Psychology, Faculty of Natural Sciences

University of Stirling

MSc Health Psychology

HPSP116 Research Project

A digital resource to increase walking for the self-management of type 2 diabetes for ethnic minority populations in the UK: A qualitative study

Student Number: 2412321

Supervisor: Dr Wendy Maltinsky

Submission Date: 14/09/2020

Word count:

Acknowledgements

I would like to thank my supervisor Wendy Maltinsky for all of her support and guidance throughout this project. Thanks to individuals at Pilton community health project for their assistance with participant recruitment and sense checking aspects of this study and the Digital health and care institute for funding this project.

TABLE OF CONTENTS

List of Abbreviations

T2D	Type 2 Diabetes mellitus
BCT	Behaviour change techniques
SCT	Social cognitive theory
HP	Health Professional

Abstract

Background: Prevalence of Type 2 diabetes mellitus (T2D) is higher amongst ethnic minority populations. Self-management such as walking is effective in reducing health complications associated with T2D. Digital technology is a cost-effective way to develop and implement self-management interventions such as walking.

Aims and Methods: To investigate what a potential digital resource to increase walking for management of T2D could look like for ethnic minority populations in the UK. The online survey included 29 questions surrounding: technology usage; walking attitudes; and digital resources based on behaviour change techniques (BCT) to increase walking. 15 participants with T2D, and from an ethnic minority group in the UK were included in analysis.

Results: Six BCTs important for increasing walking for self-management of T2D among ethnic minority populations in the UK were identified. BCTs include: self-monitoring; goal setting and planning; social support; outcome expectancy; feedback; and rewards. When examples of digital resources were presented this highlighted more specific aspects of BCTs participants felt would influence their walking.

Conclusions: Further research should gain a more in-depth understanding based on these findings to develop and test a digital resource to increase walking within ethnic minority groups in the UK.

Keywords: Type 2 Diabetes, Ethnic minority populations, UK, Walking, self-management, digital resource.

2. Introduction

2.1 Type 2 Diabetes

Type 2 diabetes mellitus (T2D) is a long-term health condition where blood glucose levels rise due to the pancreas not producing sufficient levels of insulin (Diabetes UK, 2020). If T2D is not managed appropriately it can lead to the development of other health complications and shorter life expectancy (Dack et al., 2019). T2D in the United Kingdom (UK) accounts for 90% of all diabetes cases reported (Diabetes.co.uk, 2019). There are several risk factors which can contribute to the diagnosis of T2D. These include: being overweight; diet; physical activity levels; family history; and ethnicity (Fletcher et al., 2002).

2.2 Ethnic minority groups

The definition of an ethnic group relates to different factors including: language; history; physical appearance; ancestry; religion; diet; and cultural heritage (Williams, 1997). Due to this range of factors it is important individuals are given the opportunity to self-identify when it comes to disclosing their ethnic group (Oldroyd et al., 2005). To confirm ethnicity, parental ethnic groups are collected (Goff, 2019). The list of ethnic minority groups within the UK used for this study were based on the official ethnicities developed for the 2011 England and Wales census (see Appendix C) (GOV.UK, 2020).

The prevalence of T2D is between three and five times greater in South Asian and African-Caribbean people compared to the white British population within the UK (Oldroyd et al., 2005). Additionally, the onset of T2D occurs 10-12 years younger amongst ethnic minority populations within the UK (Goff, 2019). Research suggests that ‘Second-generation immigrants display many of the same risk characteristics as their parents and grand-parents’ with regards to T2D (Barnett et al, 2006 pg. 2243). Therefore, increased risk of T2D within

ethnic minority populations is not going to improve over generations without intervention. Due to several serious health problems that arise when T2D is left untreated, ethnic minority groups experience a disproportionate health burden that effects patients, carers and the wider community (Wilson et al, 2012). Many T2D related health complications can be avoided if individuals are given advice and support to self-manage their condition (Dack et al., 2019). To achieve this, health professionals (HP) need to gain a better understanding of ethnic minority patients' views regarding factors that influence their ability to self-manage their T2D (Majeed-Ariss et al., 2015).

2.3 Self-management of T2D

Self-management is defined as an individual's ability to cope with and manage: symptoms; physical and psychosocial effects; treatment; and lifestyle changes associated with a chronic condition, such as T2D (Barlow et al., 2002). Recommendations from the National Institute for Health and Care Excellence (NICE) state that education related to the self-management of diabetes should be accessible to everyone by taking into account differences in ethnicity and culture (National Collaborating Centre for Chronic Conditions UK, 2008). However, research has found educational programs and interventions have been less effective amongst patients from ethnic minority groups (Creamer et al., 2016). An example which showed successful T2D self-management interventions for ethnic minority groups were ones which had been: culturally adapted; were community based; and involved frequent feedback (Wilson et al., 2012).

2.4 Walking and self-management of T2D

Benefits of physical activity, such as walking, have been shown in the self-management of T2D (Connelly et al., 2013). Vigorous forms of physical activity are

recommended for the effective management of T2D. However, patients with a T2D diagnosis often find it difficult to participate in this level of physical activity (Hamasaki, 2016). Therefore, the most popular form of accessible physical activity for T2D patients is walking (Richardson et al., 2007). Walking has been shown to reduce the risk of developing T2D (Hu et al., 1999) and decreasing blood glucose levels in patients with T2D (Qiu et al., 2014). The most common method of encouraging and monitoring walking in T2D patients is through use of pedometers (Richardson et al., 2007). Studies have found that using pedometers is effective in increasing the number of steps T2D patients accumulate daily (Tudor-Locke et al., 2004).

