 enhanced usual care; 151 lifestyle weight loss) 127 P`s in lifestyle weight loss group attended 24-month assessment visit Retention= 84.11%
Kulzer et al. (2009)	Germany	Randomized control trial	Programme aims at lifestyle modification. Frequency: Consisted of 12 lessons lasting approx. 90 mins each. During first 8 weeks, 8 core lessons given with 1 per week; last 4 lessons were bi-monthly booster lessons. Size: programme conducted in small groups (median size 7 people). 4 months intervention D+E	Baseline; 12 months	Not stated/not clear	From 182 P`s: Age: mean= 56.3 (10.1) years Gender: 43% female; 57% male Ethnicity: not stated	n/a	n/a	Author clarified: at baseline- 93 P`s in intervention group; 89 P`s in control. At follow up- 85 P`s in intervention and 81 in control Retention= 91.40% DO= 8.60%
Laatikainen et al. (2007)	Australia-Victoria	Intervention study-implementation trial in a practical setting; longitudinal pre-test and post-test study design General Practices	Intervention model based on the diabetes prevention project in the Finnish GOAL study. Frequency: Intervention consists of 6 structured 90-minute group sessions over 8 months using the Health Action Process Approach. First 5 sessions occurred within first 3 months, with 2-week intervals between sessions. The last session took place at 8 months. D+E	Baseline; 12 months	Participants were recruited by specially trained study nurses mainly in local GP clinics reception and waiting areas using the Diabetes Risk Score Tool- screened opportunistically	311 P`s at baseline: Age: Mean= 56.95 (9.1) years Gender: 88 (28%) males); 223 (72%) females Ethnicity: not stated	n/a	Of 523 P`s who have a score above 12 (on The Diabetes Risk Score tool), 343 P`s willing to participate (32 excluded due to being diagnosed with T2DM at baseline); 311 P`s eligible to take part and started Uptake=63.34%	311 P`s started 237 attended both baseline and 12-month clinical tests and at least one group session. This was the definition of completion. Retention=76.21%

Author/s	**Country**	**Study Design/ Setting**	**Intervention & Group component (size, frequency, content)**	**Length of follow up**	**Recruitment method**	**Sample (age, gender, ethnicity)**	**Response rate (RR)**	**Uptake rate**	**Retention and/or Dropout rate (DO)**
Makrilakis et al. (2010)	Greece-Athens	Community-based lifestyle intervention Primary care and occupational settings	Frequency: The 1-year intervention programme consisted of six sessions (1 h each) held by a registered dietitian at the area of the participants' residence or work. Size: Groups of 6–10 persons were constructed. Content: In every session, information on healthy lifestyle, personal discussion and written material (leaflets, etc.) were provided, analysing concept of the disease risk in general and the individual risk in particular D+E	Baseline; post-intervention	Not clear/ not stated For primary care settings: staff were asked to distribute FINDRISC questionnaires to potential P`s. for occupational settings, a particular day was organised where the FINDRISC was given. Those eligible were told about DE-PLAN project by investigators themselves All high-risk P`s were informed of project via telephone and personalized mail	191 P`s at baseline: Age: mean= 56.3 (10.8) years Gender: 77 (40%) male; 114 (60%) female Ethnicity: not stated	7900 FINDRISC distributed (1500 in occupational settings; 6400 in primary care settings) 3240 completed questionnaires Response rate= 41.01%* *Note: this figure might be questionable as in recruitment strategy, for occupational settings, a day was organised when the questionnaires were given which means some people may have been informed about study but then did not have the questionnaire to complete	251 identified as non-diabetic (high risk) 191 P`s entered intervention Uptake= 76.10%	191 P`s entered intervention 125 P`s completed program Retention= 65.45%
Marrero et al. (2016)	USA-Indianapolis-Indiana	Individual randomized intervention trial compared with Weight Watchers Program P`s screened in community settings including recreation centres, churches and community clubhouses	The Weight Watchers core curriculum is evidence-based and covers same behavioural topics used in DPP including: self-monitoring of weight, intake & activity; dietary modification; physical activity; stimulus control & relapse prevention. The curriculum is delivered in a supportive, weekly group environment by appropriately trained group leaders. 1-year intervention D+E	Baseline; post-intervention	Not stated- just screened in community settings	Age: average= 52 (SD = 11) years Gender: primarily female (85%) Ethnicity: non-Hispanic (94%), and White (64%)	n/a	n/a	225 randomized (112 intervention, 113 control) 175 at 12 months follow up (94 intervention, 81 control) Retention = 83.93%
McDermott et al. (2014)	India-Bangalore	Parallel randomized controlled pilot study	Content: Session on healthy lifestyle changes with topics on healthy diet, increasing physical activity and smoking cessation. Spouses were invited to attend this group counselling session as well. Attended a day long (8 hour) group counselling session. P`s then asked to attend at least 3, and up to 6, yoga classes per week over the 8 weeks of the study and each class lasted 75 minutes in total. D+E	Baseline; post-intervention	P`s recruited using advertisements placed in primary care and diabetes clinics, as well as strategic locations throughout the city.	41 P1s at baseline Age: mean= 47 years (9) Gender: 16 (39%) male Ethnicity: not stated	n/a	n/a	41 P`s randomized (21 yoga intervention; 20 walking control) 38 P`s completed (20 P`s in intervention, 18 P`s in control) Retention= 95.24% DO=4.76%
Miller et al. (2016) (Weinhold et al, 2015)	USA-Ohio	Randomised control trial Pre-test-post-test control group design University worksite	Experimental group received the 16-week Group Lifestyle Balance Intervention. Size, frequency: Groups of 10-15 P`s met for 60 minutes weekly during the lunch hour or after work and facilitated by a lifestyle coach using the program manual. Content: First 8 sessions presented intervention goals, taught fundamental information about modifying energy and fat intake and increasing energy expenditure, and helped P`s self-monitor. Latter 8 sessions focused on problem solving to achieving lifestyle goals, preventing relapse, and motivating sustained behavioural change. Four months intervention. D+E	Baseline; post-intervention; 3 months	P`s were recruited through electronic advertisements on the university newswire, campus flyers, and a news story in the employee newspaper, electronic advertisements in digital newsletters, employee email notifications, notices in ResearchMatch.com (recruitment website) and through direct mailings to employees with health insurance who completed the university health risk assessment, and university health screening; health fair; and word of mouth	University employees with prediabetes Baseline of 68 P`s: Age: Mean age= 51.2 (8.8) years Gender: 14 (21%) male; 54 (79%) female Ethnicity: 56 (82%) White; 12 (18%) Black or Asian	n/a	n/a	78 P`s (40 in experimental group; 38 in control) allocated, randomized and started 68 P`s completed post intervention (34 intervention; 34 control) and final visit 3 month follow up after intervention (35 experimental and 33 control) DO=15% Retention= 85%
Moin et al. (2017) (Damschroder et al, 2015)	USA- Los Angeles	Prospective, pragmatic, non-randomized comparative effectiveness trial VA (Veterans Affair) medical centres	Compared the VA-DPP and MOVE! VA-DPP used Group Lifestyle Balance Curriculum which included: 22 sessions over 12 months (16 core sessions (weekly then biweekly) in first 6 months then 6 monthly maintenance sessions in next 6 months). D+E	Baseline; post intervention; 3 months	Referrals; electronic medical records (from 2015 paper)	For VA-DPP: Mean age: 57.7 (10.0) years Gender: 32 (11.7%) female; majority men (88.3%) Ethnicity: 44.7% non-	n/a	1850 P`s were assessed for eligibility (screened and attended VA MOVE! Orientation) 387 eligible P`s assigned (273 to VA-DPP; 114 to MOVE!)	More VA-DPP participants completed eight or more sessions (42.5% VA-DPP vs 31% MOVE!) (273/100) X42.5= 116 P`s completed Retention= 66.29%

Author/s	Country	Study Design/ Setting	Intervention & Group component (size, frequency, content)	Length of follow up	Recruitment method	Sample (age, gender, ethnicity)	Response rate (RR)	Uptake rate	Retention and/or Dropout rate (DO)
						Hispanic white; 43.6% non-Hispanic black; 6.2% n/a; 3.3% Hispanic; 2.2% non-Hispanic other		Of the 273 participants assigned to VA-DPP, 36% (n=98) explicitly declined to participate Uptake= 64.10%	
Moore et al. (2011)	Australia-Victoria	Randomized control trial GP practices	Content: Sessions are psycho educational, providing information on diet, exercise, motivation, goal setting and stress, plus support for participants to adopt healthier lifestyle choices. Size: The programme comprises a series of learning sessions conducted in groups of six to ten people with prediabetes over 6 months. D+E	Baseline; post-intervention	P`s recruited across 2 metropolitan and 1 rural region in Victoria, mostly through GP referral, other P`s recruited through opportunistic community screening and self-referral. Recruitment managed by Primary Health Care Partnerships	Age: 28-86 years (mean= 62.5 (10.1) years) Gender: 126 (41%) males; 181 (59%) females Ethnicity: NS	n/a	n/a	307 P`s randomized (208 group intervention; 99 control group) 274 P`s completed follow up (183 group; 91 control) DO=12.10% Retention= 87.90%
Ockene et al. (2012) (Merriam et al, 2009)	USA-Massachusetts	Community-based translational research study Lawrence Senior Center (centrally located social service facility) Randomised control trial	Frequency: 3 individual and 13 group sessions over a 12-month period. Duration of first group session was 1.5 hours and the remaining group sessions were 1 hour. D+E	Baseline; post-intervention	Majority of P`s recruited from family health centre patient panel through mailed letter of invitation and telephone recruitment calls from study community coordinators Other methods included: public service announcements on local radio and television stations, newspaper advertisements, flier inserts in the Senior Center newsletter and mailings to physicians.	312 P`s at baseline Age: Mean age= 52 years (11.6) (25-79 years) Gender: 232 (74%) female; 80 (26%) male Ethnicity: Latino P`s (60% Dominican origin; 40% Puerto Rican)		312 P`s enrolled (23 did not receive intervention so =289) 162 allocated to the intervention (139 received the intervention; 23 did not) Uptake= 85.80%	271 P`s at the end of follow up (143 usual care; 128 intervention) DO= 7.91% Retention= 92.09%
Parikh et al. (2010)	USA- New York	Peer-led intervention Where workshops took place at community sites	The programme consisted of eight 1.5-hour sessions over 10 weeks. Content: Topics included diabetes prevention, finding and affording healthy foods, label reading, fun physical activity, planning a healthy plate, making traditional foods healthy, and portion control. D+E	Baseline; 2 weeks, 3 months and 9 months	Several recruitment strategies involved at community sites and events, such as churches, social service agencies, senior centers, and health fairs. Most successful recruitment took place when community leaders advertised and were in charge of recruitment at their organizations.	99 P`s at baseline Age: mean age of 48 years (ranging from 25-84 years) Gender: mainly female (85%) Ethnicity: 9% black; 89% Hispanic	n/a	n/a	99 P`s started the intervention (50 intervention and 49 control) At 12 months, 72 P`s (37 control and 35 intervention) DO=30% Retention= 70%
Payne et al. (2008)	Australia-Victoria	Quasi-experimental two-group repeated measures design Recruited from regional city of Ballarat	Intervention included 6-week group self-management education program, a gymnasium-based or home-based 12-week resistance training program, and a 34-week maintenance program. In total 52 weeks (13 months intervention). Self-management education program started with six 1.5-h group education sessions. Size: Sessions included PA & dietary components with groups of 15–20. Maintenance program-attended three 2-hour group reinforcement sessions D+E	Baseline; post-intervention	P`s recruited through media campaign & promotional materials distributed in socioeconomically disadvantaged localities. Primary health care professionals encouraged to refer eligible P`s	122 P`s started programme Age: Mean= 52.6 (8.6) Gender: 78% women Ethnicity: NS	n/a	n/a	122 P`s started programme 98 completed clinical assessments at weeks 52 and 84 DO= 19.67% Retention= 80.33%
Pimental et al. (2010)	Brazil		Intervention group received individual and group counselling with a team of nutritionists. Consisted of discussion-format group sessions that took place twice per month and individual sessions that took place once per month. Intervention included written and oral didactic instructions to improve diet quality. One-year intervention. D	Baseline; post-intervention	Recruited during 2 public health campaigns designed to promote knowledge, detection, and prevention of T2DM complications.	67 randomized P`s with prediabetes Mean Age (group): 51.7 (14.5) Gender (in total): 63% (42 P`s) females; 37% (25 P`s) males Ethnicity: All Brazilian	n/a	n/a	67 P`s were randomized into 2 groups: the intervention group (n = 24), and the control group (n = 43). Of the 67 P`s, 51 completed the study (control group n = 30 and intervention group n = 21). DO=12.5% Retention= 87.50%