2.5 Digital technology for self-management

The last decade has seen the introduction and availability of applications (apps) and digital technology resources which can be utilised to improve health and wellbeing (Cafazzo, 2019). Due to the nature of T2D management many apps have been specifically designed to help manage different aspects of T2D such as: diet; physical activity; medication adherence; and blood glucose levels (Wu et al., 2017). Despite this, a 2013 study found that only 1.2% of diabetes patients who owned a smart phone used diabetes apps (Jahns, 2014). Furthermore, research conducted by Katz et al (2015) found that despite participants rating apps as helpful, this perception did not encourage long-term usage. Additionally, the endorsement of app usage to self-manage T2D is not regularly advocated by HP (Wu et al., 2017). This is associated with the lack of current research into the effectiveness of digital resources (Wu et al., 2017). A systematic review conducted by Greenwood et al (2017) found that interventions with the greatest effectiveness were ones which connected with patients' health care providers. Therefore, highlighting the role of HP in the use of apps for the self-management of T2D. It is important to note criticisms regarding the quality of

studies included in the aforementioned systematic reviews (Greenwood et al., 2017; Wu et al., 2017) as they have been conducted within a new research area.

2.6 Behaviour change techniques and social cognitive theory

Behaviour change techniques (BCT) are key factors present in behaviour change interventions designed to be replicable, complex and observable (Michie et al., 2013). Behaviour change interventions using BCT have been used to increase physical activity such as walking (Conroy et al., 2014; Procter et al., 2014). Research suggests the use of BCT in digital resources with regards to health promotion (Webb et al., 2010). Conroy et al (2014) found most top-rated apps for physical activity used less than four BCTs. These included: goal setting; instructional information surrounding techniques and exercises; social support; and performance feedback. Previous BCTs found to be successful in changing physical activity behaviours included: behaviour practice; planning; problem solving; self-monitoring; feedback; social support; goal setting; and prompts (Cradock et al., 2017).

Using social cognitive theory (SCT) to gain an understanding of physical activity behaviours is appropriate due to the interactions between the individual, behaviour and environment (Bandura, 2001). The following SCT constructs have been shown to influence physical activity behaviours: self-efficacy; behavioural capability; self-regulation; outcome expectancy and social support (Chase, 2013). SCT based interventions to increase physical activity have shown to be effective (Joseph et al., 2017; Shamizadeh et al., 2019).

2.7 Online survey question selection

To ensure sufficient research data, online survey questions were carefully selected. Multiple choice questions were presented to gauge current technology usage. Although the onset of T2D occurs younger amongst ethnic minority groups within the UK (Goff, 2019),

Wi-Fi and technology access could not be assumed. Access to these devices is key as this could act as a potential barrier when developing a resource. There has been limited research to investigate disparities between technology usage for health comparing ethnic minority groups. The few studies that have been conducted have shown that individuals from ethnic minority groups are less likely to access health-related technology than white individuals (Mitchell et al., 2019).

Previous research conducted by Joseph et al (2017) used the aforementioned constructs of SCT to test cultural relevance when designing an intervention for African-American women to promote physical activity. Questions regarding walking for this online survey were adapted from the questions used in Joseph et al's study due to their evaluated effectiveness.

Digital technology examples designed using BCT to increase walking were included within the survey. The BCTs included were taken from the BCT taxonomy (Michie et al., 2013) as follows: reward; prompts/cues; self-monitoring of behaviour; goal setting; outcome expectancy, social support and knowledge. These were chosen to replicate previous studies where similar BCTs were found to be effective in changing physical activity behaviours (Cradock et al., 2017).

2.8 Purpose of this study

T2D costs the NHS over £1.5m every hour. Costs are expected to continually rise as the prevalence of the disease rises globally (Diabetes.co.uk, 2019). These figures emphasise the need for a cost-effective solution for the prevention and self-management of T2D. As

the prevalence of T2D increases, research is emerging in relation to T2D management and prevention. However, research dedicated to understanding and overcoming cultural barriers to current T2D management and prevention is limited (Creamer et al., 2015). Consequently, ethnic minority groups are placed at greater risk through lack of access to culturally appropriate resources to prevent and manage T2D. The use of digital resources is perceived to be the most cost-effective solution in the self-management and prevention of T2D (Li et al., 2018).

This online survey aimed to investigate the effectiveness of using a digital resource to help increase walking for self-management of T2D within ethnic minority populations in the UK. With the aim of gaining an understanding of participants' walking attitudes and explore how a digital resource could increase participants' walking through the use of related BCTs. The data collected aims to influence the development of future digital resources to help increase walking for self-management of T2D within ethnic minority groups in the UK.

3. Methods

3.1 Design

Original design

The original design of this study was to run two focus groups in connection with Pilton Community Health Project based in Edinburgh (PCHP).

Modified design

Due to COVID-19 lockdown restrictions face-to-face focus groups were cancelled. The study design was changed to create an online qualitative survey using Qualtrics. This study was linked with another University of Stirling student's study as the target population and demographic questions were the same for both projects. This project was completed in partnership with PCHP and funded by the Digital Health and Care institute (DHI).

Survey design

In order to obtain the same data from the online survey as the previously planned focus groups a total of 29 specifically designed questions were used. The survey contained (see Appendix C): eight demographic questions to ensure inclusion criteria was met; nine current technology usage questions; six open-ended walking questions; two multiple choice questions related to BCT based digital technology examples; four open-ended questions to explain reasons behind BCT choices.

Walking questions were adapted from existing social cognitive theory (SCT) (Bandura, 1988) based questions as used by Joseph et al (2017). These were based on four main factors: behavioural capability; social support; self-efficacy; and self-regulation. Following walking questions participants were asked to select three digital technology examples based on BCTs

from a list of 15 that they felt would increase walking and three that would not increase walking. Finally, participants were asked to explain their reasoning in depth.

All questions were sense checked by experts working in this field to reduce the risk of questions being misinterpreted and/or causing offense.

3.2 Participants

Recruitment

The recruitment of participants relied on volunteer sampling. The online survey link was posted to social media sites such as Facebook, Twitter and LinkedIn. Recruitment was targeted to specific T2D Facebook groups. Gatekeepers -individuals identified from PCHP -were used to recruit on the researcher's behalf as they had contact with groups where members fit inclusion criteria.

Recruitment incentives

To encourage recruitment, participants were asked to vote for one of three charities on completion of the survey (The Health and Wellbeing Project Glasgow, Pilton Community Health Project, or Saheliya). The charity with the most votes on closure of the survey would receive an £100 donation.

Recruitment problems

Initially recruitment was slow and only a few participants progressed beyond the demographic questions. As eligible participants were clicking the survey link and completing the first set of questions it was thought to be a retention issue. To motivate participants to complete the survey a £10 voucher on completion was introduced. To reduce

the risk of participants skipping through questions without answering fully force response logic and a minimum limit of 50 characters was applied to open-ended questions.

The addition of the voucher increased participation, however, it was apparent participants had completed the survey several times to receive multiple vouchers. Fake responses were confirmed through the submission of the same email address multiple times. Participant email addresses and survey responses were not linked due to ethical concerns. Therefore, fake survey responses could not be identified directly by email address. Fake responses were identified prior to data analysis using an inconsistency approach (Huang et al., 2012). This was clearly identified by participants using the same answers across multiple responses and the use of copy and paste of the same text across multiple questions in a row. To reduce the risk of receiving more fake responses the survey link was removed from social media and recruitment continued through Gatekeepers. These Gatekeepers reached out to potential participants and provided the researchers with contact information to send the survey link directly.

Gatekeepers suggested that language barriers may be a potential recruitment problem. To make the survey more accessible an option was added to complete the survey over the phone with a researcher or via Microsoft teams using the screenshare function. This alternative was only requested by one participant and they were not assigned to complete the questions from this study.

Participant inclusion criteria

In order to complete the online survey participants were required to access the online link using an internet enabled device and read and answer the questions in English. The

participant inclusion criteria: participants had to be 18 years or older; currently live in the UK; have T2D or a prediabetes diagnosis; and self-identify as being from an ethnic minority group. Participants who did not meet the inclusion criteria were directed to the end of the study and shown an end of survey message (see Appendix E).

Participant exclusion

A total of 126 participants agreed to participate in the online survey, after data cleaning the total number of participant responses analysed in this study was 15. See table 1.

Table 1

Number of excluded responses and reasons for exclusion from analysis.

Reason for exclusion of data	Number of responses excluded
Non completion of the demographic questions	24
Not completing beyond the demographic questions (pre-randomisation)	70
Non completion of the open-ended questions	11
Responses considered fake	5

3.3 Ethical approval

Ethical approval for this study was granted by the University of Stirling Health Psychology department prior to online distribution of the survey (see Appendix P). Ethical approval was granted on two separate occasions. Following the addition of the voucher incentive and the option to complete the study directly with the researcher.

3.4 Procedure

Participants were asked to follow the link to the online survey where they could read the participant information form (see Appendix A) and complete the online consent form to

confirm their participation (see Appendix B). Participants were given a unique ID number to use should they wish to withdraw their data. After completing the demographic questions participants were randomised to receive either study 1 or study 2 questions. Study 2 questions relate to this study (see Appendix C). Participants were directed to a debrief sheet and asked to vote for one of the listed charities (see Appendix D). Lastly participants were directed to a separate Qualtrics study to enter their email address to receive a £10 voucher.

3.5 Data analysis

Data collected was exported from Qualtrics into excel where the data was cleaned to eliminate unusable responses as outlined in table 1.

The walking questions and BCT questions were analysed using Braun and Clarke's (2006) six phase approach to thematic analysis. A deductive approach was used as questions were based on existing theory that formed the basis of the survey questions. Themes of a latent nature were categorised in the analysis of this data. The researcher aimed to investigate beyond the basic themes identified and compare these and relate to existing theory. This data was analysed from a realism ontological approach -where the existence of single reality can be experienced and understood as a truth. The epistemological approach was subjectivist- where reality can be altered to fit individuals in a way they understand (Moon & Blackman, 2014).

As per the first stage of Braun and Clarke's (2006) six phase approach, the researcher familiarised themselves with the data collected from the open-ended questions. This was achieved by sorting participant responses by question and reading these multiple times to secure an understanding. Once familiar with the data initial codes were highlighted. These

codes were subsequently used to complete the third stage of Braun and Clarke's (2006) six phase approach-grouping codes into related themes. These were reviewed and any which were not appropriate or too similar were removed. Further analysis of themes was conducted to ensure they were related to the research question. At this stage sub-themes were identified and added to the larger more complex themes to make these more defined. These codes, themes and sub themes were added to a framework (see Appendix G). The frameworks are separated by theory.

Reflexivity statement

The researcher analysing this data has personal knowledge of T2D through family members with a diagnosis. Furthermore, through volunteering at a walking group, that helps individuals increase their physical activity, the researcher has observed first-hand the impacts of walking. The researcher was aware of these personal experiences and how they could potentially lead to bias when analysing the data. This was taken into consideration to reduce the risk of influencing the analysis in this way.