Author/s	**Country**	**Study Design/ Setting**	**Intervention & Group component (size, frequency, content)**	**Length of follow up**	**Recruitment method**	**Sample (age, gender, ethnicity)**	**Response rate (RR)**	**Uptake rate**	**Retention and/or Dropout rate (DO)**
Quinones et al. (2018)	USA- New York	Pilot study Large community based mental health residential program	22 weekly 90 min group sessions from Nov 2013-May 2014. D+ E	Baseline; post intervention	Information material including flyers, pamphlets, posters and mailings used	For 21 P: Mean age: 49.4 (10.9) years Gender: 73% women; 27% men Ethnicity: 91% Caucasian	n/a	21 P`s agreed to participate. 3 P`s dropped out prior to the start of the programme Uptake= 85.7%	From the remaining 18 P`s, 11 completed the program Retention=61.11%
Sakane et al. (2011)	Japan-Kyoto	Randomized control trial Primary health care setting- 32 health institutions and company clinics across the country participated	During the initial 6 months, 4 group sessions were conducted using slides, videotapes, and a booklet with each session lasting 2 or 3 hours. Main subjects in each group session were: (1) What is diabetes? What is IGT? How to prevent diabetes? (2) Healthy diets to prevent diabetes, (3) Exercise tips to prevent sporting injuries, and (4) Let's enjoy exercise. D+E	Baseline, post-intervention; 3 years	Each centre recruited study candidates using posters, through fliers, and by word of mouth Recruited through health check-ups at community health centres and in workplaces	304 P`s: Age: 30-60 years Baseline characteristic for both groups similar Mean Age: 51 (7) Gender: 50% (150 P`s) males; 50% (148 P`s) females Ethnicity: not stated	n/a	n/a	304 P`s randomized (152 control; 152 intervention but 6 P`s did not meet eligible criteria so = 146)) 213 completed follow up (110 control & 103 intervention) DO=29.45% Retention= 70.55%
Tsai et al. (2018)	Taiwan	Single-group repeated measurement longitudinal study	4-week lifestyle change programme. In groups of 7-11 P`s had 1 face to face 90-120 mins session per week. D+E	Baseline; 3 months; 6 months; 12 months	Not stated	For 39 P`s: Mean age: 59.6 (7.71) years Gender: 31 (79.5%) female; 8 (20.5%) male Ethnicity: n/a	n/a	126 eligible P`s were contacted by telephone and mail 41 willing to participate, provided baseline data and did the program Uptake= 32.54%	41 P`s completed the program Retention= 100%
Vincent et al. (2014)	USA-Arizona	Randomized 2-group attention control design Community rooms of churches. P`s attended Sunday afternoons after church services	Community-based, culturally tailored DPP. Frequency: 5-month-long programme consisting of an intensive phase of 8 weekly 2-hour sessions, followed by a maintenance phase of 3 monthly 1-hour sessions. Each of 8 weekly sessions included: 4 delivery components: an episode that emphasized the weekly take-home message, brief presentation & cooking demonstrations & meal sharing & short informal discussions. Size: Author confirmed: GB intervention, group sizes approximately 6-18 P`s. D+E	Baseline, post-intervention	Widely distributed English and Spanish flyers advertising study, use of social media to announce study to employees of the university, provider referral, & presentations at churches & community health events.	Mean age: 50.9 years (middle-aged); age range: 29-84 years Gender: 45 (78%) female; 13 (22% male Ethnicity: Mexican	n/a	n/a	58 P`s started (38 intervention; 20 control) From results table: 25 P`s at the end of intervention DO=34.21% Retention= 65.8%
Yates et al. (2009) (Yates, 2008)	UK- Leicester	Randomized control trial	Group 1: 3-h (1 day) group-based structured education programme designed to promote walking activity using personalized steps per-day goals and pedometers. Group 2: 3-hr group-based structured education program designed to promote walking activity using generic time-based goals. Size; frequency: PREPARE programme is a single-session group-based education program,180 min (3hr) long; delivered to 5-10 P`s. D+E	Baseline; 3 months; 6 months; 12 months	P`s recruited from on-going population-based diabetes screening programmes Contacted by letter and follow up telephone call	Data for 87 P`s: Age: mean= 64 (9) years Gender: 57 (66%) male; 30 (34%) female Ethnicity: 65 (75%) white; 21 (24%) south Asian; 1 (1%) black	n/a	n/a	98 randomly assigned (34 control; 31 PREPARE intervention; 33 PREPARE & pedometer intervention; intervention total= 64) 83 completed study (26 control; 28 PREPARE; 29 PREPARE & pedometer; intervention total= 57) DO=10.94% Retention= 89.06%
Yeh et al. (2015)	USA-New York	Randomized control trial (RCT) Medical practices	Frequency: The modified lifestyle programme, consisting of 12 biweekly core sessions & 6 monthly follow-up sessions, was conducted in Chinese	Baseline, post-intervention	Recruited from medical practices within the Chinese American independent practice association	In total (control & intervention groups):	n/a	n/a	60 randomized (30 intervention; 30 control) 58 P`s (97.7%) completed both

Author/s	**Country**	**Study Design/ Setting**	**Intervention & Group component (size, frequency, content)**	**Length of follow up**	**Recruitment method**	**Sample (age, gender, ethnicity)**	**Response rate (RR)**	**Uptake rate**	**Retention and/or Dropout rate (DO)**
			(Mandarin or Cantonese) by trained lifestyle coaches at a community site. Size: Each session lasted 1.5–2 hrs. Author confirmed its group-based with 15 P`s in a group. 12 months intervention D+ E			Mean age: 58.9 years Average Gender: 17 (57%) women Ethnicity: not stated			follow ups (30 intervention; 28 control) DO=0% Retention= 100%

Key: D=dietary component; E=exercise component; P`s=participants

Appendix 3: BCTs present in the ten highest and ten lowest retention programmes (Chapter 2)

	Highest retention *n*	**Lowest retention** *n*
BCTs		
1.1 Goal setting (behaviour)	6	7
1.2 Problem-solving	5	2
1.3 Goal setting (outcome)	4	8
1.4 Action planning	2	0
1.5 Review behaviour goal(s)	3	0
1.6 Discrepancy between current behaviour and goal	1	0
1.7 Review outcome goal(s)	2	1
2.1. Monitoring of behaviour by others without feedback	1	1
2.2. Feedback on behaviour	1	3
2.3. Self-monitoring of behaviour	3	6
2.4 Self-monitoring of outcome(s) of behaviour	2	
2.5 Monitoring outcome(s) of behaviour by others without feedback	1	1
2.7 Feedback on outcome(s) of behaviour		1
3.1. Social support (unspecified)	5	4
3.2 Social support (practical)		1
3.3. Social support (emotional)	2	4
4.1. Instruction on how to perform the behaviour	8	6
5.1. Information about health consequences	1	
6.1. Demonstration of the behaviour	5	2
8.1. Behavioural practice/rehearsal	4	2
8.7. Graded tasks	1	1
9.1. Credible source	10	10
9.2 Pros and cons	1	0
10.4. Social reward	0	1
11.2. Reduce negative emotions	4	2
Incentive for participation	5	1

Appendix 4: Further, updated information on the NHSDPP (Chapter 4)

In addition to the information provided on the NHSDPP in Chapter 4, the following details further, updated information about the programme.

Programme eligibility and referral

Individuals are eligible for the programme if they are identified as having prediabetes after undergoing an NHS Health Check, through routine clinical practice or obtaining qualifying blood test results through GP records (Barron et al., 2018; National Institute of Clinical Excellence, 2012; NHS England Publications, 2016). From August 2020, individuals have been able to self-refer onto the NHSDPP after completing an online Diabetes UK risk score assessment, which it is anticipated will help with increasing uptake rates (ICS Health & Wellbeing, 2020; NHS England, 2020a). However, since the 15th of November 2022, the self-referral pathway for the NHSDPP via the Diabetes UK risk assessment tool is now closed (North Central London Integrated Care Board, 2023). Although the tool will still be available for individuals to undertake an initial risk assessment for Type 2 Diabetes, they will be signposted to their GP service for a blood test if they score 'moderate' or 'high' after completing the assessment.

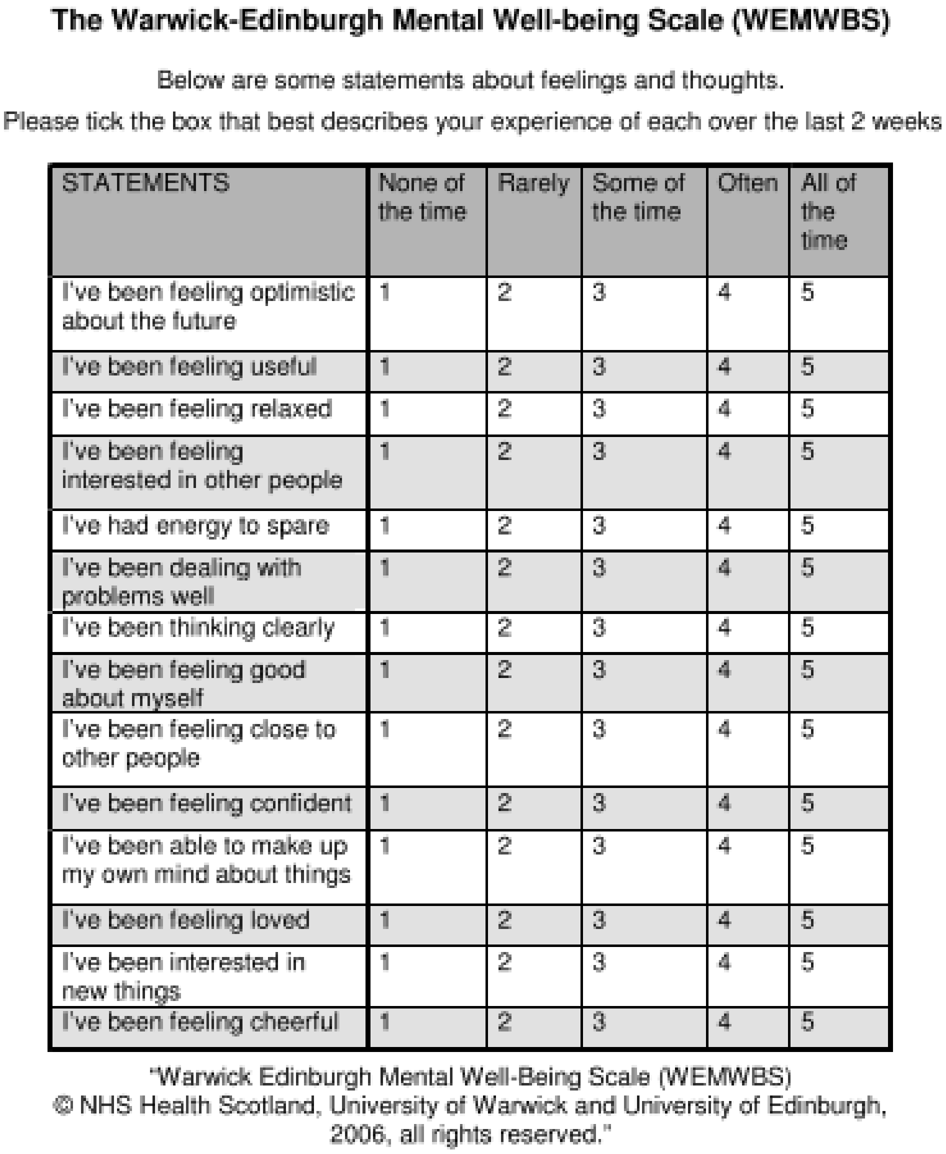
Programme delivery

At the time of writing when submitting the thesis, the NHSDPP were being delivered across England by four local service providers who were chosen after going through a national competitive process (Reed Wellbeing (previously known as Reed Momenta), Pulse Healthcare Limited trading as ICS Health & Wellbeing, Ingeus UK, and Living Well Taking Control) (Diabetes Prevention Team, 2015; NHS England Publications, 2016; Valabhji et al., 2020). At the time of writing (post viva), instead of local providers (LPs) Pulse Healthcare Limited trading as ICS Health & Wellbeing, and Ingeus UK, they have been replaced by Xyla Health and Wellbeing and Thrive Tribe (NHS England, 2023a).

Each provider follows a similar structure of an initial assessment, core and maintenance sessions, with at least 13 face-to-face group-based sessions with 16 hours contact time, over a minimum of 9 months (Diabetes Prevention Team, 2015; NHS England Publications, 2016; Valabhji et al., 2020). However, due to the global pandemic in 2020 (due to Covid-19), there has been temporary changes to the delivery of the NHSDPP (Newbound & Valabhji, 2020). Since the 20th of March 2020, group-based face-to-face sessions were no longer taking place due to Covid-19 and were being delivered remotely with telephone-based coaching and digital services being offered (Newbound & Valabhji, 2020). From April 2022, the NHSDPP is available both as a face-to-face group service and as a digital service. When individuals are referred to the programme, they are free to choose between the two modes of delivery (i.e., face-to-face group service or as a digital service) (NHS England, 2023b).

At the time of data collection, the LP delivered 18 face-to-face group-based sessions for up to 20 people (six weekly, six fortnightly and six-monthly sessions) (Macmillan, 2016). The duration of these sessions was one hour except for the first session which lasted 1.5 hours. At the time of writing, the LP now delivers 13 one-hour group sessions over 40 weeks. Other LPs also offer 13 group-based sessions (Valabhji et al., 2020).

Appendix 5: The Warwick-Edinburgh Mental Well-being Scale (WEMWBS) (Chapter 4)



The Warwick-Edinburgh Mental Well-being Scale (WEMWBS)

Below are some statements about feelings and thoughts.

Please tick the box that best describes your experience of each over the last 2 weeks

STATEMENTS	None of the time	Rarely	Some of the time	Often	All of the time
I've been feeling optimistic about the future	1	2	3	4	5
I've been feeling useful	1	2	3	4	5
I've been feeling relaxed	1	2	3	4	5
I've been feeling interested in other people	1	2	3	4	5
I've had energy to spare	1	2	3	4	5
I've been dealing with problems well	1	2	3	4	5
I've been thinking clearly	1	2	3	4	5
I've been feeling good about myself	1	2	3	4	5
I've been feeling close to other people	1	2	3	4	5
I've been feeling confident	1	2	3	4	5
I've been able to make up my own mind about things	1	2	3	4	5
I've been feeling loved	1	2	3	4	5
I've been interested in new things	1	2	3	4	5
I've been feeling cheerful	1	2	3	4	5

Appendix 6: Interview schedule (Chapter 5)

Interview topic guide

Interviewer script: Thank you for agreeing to take part in this interview. We would like to know your views on Type 2 diabetes and on the NHS Diabetes Prevention programme.

Study 1: Attenders Vs Non-Attenders

Q1: What do you think Type 2 diabetes is?

Q2: What is your risk of developing Type 2 diabetes?

Q3: How did you hear about this programme (IA)?

Q4: How did you feel when you first got this letter?

Q5: What factors influenced your decision to attend/not attend the IA?

Q6: How did you find the Initial Assessment?

Q7: What factors will influence your decision as to whether to attend/not attend this programme?

Q8: How well do you feel you understand what the programme involves? How can this be improved?

Q9: What can we do in the future to encourage people to attend both the IA and programme? (Non-attenders)

Q10: What can we do to make it easier for you to complete the IA/programme you have just started? (Attenders)

Q11: Is there anything you are looking forward to? Anything you feel you are concerned/worried about?

Q12: Is there anything further you would like to add that has not been discussed so far?

Follow-up questions for non-attenders:

Q1: What kind of factors influenced your decision in not being able to start the programme?

Q2: What can we do to encourage people to start the programme and attend?

Follow-up question for attenders:

Q1: What factors influenced your decision to start/attend the programme initially?

Appendix 7: Interview schedule (Chapter 6)

Interview topic guide for completers and non-completers

Interviewer script: Thank you for agreeing to take part in this interview. We would like to know your views on Type 2 diabetes and on the NHS Diabetes Prevention programme.

Study 2: Completers Vs Non-Completers

Q1: What do you think Type 2 diabetes is?

Q2: What is your risk of developing Type 2 diabetes?

Q3: What factors influenced your decision to attend this programme initially?

Q4: How well did you feel you understood what the programme involved? How could this be improved?

Q5: What was your experience like of having completed all / some of the programme?

Q6: What factors influenced your decision to continue/ no longer continue with this programme?

Q7: How do you feel about recommending this programme to others?

Q8: After going through the programme, how well equipped do you feel in taking the right steps to prevent yourself from developing Type 2 diabetes?

Q9: What impact (if any) does this programme have on your life?

Q10: What can we do in the future to make it easier for others to continue with the programme until the end? (Non-completers)

Q11: Is there anything further you would like to add that has not been discussed so far?

Thank you for taking part. Please feel free to contact me for any further information on this programme or if you think about anything else that might be useful for us.

Contact details are on the Information Sheet you received earlier.

Appendix 8: Example of coding (Chapter 5)

An example of initial codes that were identified and subsequent sub-themes and themes derived from the data for the study described in Chapter 5 are shown below. Transcripts were analysed using inductive thematic analysis with an essentialist epistemological approach. The six phases of thematic analysis developed by Braun and Clarke`s (2006) were followed, starting with data familiarisation, initial coding (Column 1), and development of possible sub-themes and themes (Column 2), which were then discussed (Column 3) to refine and finalise the final sub-themes and themes (Columns 4 and 5).

Initial codes	**Searching for sub-themes/themes**		**Defining/naming sub-themes**	**Defining/naming themes**
Have cut portion size	Body and self-improvements/ Self behaviours (past and present)	*Sub-themes and themes reviewed*	Lifestyle changes made	Lifestyle changes (past and present)
Doing more exercise				
Lost weight				
Have too much sugar	Difficulties and concerns regarding self/ Self behaviours (past and present)		Difficulties and concerns with making lifestyle improvements	
Difficult to exercise				
Availability depends on work	Availability and preferences/Access to programme and practicalities		Availability	Accessibility and practicalities
Difficulty with calling LP to book IA	Booking appointments/ Access to programme and practicalities		Booking appointments	
LP took a long time to book onto an IA				
Need to make time to attend programme	Time limitations or constraints/ Access to programme and practicalities		Time limitations or constraints	
Venue should be closer to home	Venue (IA and programme)/ Access to programme and practicalities		Location	
GP referred or recommended programme	Referral to programme/ Access to programme and practicalities		Programme access	
Letter from GP motivated to start				

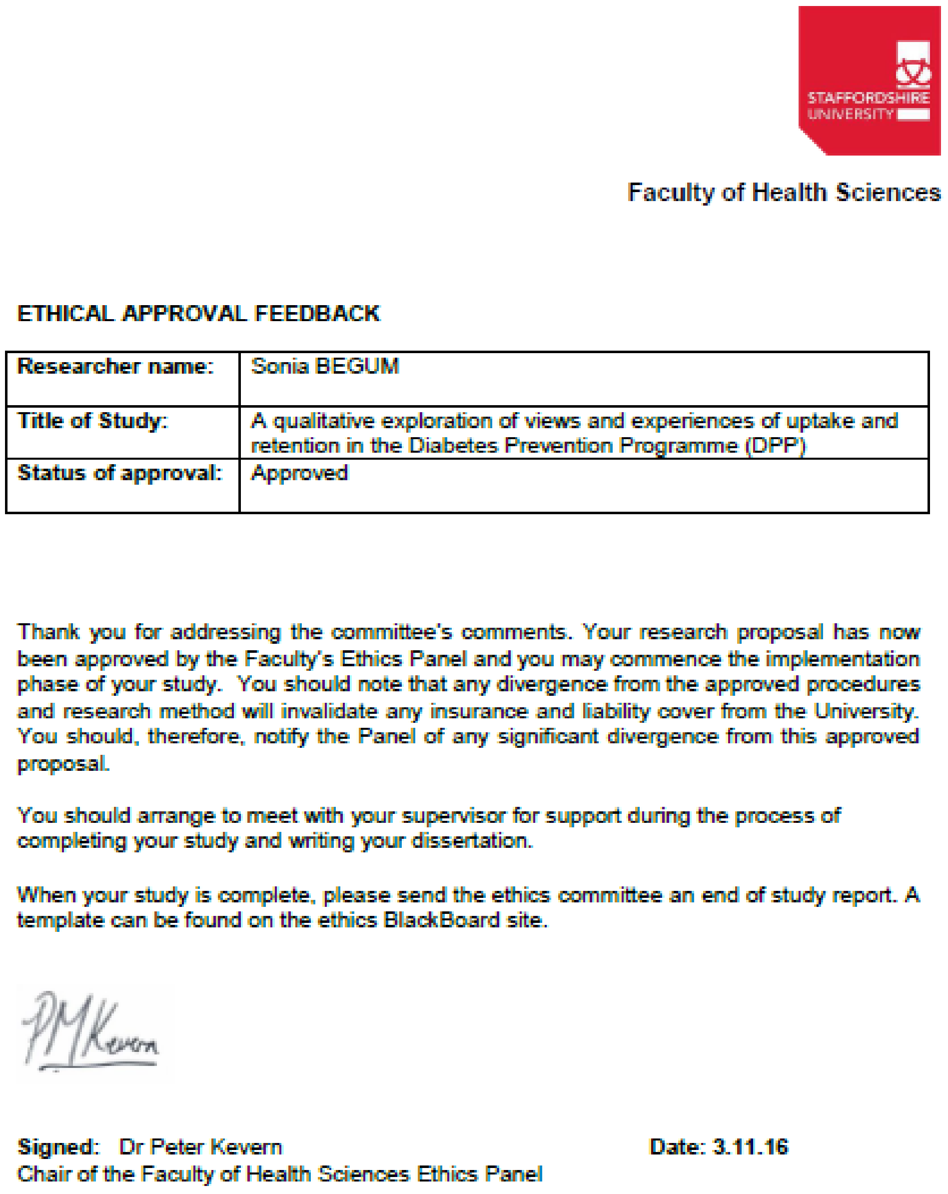
Key: LP= local provider; IA= initial assessment; GP= general practitioner.