4. Results

4.1 Participant characteristics

Out of 15 participants, eight were males (53.3%) and seven were females (46.6%). All participants reported a T2D diagnosis. For further demographic details see table 2 and table 3.

Table 2

Participant demographics

Age range	*n*	% of participants	*n*	Diabetes diagnosis	*n*	% of participants
32-45	4	26.6%	4	Less than 6 months	1	6.6%
46-58	8	53.3%	8	1-5 years	7	46.6%
59-71	3	20%	3	5-10 years	4	26.6%
				10+ years	3	20%

Note. n= number of participants out of 15.

Table 3

Percentage of participants and self-identified ethnic group

Ethnic group		*n*	% of participants
Mixed/Multiple ethnic groups	*White and black Caribbean*	1	6.6%
	White and black African	4	26.6%
	White and Asian	1	6.6%
Asian/Asian British	*Indian*	2	13.3%
	Pakistani	2	13.3%
Other ethnic group	*Arab*	4	26.6%
	Black Nubian	1	6.6%

Note. n= number of participants out of 15.

4.2 Current technology usage

All participants had access to Wi-Fi. One participant had access to a single digital device while the majority of participants reported access to multiple devices. Of these, 86.6% of participants reported daily usage. Over half of participants (66.6%) reported owning and using a fitness tracker regularly (60%) at least weekly. See table 4.

Table 4

The percentage of participants with access to specific digital devices and fitness trackers.

Digital Devices	*n*	% of participants	Fitness trackers	*n*	% of participants
Laptop	8	*53.3%*	Apple watch	9	*60%*
PC	8	*53.3%*	Garmin	1	*6.6%*
Tablet/iPad	9	*60%*	None	4	*26.6*
Smart phone	14	*93.3%*			

Note. n= number of participants out of 15.

Participants used SMS and calls most frequently on their digital devices. Apps used by participants only showed slight variation (14.3%) in weekly usage. See table 5.

Table 5

Showing apps and the percentage of participants using these weekly.

SMS and Call weekly usage	*n*	% of participants
SMS/text	10	71.4%
Phone call	14	100%
Apps used weekly	***n***	**% of participants**
Skype	8	57.1%
Twitter	7	50%
Instagram	7	50%
Facebook	9	64.3%
Facebook messenger	9	64.3%
WhatsApp	9	64.3%

Note. n= number of participants out of 14.

4.3 Walking

Walking questions presented to participants were based on five concepts associated with SCT (see Appendix F). Key themes were derived from each of these concepts (see Appendix G).

Behavioural capabilities

The main themes show walking was perceived as important. Participants shared a preference for increasing walking slowly over a longer time period as shown by:

"I would start slowly"

and

"Do not expect to do it overnight"

The BCT of planning and goal setting was mentioned as a way to increase walking. Participants emphasised setting and following their own walking plans as noted by these responses:

"I will make a walking plan, increase the walking distance, and walk according to my own plan"

and

"We should increase the amount of walking we set for ourselves"

The theme and BCT of social support was noted as participants mentioned ways other people could increase their walking. For example:

"Take family or friends so have company"

and

"Just need other people to walk with"

Social support

The theme of social support was identified across several SCT concepts and was not exclusive to social support-based questions. The preferred type of social support was close family and friends. Participants noted they would benefit from their close family and friends motivating them through words of encouragement such as:

"Things that would motivate me, say I'm doing well and how benefitting it is"

The BCT of outcome expectancy was noted as important information to receive from close friends and family, for example:

"I hope they tell me more about the benefits of walking"

Participants shared that familiarity and common connection, including a common language and or interest, was important if they were joining them whilst walking to aid as a distraction as shown by:

"Time would pass quicker talking whilst walking"

and

"Common interests to discuss on the way"

Outcome expectancy

To reduce the risk of priming participants with the benefits of walking participants were not asked a question explicitly related to outcome expectancy. Despite no formal question the positive expectations participants had of walking were frequently noted.

The theme related to positive bodily changes and long-term benefits. Some participants shared positive outcomes they had already experienced from walking such as:

"Since walking sleep is getting better and better"

Whereas, others shared perceptions of how they felt walking could benefit their health for example:

"Walking can make me stronger and stronger"

Responses also explored mental health benefits related to walking and perceptions regarding how achievable they felt walking was for them.

Self-efficacy

The theme of encouragement from others was shown to increase walking through motivational quotes, reassurance and advice regarding walking. Participants also shared previous positive experiences which has helped with self-efficacy, as shown below:

"Taking part in marathons…which has increased the motivation of walking"

The theme of challenges and barriers both perceived and experienced by participants were noted. Barriers ranged from environmental factors, such as weather and time restraints, to health concerns and mental attitude such as:

"The biggest challenge is the weather, rainy days, snowy days, the weather where I can't walk"

and

"Making the time during busy day to day life"

Despite this online survey being conducted during COVID-19 lockdown restrictions only one participant mentioned this as a barrier to their walking, as shown by:

"During lockdown and working from home my walking is limited to possibly 20-30mins a week during my weekly shopping trip"

Participants explored ways they have overcome barriers in the past and ways they intend to overcome barriers in the future to increase walking. Solutions included the BCT of social support as noted by one participant:

"With a family member I enjoyed it"

Another BCT noted to overcome barriers was goal setting and planning, for example:

"draw up a plan"

and

"attitude to push myself to the daily walking plan"

Self-regulation

Themes of goal setting, planning and self-monitoring were apparent throughout walking questions and were not exclusive to self-regulation questions. Current experiences of self-monitoring varied, as noted by these responses:

"I don't keep track of my walking I should invest in a Fitbit"

and

"I use the apple fitness tracker to record every step I take"

This BCT was mentioned within responses to self-regulation-based questions. However, it was more apparent across other question responses, such as behavioural capability. An

example mentioned in relation to self-regulation was from someone who already implements walking specific planning:

"I usually make a walking itinerary plan"

For tables of codes, sub-themes and themes for walking question responses see Appendix H-L.