Appendix 9: Example of coding (Chapter 6)

An example of initial codes that were identified and subsequent sub-themes and themes generated and derived from the data for the study described in Chapter 6 are shown below. Transcripts were analysed using inductive thematic analysis with an essentialist epistemological approach. The six phases of thematic analysis developed by Braun and Clarke (2006) were followed, starting with data familiarisation, initial coding (Column 1), and development of possible sub-themes and themes (Column 2), which were then discussed (Column 3) to refine and define the final sub-themes and themes (Columns 4 and 5).

Initial codes	**Searching for sub-themes/themes**		**Defining/naming sub-themes**	**Defining/naming themes**
Fear and panic immediately led to starting programme	Fear and negative T2DM perceptions	*Sub-themes/ themes reviewed*		Illness threat
T2DM is for life				
Worried about T2DM	Negative emotions and negative T2DM perceptions			
T2DM a sickness or disease				
T2DM can affect eyesight or lead to blindness	T2DM-related knowledge		Learning and knowledge	Programme perceptions
Programme increased awareness	Knowledge			
Learnt a lot from the programme	Learning			
Programme was enjoyable	Programme perceptions			
Programme was helpful				
Need encouragement	Programme did not meet expectations			
Programme did not meet expectations				
Instructor was good	Positive views of session leader		Instructor manner and delivery	
Instructor was nervous	Instructor perceptions			
Brilliant group members	Perceptions of group members		Group perceptions and experience	
Group members can make it boring				

Appendix 10: Ethical approval - qualitative studies (Chapters 5 and 6)



STAFFORDSHIRE
UNIVERSITY

Faculty of Health Sciences

ETHICAL APPROVAL FEEDBACK

Researcher name:	Sonia BEGUM
Title of Study:	A qualitative exploration of views and experiences of uptake and retention in the Diabetes Prevention Programme (DPP)
Status of approval:	Approved

Thank you for addressing the committee's comments. Your research proposal has now been approved by the Faculty's 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.

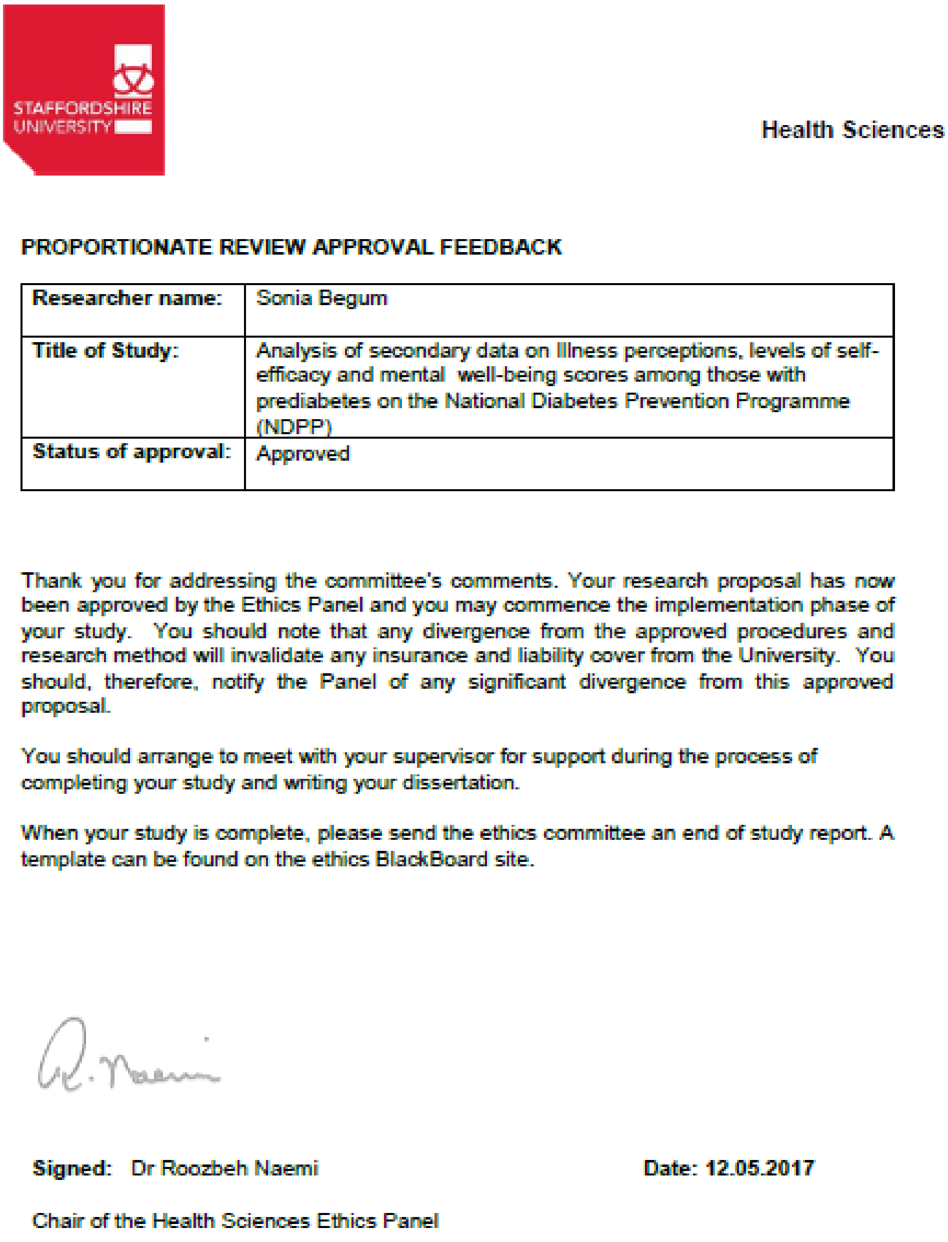
When your study is complete, please send the ethics committee an end of study report. A template can be found on the ethics BlackBoard site.

PM Kevern

Signed: Dr Peter Kevern
Chair of the Faculty of Health Sciences Ethics Panel

Date: 3.11.16

Appendix 11: Ethical approval- quantitative study (Chapter 7)



STAFFORDSHIRE UNIVERSITY

Health Sciences

PROPORTIONATE REVIEW APPROVAL FEEDBACK

Researcher name:	Sonia Begum
Title of Study:	Analysis of secondary data on Illness perceptions, levels of self-efficacy and mental well-being scores among those with prediabetes on the National Diabetes Prevention Programme (NDPP)
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.

R. Naemi

Signed: Dr Roozbeh Naemi **Date: 12.05.2017**

Chair of the Health Sciences Ethics Panel

Appendix 12: Invitation letter (Chapter 5)

Date: 16/11/2017

Study of uptake of the NHS Diabetes Prevention Programme

Dear Sir / Madam,

We are carrying out research into the factors that influence adults' decisions about whether or not to take part in the NHS Diabetes Prevention Programme.

We really want to understand why some adults choose to take part and others are unable to. This will help us plan our services and programmes so that more and more adults can benefit from this important intervention.

We would be grateful if you would consider taking part in our study. Taking part will involve having an interview with one of our researchers from Staffordshire University on the day of your Individual Assessment.

The interview is likely to take between **30 and 60 minutes**. As a thank you for your time, you would be given a **£20** Love2Shop voucher that can be spent at most high street shops.

We would be grateful if you could read the enclosed information sheet. If you think you might be interested or would like to know more, please ask the researcher or a member of staff when you attend your Individual Assessment date.

Yours Faithfully

Dr Paul Chadwick

Clinical Director

Appendix 13: Information sheet (Chapter 5)

Study of uptake of the NHS Diabetes Prevention Programme

Information sheet

Thank you for taking the time to read this information sheet. We are researchers' from Staffordshire University, and would like to invite you to take part in some research we are conducting on the NHS Diabetes Prevention Programme.

This information sheet is designed to tell you why we are doing the research, why you have been invited to take part, and what would be involved. Please take your time to read the following information and feel free to contact us if you would like to discuss anything further.

What is the purpose of the study?

The purpose of this work is to better understand how to make the NHS Diabetes Prevention Programme more accessible and appealing to adult patients.

Why have I been chosen?

You have been chosen because you have been offered a Diabetes Prevention Programme initially by your local Doctor's surgery.

What will I be asked to do if I decide to take part?

If you agree to take part, you will be given the opportunity to speak to a member of the Staffordshire University research team, and ask the researcher any further questions you have about this work.

If you are happy to proceed, the researcher will arrange a convenient time and location to meet you to take part in a short informal interview/discussion. This can take place on the day you attend your individual assessment or an alternative day/time can be arranged. The interview would last approximately 30 to 60 minutes and you may be given a 5-10 minute follow up telephone call if this is required. If it is not possible to arrange an interview in person, the researcher may contact you to arrange a telephone interview instead. To ensure that we have an accurate account, the interview would be audio recorded. We would also ask you to fill out a short profile survey asking about things like if you have any health problems that you are aware of, your age and ethnic origin.

What are the benefits of taking part?

If you take part, you will receive a **£20 Love2Shop voucher** as a thank you for your time. These can be used at most high street shops (http://www.highstreetvouchers.com/gift-vouchers/love2shop).

Do I have to take part?

Taking part is voluntary. It is up to you whether or not to take part. If you decide to participate then you are free to withdraw from the research for up to one week after the interview has taken place without stating a reason. You will not be disadvantaged in any way if you decide that you do not wish to take part. Also, taking part will not negatively affect the care you are offered by the local provider or other NHS Services.

Are there any negative effects of taking part?

We do not expect any adverse effects as a result of taking part. However, if at any time you feel upset or distressed during the interview, please inform the researcher and the interview will be stopped and appropriate action taken. If after participation, you have any questions relating to this research, you can contact the researcher using the details at the end of this information sheet. If you wish to speak to an external organization about your participation in this research or for further support, please contact Diabetes UK Lambeth and Southwark Group, 13 Great Spilmans, East Dulwich, East Dulwich, SE22 8SZ, Greater London, Tel: 02086932372 or 0345 123 2399, Email: cokerb@btopenworld.com

What will happen to my information?

All information you provide will be stored securely. Only members of the Staffordshire University research team will have access to the names of those taking part. All those taking part will be assigned a unique code, which will be used to identify them and ensure your anonymity. You will not be identifiable from any reports that are produced as a result of this work.

What will happen with the results of the study?

It is hoped that finding out about your experiences of the programme will help the organisers to make improvements to the programme. The results of the study will be written up into a report provided to the organisers of the programme and publication in academic journals. The results will also be written up as chapters of a PhD thesis. All results will be reported such that no individuals can be identified.

If you wish, you can receive a copy of this report. Please contact Sonia Begum directly if you would like to receive a copy.

If you need further information, please contact

Sonia Begum (PhD Student)
Staffordshire University
Brindley Building, Leek Road
Stoke-on-Trent, Staffordshire, ST4 2DF
+44(0)1782 294024
sonia.begum@research.staffs.ac.uk

Dr Rachel Povey (Primary Supervisor)
Staffordshire University
Science Centre, Leek Road
Stoke-on-Trent, Staffordshire, ST4 2DF
+44 (0)1782 294570
r.povey@staffs.ac.uk

Appendix 14: Invitation letter (Chapter 6)

Date: 15/02/2018

Views and experiences of the NHS Diabetes Prevention Programme

Dear Sir / Madam,

We are carrying out research into the views and experiences of adults' who take part in the NHS Diabetes Prevention Programme.

We really want to understand why some adults are able to take part in the full programme and others are unable to. This will help us plan our services and programmes so that more and more adults can benefit from this important intervention.

We would be grateful if you would consider taking part in our study. Taking part will involve having a telephone interview with one of our researchers from Staffordshire University.

The interview is likely to take between **30 and 60 minutes**. As a thank you for your time, you would be given a **£20** Love2Shop voucher that can be spent at most high street shops.

We would be grateful if you could read the enclosed information sheet. If you think you might be interested or would like to know more, please contact the researcher using the contact details provided on the attached information sheet.

Yours Faithfully

Dr Paul Chadwick

Clinical Director

Appendix 15: Information sheet (Chapter 6)

Views and experiences of the NHS Diabetes Prevention Programme:

Information sheet

Thank you for taking the time to read this information sheet. We are researchers` from Staffordshire University, and would like to invite you to take part in some research we are conducting on the NHS Diabetes Prevention Programme.

This information sheet is designed to tell you why we are doing the research, why you have been invited to take part, and what would be involved. Please take your time to read the following information and feel free to contact us if you would like to discuss anything further.

What is the purpose of the study?

The purpose of this work is to better understand how to make the NHS Diabetes Prevention Programme more accessible and appealing to patients.

Why have I been chosen?

You have been chosen because you have been offered a Diabetes Prevention Programme initially by your local Doctor's surgery.

What will I be asked to do if I decide to take part?

If you agree to take part, you will be given the opportunity to speak to a member of the Staffordshire University research team, and ask the researcher any further questions you have about this work.

If you are happy to proceed, the researcher will arrange a convenient date and time to arrange a short informal telephone interview/discussion. This would last approximately 30 to 60 minutes. To ensure that we have an accurate account, the interview would be audio recorded.

What are the benefits of taking part?

If you take part, you will receive a **£20 Love2Shop voucher** as a thank you for your time. These can be used at most high street shops (http://www.highstreetvouchers.com/gift-vouchers/love2shop).

Do I have to take part?

Taking part is voluntary. It is up to you whether or not to take part. If you decide to participate then you are free to withdraw from the research for up to one week after the interview has taken place without stating a reason. You will not be disadvantaged in any way if you decide that you do not wish to take part. Also, taking part will not negatively affect the care you are offered by the local provider or other NHS Services.

Are there any negative effects of taking part?

We do not expect any adverse effects as a result of taking part. However, if at any time you feel upset or distressed during the interview, please inform the researcher and the interview will be stopped and appropriate action taken. If after participation, you have any questions relating to this research, you can contact the researcher using the details at the end of this information sheet. If you wish to speak to an external organization about your participation in this research or for further support, please contact Diabetes UK Lambeth and Southwark Group, 13 Great Spilmans, East Dulwich, East Dulwich, SE22 8SZ, Greater London, Tel: 02086932372 or 0345 123 2399, Email: cokerb@btopenworld.com

What will happen to my information?

All information you provide will be stored securely. Only members of the Staffordshire University research team will have access to the names of those taking part. All those taking part will be assigned a unique code, which will be used to identify them and ensure your anonymity. You will not be identifiable from any reports that are produced as a result of this work.

What will happen with the results of the study?

It is hoped that finding out about your experiences of the programme will help the organisers to make improvements to the programme. The results of the study will be written up into a report provided to the organisers of the programme and publication in academic journals. The results will also be written up as chapters of a PhD thesis. All results will be reported such that no individuals can be identified.

If you wish, you can receive a copy of this report. Please contact Sonia Begum directly if you would like to receive a copy.

If you need further information, please contact

Sonia Begum (PhD Student)
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sonia.begum@research.staffs.ac.uk

Dr Rachel Povey (Primary Supervisor)
Staffordshire University
Science Centre, Leek Road
Stoke-on-Trent, Staffordshire, ST4 2DF
+44 (0)1782 294570
r.povey@staffs.ac.uk

Appendix 16: Consent form (Chapter 5)

CONSENT FORM

Title of Project: Study of uptake of the NHS Diabetes Prevention Programme

Please tick the appropriate box(es) on the right if you agree with the correspondent statement(s):

1. I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time from the research up to one week after the interview, without giving any reason, without my legal rights being affected. ☐
3. I agree to be contacted again to take part in an interview via letter, email or telephone. ☐
4. I agree to take part in the above study. ☐
5. I agree to the data being used for a final report, in a PhD thesis and in publications. ☐

Name of participant: Date: Signature:

______________________ __________ __________________

Participant Contact Number (optional): Participant Email (optional):

________________________________ ________________________

Researcher Name: Date: Signature:

______________________ __________ __________________

Appendix 17: Consent form (Chapter 6)

CONSENT FORM

Title of Project: Views and experiences of the NHS Diabetes Prevention Programme

Please tick the appropriate box(es) on the right if you agree with the correspondent statement(s):

1. I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time from the research up to one week after the interview, without giving any reason, without my legal rights being affected. ☐
3. I agree to take part in the above study. ☐
4. I agree to the data being used for a final report, in a PhD thesis and in publications. ☐

Name of participant: ______________________ Date: __________ Signature: __________________

Researcher Name: ______________________ Date: __________ Signature: __________________

Appendix 18: Debrief form (Chapter 5)

Study of uptake of the NHS Diabetes Prevention Programme: Debrief Form

Date:………………

Dear Participant,

Thank you for participating in this study. The purpose of this study is to better understand how to make the NHS Diabetes Prevention Programme more accessible and appealing to patients.

You completed an audio recorded interview to look at your views and opinions of this prevention programme. The reason for asking you to complete this task is because this project is looking at the views and experiences of participants who were offered this programme.

Your name will be replaced with a pseudonym (replacement name) where appropriate. Your details of participation will not be shared with anyone else. If the research is published, the pseudonym will be used in placement of your real name so that you are not identifiable.

As stated in the participant information sheet, you still have a right to withdraw from the research up to one week after the date on this form. If you would like to withdraw from the research, please email the researcher on the contact details below and your information will be destroyed.

Whilst a lot is being done and will be done to encourage people to attend the NHS Diabetes Prevention Programme, more research is needed to find the most effective way of encouraging people to attend this programme. Data collected will be used to improve practice in this area.

If you would like to know more about my results or if you have any questions or concerns about the research, you can email me on: Sonia.Begum@research.staffs.ac.uk

If you would like to discuss the programme in more detail, or would like more information or support, please see the links below, or speak to your GP or local provider.

Information about the NHS Diabetes Prevention programme:

https://www.england.nhs.uk/ourwork/qual-clin-lead/diabetes-prevention/

Information and support about Type 2 Diabetes:

https://www.diabetes.org.uk/

Appendix 19: Debrief form (Chapter 6)

Views and experiences of the NHS Diabetes Prevention Programme:

Debrief Form

Date: 11/12/2018

Dear Participant,

Thank you for participating in this study. The purpose of this study is to better understand how to make the NHS Diabetes Prevention Programme more accessible and appealing to patients.

You completed an audio recorded interview to look at your views and opinions of this prevention programme. The reason for asking you to complete this task is because this project is looking at the views and experiences of participants who were offered this programme.

Your name will be replaced with a pseudonym (replacement name) where appropriate. Your details of participation will not be shared with anyone else. If the research is published, the pseudonym will be used in placement of your real name so that you are not identifiable.

As stated in the participant information sheet, you still have a right to withdraw from the research up to one week after the date on this form. If you would like to withdraw from the research, please email the researcher on the contact details below and your information will be destroyed.

Whilst a lot is being done and will be done to encourage people to complete the NHS Diabetes Prevention Programme, more research is needed to find the most effective way of encouraging people to complete this programme. Data collected will be used to improve practice in this area.

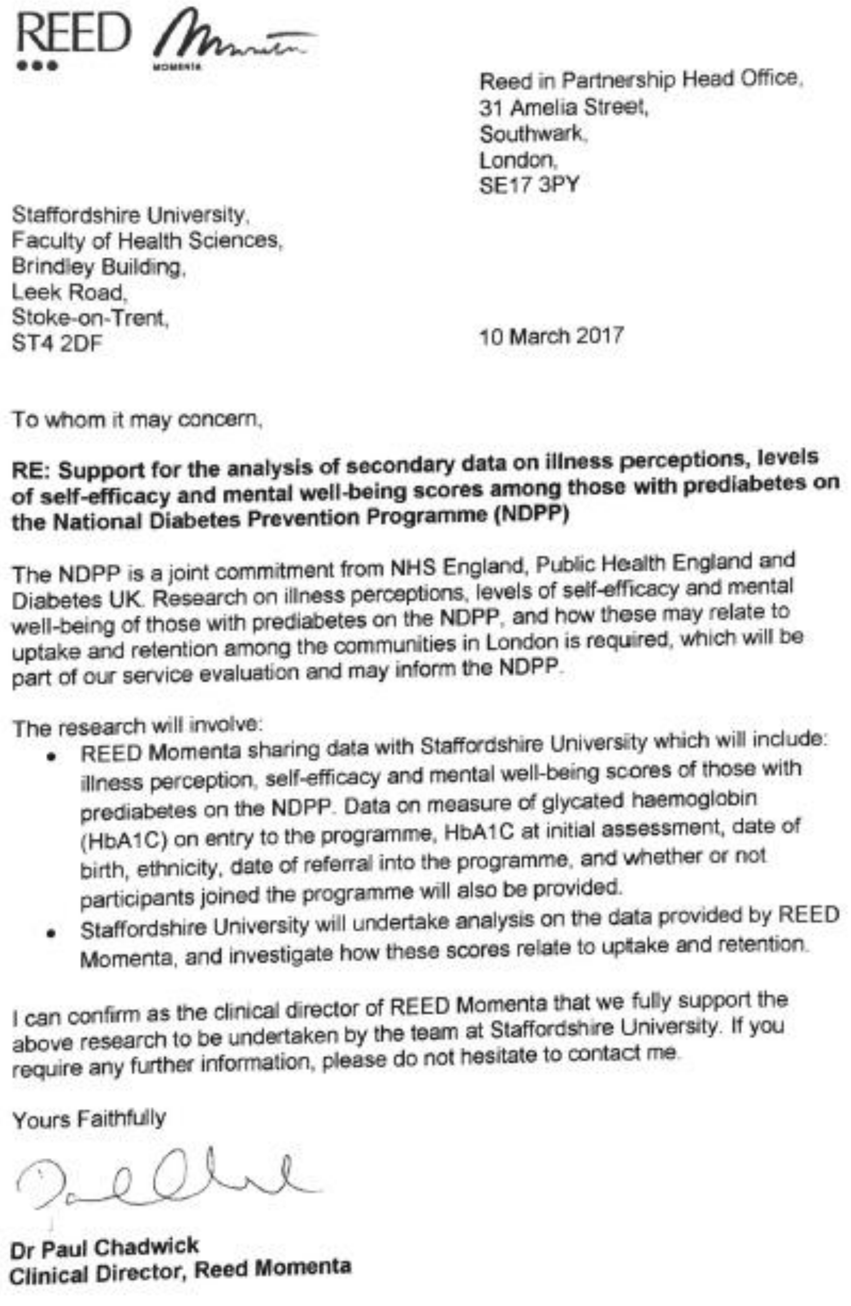
If you would like to know more about my results or if you have any questions or concerns about the research, you can email me on: Sonia.Begum@research.staffs.ac.uk

If you would like to discuss the programme in more detail, or would like more information or support, please see the links below, or speak to your GP or local provider.