4.4 Digital technology

Digital technology options were designed using the BCT taxonomy (Michie et al., 2013) (see Appendix C). Participants selected three digital technology options that would increase their walking, and three that would not, from a list of 15. Options were split into respective BCT categories. The number of participants selecting digital technology options within each category was then calculated as a percentage of total participant selections. This was calculated for options that would both increase and would not increase walking. (see Appendix M).

Digital technology options

Findings show 40% of participants selected that 'An app where you can log your walking and earn virtual rewards/medals' or 'a device that measures your walking' would increase their walking. These digital technology options fit into the rewards and self-monitoring BCT categories, respectively. See table 6.

In comparison, the highest percentage of participants (53.3%) selected 'A website that detailed the health benefits of walking' as a digital resource they felt would not increase their walking. This is part of the outcome expectancy BCT category. See table 6.

Table 6

Shows BCT category, corresponding digital technology options and percentages of participant selections for both would and would not increase walking.

		Would increase walking		Would not increase walking	
BCT	**Digital technology option**	***n***	**% of participants**	***n***	**% of participants**
Social comparison of behaviour	Seeing a friend on social media going for a walk	3	20%	5	33.3%
	An app where you can log your walking and compare to other people with type 2 diabetes	5	33.3%	2	13.3%
Rewards	An app where you can log your walking and earn virtual medals/reward	6	40%	2	13.3%
Knowledge	A website that shows nearby walking route	5	33.3%	3	20%
Goal setting	An app where you can set walking goals (e.g. 5,000 steps a day)	5	33.3%	3	20%
Outcome expectancy	A website that detailed health benefits of walking	2	13.3%	8	53.3%
Prompts/cues from a Health professional	A text service from a health professional to give information and reminders about walking	1	6.6%	5	33.3%
	Reminder notification about walking from a health professional via an app	2	13.3%	0	0%
Social support	WhatsApp (or other messaging app) with friends and family who want to increase their walking	1	6.6%	1	6.6%
	WhatsApp (or other messaging app) with other people with type 2 diabetes who want to increase their walking	3	20%	3	20%
	Reminder text about walking from a friend	3	20%	5	33.3%
	An app with interactive maps to find other people	1	6.6%	2	13.3%
Self-monitoring	Keeping a walking diary by imputing steps and distances into an app	0	0%	3	20%
	An app to monitor your steps and progress with graphs	2	13.3%	1	6.6%
	A device that measures your walking	6	40%	1	6.6%

Note. n= number of participants out of 15.

BCT categories

The percentage of participant selections was calculated based on the BCT category as a whole. See table 7.

Table 7

Shows BCT categories. Percentages calculated using the n divided by the number of potential selections for each BCT category. The number of potential selections are based on how many questions were presented within each BCT category.

	Would increase walking			Would not increase walking		
BCT	***n***	**Number of potential selections**	**% of participants selecting**	***n***	**Number of potential selections**	**% of participants selecting**
Social comparison of behaviour	8	30	26.6%	7	30	23.3%
Rewards	6	15	40%	2	15	13.3%
Knowledge	5	15	33.3%	3	15	20%
Goal setting	5	15	33.3%	3	15	20%
Outcome expectancy	5	15	33.3%	8	15	53.3%
Prompts/cues from a Health Professional	3	30	10%	5	30	16.6%
Social support	8	60	13.3%	11	60	18.3%
Self-monitoring	8	45	17.7%	5	45	11.1%

Note. n= number of participants out of 15.

A digital resource for increasing walking

Participants were asked open-ended questions regarding what a digital resource for increasing walking could look like and questions related to their BCT choices (see Appendix N).

Themes found regarding features important for a digital resource to increase walking were similar to aforementioned themes extracted from SCT based questions. These themes

included: social support; outcome expectancy; feedback and goalsetting; tracking and monitoring; technology design and rewards (see Appendix O).

Social support was identified by participants as an important feature of a digital resource to increase walking. Focus was on connecting with 'like-minded individuals' or those with a diabetes diagnosis, for example:

"Hope to find like-minded individuals to potentially join them walking"

and

"Find patients with diabetes can increase motivation together"

Participants shared they felt the BCT of rewards would help encourage walking. The type of reward focused around money and prizes, as noted by the following responses:

"Earn encouragement money"

and

"Lucky draw"

In terms of goal setting, some participants shared a preference for setting their own walking goals and others would prefer the digital device to set walking goals on their behalf. For example:

"I like setting goals"

and

"Provide me with professional exercise plans and some first aid knowledge"

The BCT of self-monitoring is related to the aforementioned themes of feedback and goal setting . Other aspects of self-monitoring noted by participants included the type of digital device to allow monitoring and the information being recorded. For example:

"Robust activity watch"

and

"Monitor all kinds of activity data"

The BCT of outcome expectancy was highlighted as participants shared current and expected benefits from using a digital device to increase their walking, shown by the following responses:

"Increase my fitness and walking level"

and

"My body is getting better and better"

The BCT of self-monitoring was noted. Participants reported the importance of having real time and historical walking data recorded by a digital device. For example:

"The walking steps and distances that I do in real life will show up on the app"

and

"Historical data, cumulative steps: motion analysis"

Participants expressed the importance of receiving feedback. The feedback had to be accurate, give information in connection with pre-determined plans and show improvements. As noted by participants below:

"The tracker can give me accurate feedback"

and

"Will let me know how much I have moved faster"

and

"Tell me whether my plan is completed"

Design of a digital device was shown to be an important factor. Participants noted they would like something that is easy to use and professional as shown:

"Give me a very professional feeling"

and

"Easy steps"

Concerns regarding digital resources

Privacy concerns were noted by participants and were related to not wanting to share information about their diabetes on a digital device. For example:

"I find it personal"

and

"It makes me feel like these websites and digital resources are peeping into my life without any sense of security"

Another concern was lack of time to use a digital resource to increase their walking. For example:

"Input into an app is time consuming"

Participants noted different reasons why a digital resource would not help to motivate them to increase their walking. As shown:

"Health professionals can't motivate me to increase exercise"

and

"Don't think its motivating enough for me"

Some participants discussed how information presented in a digital format was too detailed and overwhelming. This is noted by:

"Makes me dazzled and I don't know where to find the information I need"

and

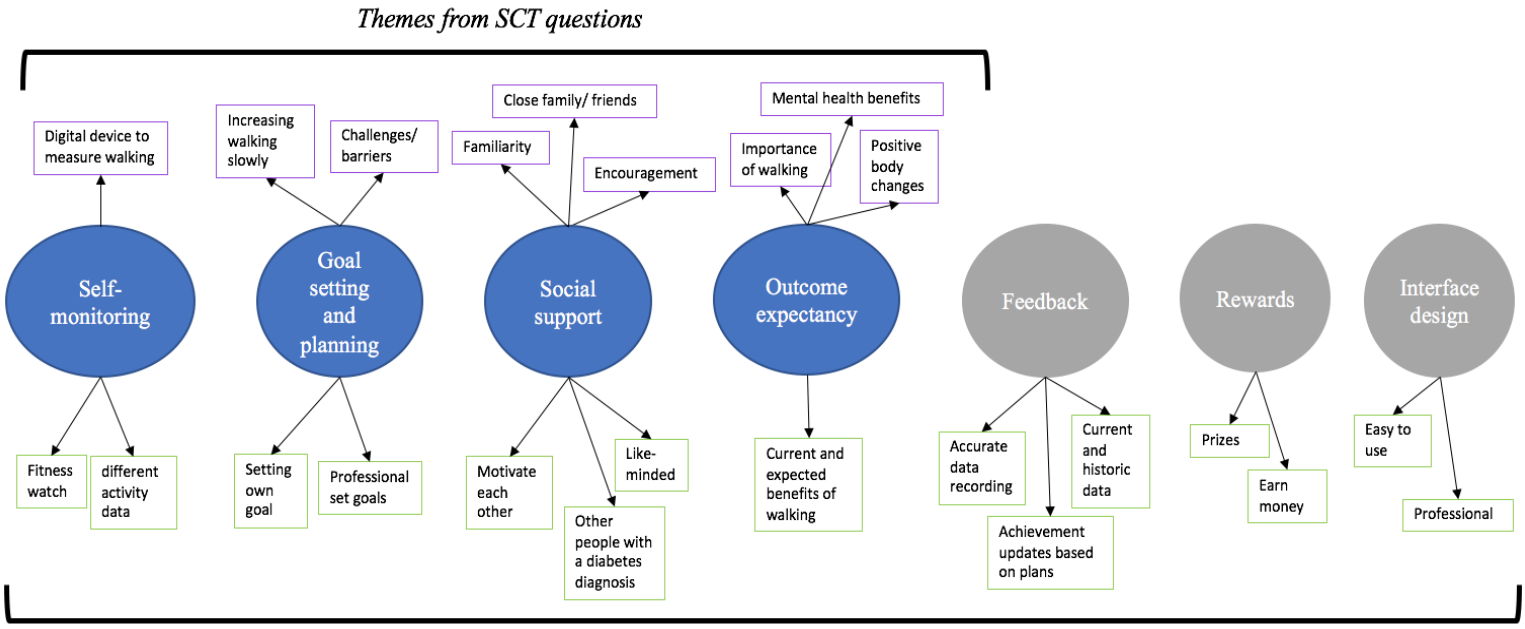
"Information about sports walking is too detailed"

Relationships between findings

The relationship between aforementioned themes and subthemes from SCT question responses and desired features of a digital device responses are shown in figure 1.

Figure 1

Themes and their relationship



**SCT- Social Cognitive theory,*

Note. This figure shows four themes identified as BCTs, shown in blue, are present in both SCT questions and desired features of a digital resource. The themes of reward and feedback, shown in grey, are also examples of BCTs. The green and purple text boxes show sub-themes related to desired features of a digital resource and SCT questions respectively. All BCTs identified are included in Michie et al (2013) BCT taxonomy.

5. Discussion

The aim of this online survey was to investigate what a potential digital resource to increase walking for management of T2D could look like for ethnic minority populations in the UK.

5.1 Technology usage

Participants had access to a range of digital device options and reported using these daily and using phone calls and SMS/text most frequently. This finding is supported by a previous study by Mitchell et al. (2019) which found these and email to be most popular within ethnic minority groups, and especially older patients, when accessing online health resources. 66.6% of participants had access to a digital fitness tracker which they used at least weekly. Therefore, participants would be able to access a future digital resource to increase walking, as these devices are already integrated into their lives. Despite participants access to digital technology this does not guarantee continued long-term use (Katz et al., 2015).