Information about the NHS Diabetes Prevention programme: https://www.england.nhs.uk/ourwork/qual-clin-lead/diabetes-prevention/

Information and support about Type 2 Diabetes: https://www.diabetes.org.uk/

Appendix 20: Letter of support (Chapter 7)



REED Momenta

Reed in Partnership Head Office,
31 Amelia Street,
Southwark,
London,
SE17 3PY

Staffordshire University,
Faculty of Health Sciences,
Brindley Building,
Leek Road,
Stoke-on-Trent,
ST4 2DF

10 March 2017

To whom it may concern,

RE: Support for the analysis of secondary data on illness perceptions, levels of self-efficacy and mental well-being scores among those with prediabetes on the National Diabetes Prevention Programme (NDPP)

The NDPP is a joint commitment from NHS England, Public Health England and Diabetes UK. Research on illness perceptions, levels of self-efficacy and mental well-being of those with prediabetes on the NDPP, and how these may relate to uptake and retention among the communities in London is required, which will be part of our service evaluation and may inform the NDPP.

The research will involve:

- REED Momenta sharing data with Staffordshire University which will include: illness perception, self-efficacy and mental well-being scores of those with prediabetes on the NDPP. Data on measure of glycated haemoglobin (HbA1C) on entry to the programme, HbA1C at initial assessment, date of birth, ethnicity, date of referral into the programme, and whether or not participants joined the programme will also be provided.
- Staffordshire University will undertake analysis on the data provided by REED Momenta, and investigate how these scores relate to uptake and retention.

I can confirm as the clinical director of REED Momenta that we fully support the above research to be undertaken by the team at Staffordshire University. If you require any further information, please do not hesitate to contact me.

Yours Faithfully

Dr Paul Chadwick
Clinical Director, Reed Momenta

Appendix 21: Data agreement sharing form (Chapter 7)

Third party data sharing agreement

Local Provider
[name and address removed]

Background: This third party data sharing agreement is between the Local Provider (LP) and Staffordshire University study team to facilitate the analysis of secondary anonymised data from LP as part of their service evaluation of the National Diabetes Prevention Programme (NDPP). These data will be used to identify predictors of uptake.

This anonymised data of the NDPP participants will include of the following measures of health perceptions, health, diabetes risk and demographic information.

Data analysis: Primary analysis of the anonymised data will include conducting a logistic regression to identify if 3 factors (scores on the Brief IPQ-R, New General Self-efficacy and WEMWBS scales) predict uptake of the NDPP programme, independent of other possible confounders (including age, ethnicity, HbA1C levels and deprivation).

Data storage: The anonymised data will be given electronically by the LP and stored on a password protected, university computer. The processing of data will comply with the Data Protection Act (1998) and will be processed only for the purposes of this research project with all data received anonymously. Access to the data will be limited to the research team for the purpose of this research only. Data will be stored for 10-years in accordance with the Staffordshire University Code of Conduct for Research. At the end of this storage period, all original and back up files will be deleted from University computers.

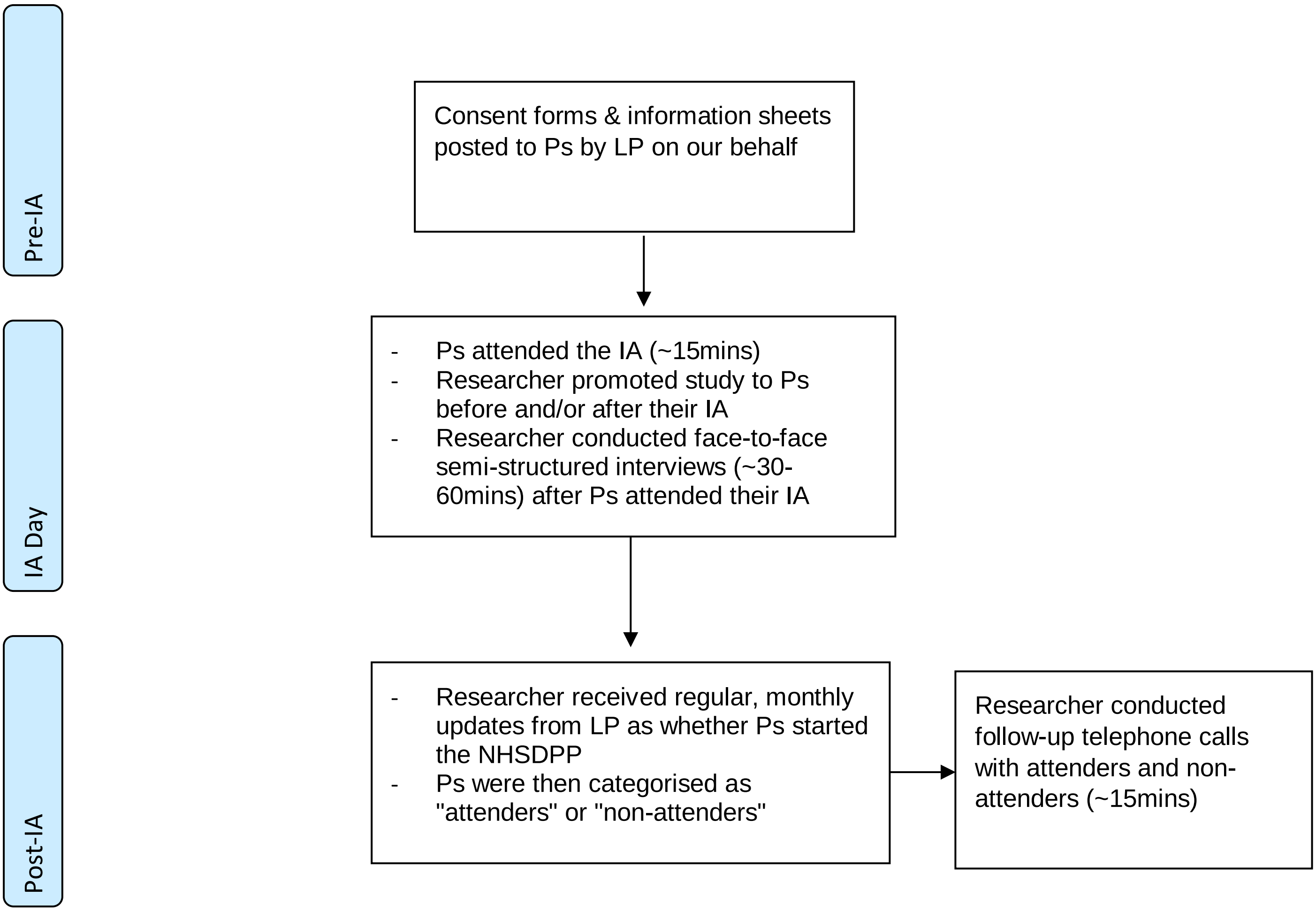
By signing below, both parties agree to the above.

SIGNATURES

Signed on behalf of the Local Provider:	
Name	
Job Title	
Date	
Signature	
Signed on behalf of Staffordshire University Research Study team:	
Name	
Job Title	
Date	
Signature	

Appendix 22: Recruitment process (Chapter 5)

Flowchart of the NHSDPP recruitment process for attenders and non-attenders



Key:

Ps= participants

IA= initial assessment

LP= local provider

Appendix 23: Demographic questionnaire (Chapter 5)

Study of uptake of the NHS Diabetes Prevention Programme

1. **Gender:** Male ☐ Female ☐

2. **Date of Birth**: ____________ (dd/mm/yyyy)

3. **Ethnicity**...Please tick the option that best describes your ethnicity:

White ☐
Mixed ☐
Asian or Asian British ☐
Black or Black British ☐
Other ☐ Please specify:

4. What is your home postcode? ………………………

5. Which of the following best describes your current work situation?

Full-time work ☐
Part-time work ☐
Casual ☐
Student/ in training ☐
Look after home/family ☐
Unemployed ☐
Retired ☐
Long-term sickness ☐

6. Please state your job role (if applicable)……………………………………..

7. Are you a **smoker**?

Yes ☐
No, but I used to ☐
No, I have never ☐

8. Do you currently have any medical conditions or chronic illness?

No ☐
Yes ☐ Please specify ………………………………………………..

Appendix 24: Reasons for non-attendance (Chapter 5)

Reasons for non-attendance at follow-up

Reasons for non-attendance	**Number of Participants**
Organisational issues (changing of session timings and lack of notice)	3
Inconvenience (session times and location)	7
Poor health	2
Knowledge of T2DM risk	2
Travel abroad	2
Lack of time	1

Appendix 25: Themes and sub-themes (Chapter 5)

Themes and sub-themes derived from the data.

Themes	Sub-themes
Understanding of T2DM	Current T2DM knowledge
	Emotional reactions and feelings
	Difficulties with understanding
	Facilitating understanding
Lifestyle changes (past and present)	Lifestyle changes made
	Difficulties and concerns with making lifestyle improvements
Comparison with others	Family
	Friends
	Other people
Support	Family
	Friends
	Group Members
	Programme delivery staff
Self-perceptions*	Body Image*
Accessibility and practicalities	Booking appointments
	Availability
	Location
	Time limitations or constraints
	Programme access
Motivations	Aspiring to looking after yourself
	Expectations
	Mind over matter*
	Family is a motivator*
	Commitment to start programme

*applies to attenders only

Appendix 26: Participant details (Chapter 5)

Participant Number	Name	Attendance status	Ethnicity	Gender	Age (years)*
1	William	A	BBB	M	51
2	Zainab	A	AAB	F	55
3	Hawa	A	BBB	F	40
4	Mark	A	BBB	F	55
5	Gwynn	A	BBB	F	49
6	Margaret	A	WB	F	61
7	Omer	NA	O	M	42
8	John	NA	WB	M	48
9	Yvonne	NA	BBB	F	58
10	Grace	NA	BBB	F	41
11	Chloe	NA	WB	F	53
12	Natasha	A	BBB	F	45
13	Tim	A	WB	M	56
14	Gary	A	WB	M	62
15	Yousef	A	O	M	53
16	Ava	NA	BBB	F	69
17	Gladys	NA	WB	F	63
18	Zhang	NA	O	M	47
19	Fred	NA	WB	M	41
20	Claire	NA	WB	F	56
21	Charity	A	BBB	F	52
22	Herbert	A	BBB	M	48
23	Azeem	A	MI	M	59
24	Ariyo	A	BBB	M	54
25	Anna	A	WB	F	58
26	Jericho	A	BBB	M	56
27	Katerina	A	O	F	64
28	David	A	WB	M	47
29	Mandy	A	O	F	42
30	Letisha	A	BBB	F	52
31	Natalie	A	WB	F	54
32	Saif	NA	AAB	M	49
33	Arjun	A	AAB	M	34
34	Charlotte	NA	MI	F	25
35	Ebony	A	BBB	F	45

Key: A=Attender, NA=Non-attender, BBB= Black/Black British, AAB= Asian/Asian British, WB= White British, O=Other, MI=Mixed, M=Male, F=Female, *at the time of the pre-programme interview. Please note: all names are pseudonyms.