5.2 Behaviour change techniques

Out of the six BCTs identified -to increase walking via a digital device -four of these were apparent across both the SCT and desired features of a digital resource questions. Differences were identified between these six BCT and the BCT investigated through the results from the multiple-choice digital examples.

Rewards

The BCT of rewards was selected by the highest percentage of participants to increase walking which aligns with findings from the desired features of a digital device.

Therefore, integrating the BCT of rewards into the development of a digital resource, to increase walking in ethnic minority groups, would be effective. When developing such rewards particular focus should be placed on financial based rewards and prizes. These have been shown to be more effective than standard care and control groups for encouraging healthy behaviour change in a study by Shah and Garg (2015).

Self-monitoring

Participants identified the desire for a digital device or fitness tracker, classed as a self-monitoring BCT, in the SCT questions. This was confirmed when participants later chose these options from the multiple-choice list. 40% of participants selected that having 'A device that measures your walking' would increase their walking. Furthermore, the specific need for a digital fitness tracker was strengthened when no participants chose manual input methods from the multiple-choice list. For example, 'inputting steps and distances into an app' was not selected by any participants to increase walking. Participants expressed that this method of self-monitoring was too time consuming. Therefore, this study suggests that an autonomous digital tracking resource would be the most effective form of incorporating the self-monitoring BCT into a digital resource to increase walking.

Outcome Expectancy

In addition to selecting examples that would increase walking, participants were also able to select digital resources that would not increase their walking. Outcome expectancy was selected by the highest percentage of participants (53.3%) to not increase walking. However, this BCT was identified through the SCT responses and the desired features of a digital resource as likely to increase walking. Participants expressed that the presentation of information was a crucial part of this BCT. For example, outcome expectancy information

provided on a website was too overwhelming, however, the same information given by friends and family would be helpful. These results suggest that outcome expectancy would be an ineffective way increase walking via a digital resource as participants may struggle to find the information they require.

Social support

In addition to friends and family proving a favourable link to information regarding walking, participants mentioned social support throughout the SCT questions. When participants mentioned social support, emphasis was made in relation to being accompanied on walks, and receiving motivation and support, in person. However, when participants were presented with several examples of social support as digital technology options to increase walking the results show that only 13.3% of participants felt it would increase walking. Furthermore, 18.3% of participants inferred social support options would not increase their walking. Emphasis was made on using a digital resource to connect with 'like-minded individuals to potentially join them walking'. This is important to note when developing social support into a digital resource to increase walking within ethnic minority groups.

Prompts/cues from a Health Professional

An important consideration when designing a digital resource to increase walking within a target population is how this would be advertised. Previous research suggests implementing a digital diabetes resource via HP is effective (Greenwood et al., 2017). Despite this, subsequent research suggests the endorsement of digital resources for T2D by both patients and HP is rare (Cafazzo, 2019). The reason for this is due to limited evidence of effectiveness and the nature of constantly updating digital resources. Making it difficult for HP to promote these digital resources in the limited contact time they have with T2D

patients. Introducing new versions of digital resources during these appointments would be time consuming for both patient and HP (Cafazzo, 2019). Findings from this study suggest participants do not feel a HP could help to increase their walking via a digital resource. The only professional mentioned by participants within the SCT questions was a fitness professional to help with walking focused goal setting and motivation. When participants were asked to select BCT examples, prompts/cues from a HP was selected by the lowest percentage of participants to increase walking. Additionally, 33.3% of participants actively selected this BCT to show it would not increase their walking. Emphasised through a participant stating they felt 'health professionals could not motivate them' in relation to increasing walking using a digital resource. Based on the findings of this study, implementing a digital resource to increase walking for ethnic minority groups with T2D via a HP may not be as effective as previous research suggests. Therefore, a digital resource to increase walking for ethnic minority groups would not require HP direct support to be effective.

5.3 Concerns using a digital device

Participants shared privacy concerns regarding using a digital resource to help increase walking. Privacy and the use of digital resources such as fitness trackers has been linked to poor health literacy. With low levels of health literacy being significantly associated with the reduced usage of health-related apps and fitness trackers. Increasing health literacy could help reduce these barriers and concerns related to using a digital device to increase walking. (Mackert et al., 2016).

5.4 Limitations

Recruitment for this survey led to fake responses. Email addresses provided-to receive the £10 voucher- were not linked to survey responses. An inconsistency approach (Huang et al., 2012) was applied. However, conformation that only original responses were analysed was impossible. Furthermore, research has found online bots are being used to complete online surveys (Yarrish et al., 2019). This online survey was not designed to identify bots consequently there is no evidence to confirm this survey was not affected.

5.5 Suggestions for future research

Using an online survey resulted in lower quality responses than originally anticipated. Future research should replicate this study, using focus groups to gain more in-depth information from participants. This would eliminate the risk of receiving fake responses. Additionally, having a face-to-face conversation with participants would allow the researcher and participants to clarify points and explain any misinterpretations of questions and responses.

5.6 Conclusions

This study suggests the following BCTs should be used: self-monitoring; goal setting and planning; social support; outcome expectancy; feedback; and rewards when developing a digital resource to increase walking for the self-management of T2D for ethnic minority populations within the UK. Additionally, the interface design of a digital resource should be taken into consideration to ensure it is professional and easy to use.