Appendix 27: Test for differences of IPQ item scores (Chapter 7)

Test for differences of IPQ item scores between those who did vs. did not start the NHSDPP and between those who did vs. did not complete the NHSDPP

Mann-Whitney U-tests showed there to be statistically significant differences between those that took up the programme (i.e., started) and those that did not, in the IPQ items related to consequences, timeline, treatment control, and illness concern, and these IPQ items were used in the logistic regression model (Table 1).

Table 1- Test for differences of IPQ item scores between those who did and did not start the NHSDPP

		IPQ Items							
	Uptake	Q1: Consequences	Q2: Timeline	Q3: Personal control	Q4: Treatment control	Q5: Identity	Q6: Illness concern	Q7: Coherence	Q8: Emotional reasoning
N	Yes	2,916	2,798	2,856	2,907	2,861	2,913	2,907	2,897
	No	1,941	1,847	1,898	1,930	1,880	1,933	1,930	1,906
Median score	Yes	2.00	3.00	6.00	8.00	0.00	8.00	5.00	2.00
	No	1.00	3.00	6.00	8.00	0.00	7.00	5.00	2.00
Mann-Whitney *U*	-	2729843.50	2423524.00	2708774.50	2452073.50	2682773.50	2543659.50	2801831.50	2675103.00
z-score	-	-2.192	-3.636	-.034	-4.737	-.156	-5.825	-.073	-1.879
p-value (two-tailed)	-	.028	<.001	.973	<.001	.876	<.001	.942	.060

For completers, results from a Mann-Whitney U test showed there to be statistically significant differences between those that completed the programme and those that did not, in the IPQ items related to consequences and personal control, and these IPQ items were used in the logistic regression model (Table 2).

Table 2-Test for differences of IPQ item scores between those who did and did not complete the NHSDPP

		IPQ Items							
	Completer	Q1: Consequences	Q2: Timeline	Q3: Personal control	Q4: Treatment control	Q5: Identity	Q6: Illness concern	Q7: Coherence	Q8: Emotional reasoning
N	Yes	636	600	613	613	622	626	621	626
	No	2,280	2,198	2,243	2,232	2,239	2,287	2,286	2,271
Median score	Yes	2.00	3.00	7.00	8.00	0	8.00	5.00	2.00
	No	2.00	3.00	6.00	8.00	0	8.00	5.00	3.00
Mann-Whitney *U*	-	686832.500	638122.000	649725.000	678387.500	670344.000	693284.500	694542.000	675925.500
z-score	-	-2.120	-1.228	-2.104	-.327	-1.560	-1.239	-.830	-1.933
p-value (two-tailed)	-	.034	.219	.035	.743	.119	.215	.407	.053

Appendix 28: Test for differences of variables included and excluded in LR (Chapter 7)

There were no statistically significant differences between those participants included in the logistic regression for uptake and those excluded, except for programme location, WEMWBS and the IPQ item related to timeline (Tables 1 & 2). There was a significant association between programme location and those excluded and included in the logistic regression (□2 (5, N=10,739) =643.178, p=<.001) (Table 2). However, the association was weak (ϕ=.245) and accounted for just 6% of the variance (ϕ^2=0.06). There was a significant association between WEMWBS and those excluded and included in the logistic regression (□2 (2, N=10,679) =11.601, p=.003) (Table 2). However, the association was weak (ϕ=.033) and accounted for just 0.1% of the variance (ϕ^2=0.001). The IPQ scores for timeline were significantly not different in those included and excluded in the logistic regression for uptake (*Mdn*=3.00) (Table 1).

Table 1- Test for differences (Mann-Whitney U test) of variables between those included and excluded in the LR for uptake

		LR variables				
	Included in LR	Q1: Consequences	Q2: Timeline	Q4: Treatment control	Q6: Illness concern	GS-ES
N	Yes	3,756	3,756	3,756	3,756	3,756
	No	1,844	1,603	1,685	1,829	2,477
Median score	Yes	1.00	3.00	8.00	8.00	30.00
	No	2.00	3.00	8.00	8.00	30.00
Mann-Whitney *U*	-	3389359.00	2845993.00	3101241.00	3422312.50	4581832.50
z-score	-	-1.357	-3.216	-1.211	-.227	-1.010
p-value (two-tailed)	-	.175	.001	.226	.821	.313

Table 2- Test for differences (Multi-dimensional Chi-Square test) of variables between those included and excluded in the LR for uptake

Variables		Excluded in LR count (residual)	Included in LR count (residual)	Total (N)	Pearson Chi Square (□2)	df	Asymptotic Significance (2-sided) *p*-value	Phi (ϕ)
Programme area		6983	3756	10739	643.178	5	<.001	.245
	North East London	990 (116.1)	354 (-116.1)	1344				
	Cumbria	1011 (-2.7)	548 (2.7)	1559				
	Herefordshire	538 (-105.1)	451 (105.1)	989				
	Berkshire	327 (-255.6)	569 (255.6)	896				
	South London	2974 (-17.8)	1627 (17.8)	4601				
	West Yorkshire	1143 (265.2)	207 (-265.2)	1350				
Gender		6901	3756	10657	.516	1	.473	-.007
	Female	3811 (17.6)	2047 (-17.6)	5858				
	Male	3090 (-17.6)	1709 (17.6)	4799				
Age		6968	3756	10724	15.426	8	.051	.038
	<40	313 (1.8)	166 (-1.8)	479				
	40-44	321 (4.6)	166 (-4.6)	487				
	45-49	484 (10.3)	245 (-10.3)	729				
	50-54	712 (-13.8)	405 (13.8)	1117				
	55-59	872 (-6.5)	480 (6.5)	1352				
	60-64	850 (-9.6)	473 (9.6)	1323				

Variables		Excluded in LR count (residual)	Included in LR count (residual)	Total (N)	Pearson Chi Square (□2)	df	Asymptotic Significance (2-sided) *p*-value	Phi (ϕ)
	65-69	995 (-47.2)	609 (47.2)	1604				
	70-74	1092 (3.7)	583 (-3.7)	1675				
	≥ 75	1329 (56.8)	629 (-56.8)	1958				
Ethnicity		4591	3756	8347	5.582	4	.233	.026
	White British or White	2936 (13.2)	2378 (-13.2)	5314				
	Black	789 (-30.5)	701 (30.5)	1490				
	Asian	649 (14.3)	505 (-14.3)	1154				
	Mixed	105 (-5.6)	96 (5.6)	201				
	Other	112 (8.6)	76 (-8.6)	188				
Deprivation quintile		6860	3756	10616	3.985	4	.408	.019
	1 (most deprived)	1593 (4.7)	865 (-4.7)	2458				
	2	1678 (12.8)	899 (-12.8)	2577				
	3	1356 (-37.8)	801 (37.8)	2157				
	4	1105 (16.8)	579 (-16.8)	1684				
	5 (least deprived)	1128 (3.6)	612 (-3.6)	1740				
WEMWBS		6923	3756	10679	11.601	2	.003	.033

Variables		Excluded in LR count (residual)	Included in LR count (residual)	Total (N)	Pearson Chi Square (□2)	df	Asymptotic Significance (2-sided) *p*-value	Phi (ϕ)
	High	2035 (42.8)	1038 (-42.8)	3073				
	Medium	3746 (-82.1)	2159 (82.1)	5905				
	Low	1142 (39.3)	559 (-39.3)	1701				

Appendix 29: Results from LR for uptake using imputed data (Chapter 7)

Pooled results from the binomial logistic regression for uptake using multiple imputed data

Some statistically significant predictors in the complete-case analysis did not remain significant in the imputed analysis, and these included: programme area (Cumbria & West Yorkshire), age (45-54 years), deprivation (quintile 4) and ethnicity (Black). Also, ethnicity (mixed) reached near significance in the complete-case analysis only. Programme area (Herefordshire), gender and ethnicity (Asian) were significant in the imputed analysis but not in the complete-case analysis, with programme area (Berkshire), deprivation (quintile 4) and age (50-54 years) reaching near significance. The odds of females starting the NHSDPP was 15% higher than males (OR= 1.15; CI= 1.04-1.26; *p*=.005). Compared with participants classified as White British/White, the odds of starting the NHSDPP was lower in those from an Asian ethnic group (OR=0.76; CI=0.62-0.93; *p*=.011).

	Step 1		Step 2		Step 3		Step 4	
	OR (95% CI)	*p*	OR (95% CI)	*p*	OR (95% CI)	*p*	OR (95% CI)	*p*
Variables								
Programme area [North East London]: Cumbria	0.88 (0.73-1.07)	.198	0.91 (0.75-1.10)	.317	0.90 (0.74-1.10)	.297	0.90 (0.74-1.09)	.288
Herefordshire	0.81 (0.66-0.99)	.043	0.82 (0.66-1.01)	.059	0.81 (0.66- (1.00)	.048	0.80 (0.65-0.99)	.040
Berkshire	0.82 (0.67-0.99)	.044	0.82 (0.67-1.00)	.053	0.82 (0.67-1.00)	.046	0.82 (0.67-1.00)	.046
South London	1.01 (0.87-1.18)	.912	0.99 (0.85-1.17)	.932	0.99 (0.84-1.15)	.848	0.98 (0.84-1.15)	.824
West Yorkshire	1.05 (0.87-1.27)	.586	1.07 (0.88-1.30)	.491	1.07 (0.88-1.29)	.502	1.06 (0.88-1.29)	.521
Gender [Male]: Female	1.17 (1.07-1.29)	.001	1.15 (1.05-1.26)	.004	1.15 (1.04-1.26)	.005	1.15 (1.04-1.26)	.005
Age [<40]: 40-44	0.93 (0.71-1.22)	.620	0.95 (0.73-1.25)	.733	0.96 (0.73-1.25)	.743	0.96 (0.73-1.26)	.750
45-49	1.12 (0.86-1.44)	.401	1.15 (0.88-1.50)	.302	1.15 (0.88-1.50)	.304	1.16 (0.89-1.50)	.285
50-54	1.24 (0.97-1.57)	.081	1.26 (0.99-1.61)	.062	1.26 (0.99-1.61)	.060	1.27 (1.00-1.62)	.054
55-59	1.43 (1.14-1.79)	.002	1.47 (1.17-1.84)	.001	1.47 (1.17-1.84)	.001	1.47 (1.18-1.85)	.001
60-64	1.46 (1.16-1.84)	.002	1.51 (1.19-1.91)	.001	1.50 (1.19-1.91)	.001	1.51 (1.19-1.91)	.001
65-69	1.94 (1.51-2.49)	<.001	2.02 (1.57-2.60)	<.001	2.02 (1.57-2.60)	<.001	2.02 (1.56-2.60)	<.001
70-74	1.92 (1.48-2.47)	<.001	2.03 (1.57-2.62)	<.001	2.03 (1.58-2.63)	<.001	2.04 (1.58-2.64)	<.001
≥75	1.66 (1.30-2.11)	<.001	1.80 (1.40-2.32)	<.001	1.80 (1.40-2.31)	<.001	1.81 (1.41-2.32)	<.001
Ethnicity [White]: Black	0.97 (0.83-1.13)	.703	0.93 (0.77-1.12)	.405	0.93 (0.77-1.12)	.409	0.94 (0.78-1.13)	.456
Asian	0.82 (0.69-0.98)	.029	0.76 (0.62-0.94)	.013	0.76 (0.62-0.94)	.013	0.76 (0.62-0.93)	.011
Mixed	1.13 (0.70-1.83)	.586	1.08 (0.64-1.80)	.757	1.07 (0.65-1.76)	.779	1.07 (0.65-1.77)	.764
Other	0.85 (0.61-1.18)	.317	0.83 (0.60-1.16)	.272	0.85 (0.61-1.18)	.311	0.85 (0.61-1.18)	.323
Deprivation Quintile [1 most deprived]: Quintile 2	1.03 (0.91-1.16)	.660	1.02 (0.91-1.15)	.737	1.02 (0.90-1.15)	.745	1.02 (0.90-1.15)	.800
Quintile 3	1.04 (0.90-1.19)	.598	1.04 (0.90-1.19)	.640	1.04 (0.90-1.19)	.637	1.03 (0.89-1.19)	.683
Quintile 4	1.19 (1.02-1.38)	.028	1.17 (1.00-1.38)	.053	1.18 (1.00-1.38)	.049	1.17 (1.00-1.37)	.057
Quintile 5 (least deprived)	1.33 (1.14-1.54)	<.001	1.31 (1.13-1.53)	<.001	1.32 (1.13-1.53)	<.001	1.31 (1.13-1.52)	<.001

	Step 1		Step 2		Step 3		Step 4	
Brief IPQ Question 1: consequences	-	-	0.99 (0.96-1.02)	.627	0.99 (0.96-1.02)	.590	0.99 (0.96-1.02)	.569
Brief IPQ Question 2: timeline	-	-	1.02 (0.98-1.06)	.250	1.02 (0.98-1.06)	.252	1.02 (0.98-1.06)	.254
Brief IPQ Question 4: treatment control	-	-	1.04 (1.02-1.06)	.001	1.04 (1.02-1.06)	.001	1.04 (1.02-1.06)	.001
Brief IPQ Question 6: illness concern	-	-	1.06 (1.03-1.08)	<.001	1.06 (1.03-1.08)	<.001	1.06 (1.03-1.08)	<.001
NGS-ES score	-	-	-	-	1.00 (0.99-1.00)	.258	1.00 (0.99-1.00)	.242
WEMWBS [High score]: Medium score	-	-	-	-	-	-	1.16 (1.05-1.28)	.004
WEMWBS: Low score	-	-	-	-	-	-	0.98 (0.86-1.12)	.748

Abbreviations: OR= Odds Ratio (Exp(B) value); CI= 95% confidence interval; IPQ=Illness perceptions questionnaire; NGS-ES= New general self-efficacy scale; WEMWBS= Warwick-Edinburgh mental well-being scale; []=Referent.

Appendix 30: Results from LR for completion using imputed data (Chapter 7)

Pooled results from the binomial logistic regression for completion using multiple imputed data

Ethnicity (Asian) and deprivation (quintile 4) were significant predictors in the complete-case analysis but did not remain significant in the imputed analysis. Also, WEMWBS (low scores) and ethnicity (Black) reached near significance in the complete-case analysis only. Age (55-69 and ≥75 years), deprivation (quintile 2) and WEMWBS (low scores) were significant predictors in the imputed analysis but not in the complete-case analysis, with age (50-54 years), Asian and other ethnicity reaching near significance. Compared with individuals with high WEMWBS scores, those with low WEMWBS scores had 33% decreased odds of completing the NHSDPP (OR=0.67; CI=0.50-0.89; *p*=.006).

	Step 1		Step 2		Step 3		Step 4	
	OR (95% CI)	*p*	OR (95% CI)	*p*	OR (95% CI)	*p*	OR (95% CI)	*p*
Variables								
Programme area [West Yorkshire]: Cumbria	19.32 (9.76-38.25)	<.001	19.33 (9.76-38.27)	<.001	19.35 (9.78-38.31)	<.001	19.59 (9.89-38.79)	<.001
Herefordshire	35.57 (17.85-70.89)	<.001	35.62 (17.87-70.99)	<.001	35.06 (17.59-69.91)	<.001	35.06 (17.58-69.91)	<.001
Berkshire	18.35 (9.05-37.20)	<.001	18.38 (9.06-37.27)	<.001	18.48 (9.11-37.47)	<.001	18.49 (9.11-37.51)	<.001
South London	20.71 (10.54-40.70)	<.001	20.68 (10.52-40.65)	<.001	20.44 (10.40-40.19)	<.001	20.44 (10.40-40.19)	<.001
North East London	20.19 (9.82-41.52)	<.001	20.11 (9.78-41.37)	<.001	20.26 (9.85-41.66)	<.001	20.49 (9.96-42.13)	<.001
Gender [Male]: Female	0.95 (0.81-1.12)	.560	0.96 (0.82-1.12)	.596	0.95 (0.81-1.12)	.556	0.97 (0.83-1.14)	.685
Age [<40]: 40-44	1.25 (0.55-2.86)	.591	1.25 (0.55-2.86)	.593	1.27 (0.56-2.91)	.566	1.27 (0.55-2.89)	.578
45-49	1.23 (0.58-2.61)	.584	1.22 (0.57-2.57)	.611	1.23 (0.58-2.60)	.591	1.24 (0.58-2.62)	.580
50-54	1.80 (0.91-3.56)	.089	1.78 (0.90-3.51)	.098	1.80 (0.91-3.55)	.092	1.81 (0.92-3.59)	.087
55-59	2.03 (1.05-3.95)	.037	2.00 (1.03-3.90)	.041	2.02 (1.04-3.94)	.038	2.03 (1.04-3.96)	.037
60-64	2.34 (1.21-4.54)	.012	2.31 (1.19-4.48)	.013	2.33 (1.20-4.52)	.012	2.32 (1.20-4.51)	.013
65-69	2.93 (1.53-5.64)	.001	2.88 (1.501-5.54)	.002	2.90 (1.50-5.58)	.001	2.79 (1.45-5.38)	.002
70-74	3.48 (1.81-6.70)	<.001	3.41 (1.77-6.57)	<.001	3.45 (1.79-6.64)	<.001	3.31 (1.71-6.38)	<.001
≥75	2.92 (1.52-5.64)	.001	2.86 (1.48-5.52)	.002	2.87 (1.49-5.54)	.002	2.79 (1.44-5.39)	.002
Ethnicity [White]: Black	0.83 (0.57-1.21)	.300	0.83 (0.57-1.21)	.314	0.83 (0.57-1.22)	.327	0.82 (0.56-1.20)	.285
Asian	0.75 (0.55-1.01)	.057	0.77 (0.57-1.04)	.083	0.77 (0.57-1.04)	.083	0.76 (0.56-1.03)	.072
Mixed	0.79 (0.44-1.41)	.417	0.79 (0.44-1.43)	.431	0.77 (0.43-1.37)	.367	0.75 (0.42-1.35)	.333
Other	0.39 (0.15-1.02)	.055	0.39 (0.15-1.05)	.061	0.41 (0.15-1.07)	.068	0.41 (0.15-1.07)	.068
Deprivation Quintile [1 most deprived]: Quintile 2	0.79 (0.61-1.02)	.066	0.79 (0.61-1.02)	.065	0.79 (0.61-1.01)	.064	0.77 (0.59-0.99)	.040
Quintile 3	0.86 (0.66-1.12)	.263	0.85 (0.65-1.12)	.244	0.85 (0.65-1.12)	.244	0.83 (0.64-1.09)	.187

	Step 1		Step 2		Step 3		Step 4	
Quintile 4	1.12 (0.84-1.48)	.440	1.12 (0.84-1.48)	.441	1.12 (0.85-1.49)	.420	1.11 (0.84-1.47)	.472
Quintile 5 (least deprived)	0.88 (0.66-1.18)	.389	0.88 (0.66-1.17)	.376	0.89 (0.67-1.19)	.425	0.87 (0.65-1.16)	.340
Brief IPQ Question 1: consequences	-		0.99 (0.95-1.02)	.409	0.99 (0.95-1.02)	.350	0.99 (0.95-1.02)	.383
Brief IPQ Question 3: personal control	-	-	1.02 (0.99-1.06)	.183	1.02 (0.99-1.06)	.173	1.02 (0.99-1.06)	.232
NGS-ES score	-	-	-	-	0.99 (0.98-1.00)	.028	0.99 (0.98-1.00)	.013
WEMWBS [High score]: Medium score	-	-	-	-	-	-	1.07 (0.89-1.28)	.460
WEMWBS: Low score	-	-	-	-	-	-	0.67 (0.50-0.89)	.006

Abbreviations: OR= Odds Ratio (Exp(B) value); CI= 95% confidence interval; IPQ=Illness perceptions questionnaire; NGS-ES= New general self-efficacy scale; WEMWBS= Warwick-Edinburgh mental well-being scale; []=Referent.

Appendix 31: BCTs found in additional papers (Chapter 8)

	Chambers (2019)	Griauzde (2020)	Kitzman (2021)	Lotfaliany (2020)	Smith (2019)	Valabhiji (2020)
1. Goals and planning						
1.1 Goal setting (behaviour)			X	X	X	X
1.2 Problem-solving		X	X		X	X
1.3 Goal setting (outcome)			X	X	X	X
1.4 Action planning			X		X	X
1.5 Review behaviour goal(s)				X	X	
1.6 Discrepancy between current behaviour and goal			X		X	
1.7 Review outcome goal(s)				X	X	
2. Feedback and monitoring						
2.2. Feedback on behaviour		X			X	
2.3. Self-monitoring of behaviour		X	X	X	X	
2.4 Self-monitoring of outcome(s) of behaviour			X		X	
2.5 Monitoring outcome(s) of behaviour by others without feedback				X		
2.7 Feedback on outcome(s) of behaviour					X	
3. Social support						
3.1. Social support (unspecified)			X	X	X	
3.2 Social support (practical)					X	
3.3. Social support (emotional)			X		X	
4. Shaping knowledge						
4.1. Instruction on how to perform the behaviour		X	X	X	X	
5. Natural consequences						
5.1. Information about health consequences			X	X	X	
6. Comparison of behaviour						
6.1. Demonstration of the behaviour			X	X	X	
7. Associations						
7.1. Prompts/cues			X			
8. Repetition and substitution						
8.1. Behavioural practice/rehearsal			X	X	X	

8.2 Behaviour substitution		X			X	
8.4 Habit reversal			X			
8.7. Graded tasks					X	
9. Comparison of outcomes						
9.1. Credible source	X	X	X	X	X	
9.2 Pros and cons					X	
9.3. comparative imagining of future outcomes					X	
11. Regulation						
11.2. Reduce negative emotions			X		X	
15. Self-belief						
15.4 Self-talk			X			
New BCTs						
Incentive for participation			X			