References

Abraham, C., & Michie, S. (2008). A taxonomy of behavior change techniques used in interventions. *Health Psychology, 27*(3), 379.

Bandura, A. (1988). Organisational applications of social cognitive theory. *Australian Journal of Management, 13*(2), 275-302.

Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology, 52*(1), 1-26.

Barlow, J., Wright, C., Sheasby, J., Turner, A., & Hainsworth, J. (2002). Self-management approaches for people with chronic conditions: A review. *Patient Education and Counseling, 48*(2), 177-187.

Barnett, A. H., Dixon, A., Bellary, S., Hanif, M., O'hare, J., Raymond, N., & Kumar, S. (2006). Type 2 diabetes and cardiovascular risk in the UK south asian community. *Diabetologia, 49*(10), 2234-2246.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.

Cafazzo, J. A. (2019). A digital-first model of diabetes care. *Diabetes Technology & Therapeutics, 21*(S2), S2-52-S2-58.

Chase, J. D. (2013). Physical activity interventions among older adults: A literature review. *Research and Theory for Nursing Practice, 27*(1), 53-80.

Connelly, J., Kirk, A., Masthoff, J., & MacRury, S. (2013). The use of technology to promote physical activity in type 2 diabetes management: A systematic review. *Diabetic Medicine, 30*(12), 1420-1432.

Conroy, D. E., Yang, C., & Maher, J. P. (2014). Behavior change techniques in top-ranked mobile apps for physical activity. *American Journal of Preventive Medicine, 46*(6), 649-652.

Cradock, K. A., ÓLaighin, G., Finucane, F. M., Gainforth, H. L., Quinlan, L. R., & Ginis, K. A. M. (2017). Behaviour change techniques targeting both diet and physical activity in type 2 diabetes: A systematic review and meta-analysis. *International Journal of Behavioral Nutrition and Physical Activity, 14*(1), 1-17.

Creamer, J., Attridge, M., Ramsden, M., Cannings-John, R., & Hawthorne, K. (2016). Culturally appropriate health education for type 2 diabetes in ethnic minority groups: An updated cochrane review of randomized controlled trials. *Diabetic Medicine, 33*(2), 169-183.

Dack, C., Ross, J., Stevenson, F., Pal, K., Gubert, E., Michie, S., . . . Farmer, A. (2019). A digital self-management intervention for adults with type 2 diabetes: Combining theory, data and participatory design to develop HeLP-diabetes. *Internet Interventions, 17*, 100241.

Diabetes UK. (2020). Type 2 diabetes. Retrieved from https://www.diabetes.org.uk/type-2-diabetes

Diabetes.co.uk. (2019). Cost of diabetes. Retrieved from https://www.diabetes.co.uk/cost-of-diabetes.html

Diabetes.co.uk Editor. (2019). Risk factors for type 2 diabetes. Retrieved from https://www.diabetes.co.uk/Diabetes-Risk-factors.html

Fletcher, B., Gulanick, M., & Lamendola, C. (2002). Risk factors for type 2 diabetes mellitus. *Journal of Cardiovascular Nursing, 16*(2), 17-23.

Goff, L. M. (2019). Ethnicity and type 2 diabetes in the UK. *Diabetic Medicine, 36*(8), 927-938.

GOV.UK. (2020). List of ethnic groups. Retrieved from https://www.ethnicity-facts-figures.service.gov.uk/style-guide/ethnic-groups

Greenwood, D. A., Gee, P. M., Fatkin, K. J., & Peeples, M. (2017). A systematic review of reviews evaluating technology-enabled diabetes self-management education and support. *Journal of Diabetes Science and Technology, 11*(5), 1015-1027.

Hamasaki, H. (2016). Daily physical activity and type 2 diabetes: A review. *World Journal of Diabetes, 7*(12), 243-251. doi:10.4239/wjd.v7.i12.243 [doi]

Hu, F. B., Sigal, R. J., Rich-Edwards, J. W., Colditz, G. A., Solomon, C. G., Willett, W. C., . . . Manson, J. E. (1999). Walking compared with vigorous physical activity and risk of type 2 diabetes in women: A prospective study. *Jama, 282*(15), 1433-1439.

Huang, J. L., Curran, P. G., Keeney, J., Poposki, E. M., & DeShon, R. P. (2012). Detecting and deterring insufficient effort responding to surveys. *Journal of Business and Psychology, 27*(1), 99-114.

Jahns, R. (2014). **Top 14 diabetes app publishers capture 65% market share of the diabetes app market**. Retrieved from https://research2guidance.com/top-14-diabetes-app-publishers-capture-65-market-share-of-the-diabetes-app-market-2/

Joseph, R. P., Ainsworth, B. E., Mathis, L., Hooker, S. P., & Keller, C. (2017). Utility of social cognitive theory in intervention design for promoting physical activity among african-american women: A qualitative study. *American Journal of Health Behavior, 41*(5), 518-533.

Katz, D., Dalton, N., & Price, B. (2015). Failing the challenge: Diabetes apps & long-term daily adoption.

Li, J., Parrott, S., Sweeting, M., Farmer, A., Ross, J., Dack, C., . . . Hudda, M. (2018). Cost-effectiveness of facilitated access to a self-management website, compared to usual care, for patients with type 2 diabetes (HeLP-diabetes): Randomized controlled trial. *Journal of Medical Internet Research, 20*(6), e201.

Mackert, M., Mabry-Flynn, A., Champlin, S., Donovan, E. E., & Pounders, K. (2016). Health literacy and health information technology adoption: The potential for a new digital divide. *Journal of Medical Internet Research, 18*(10), e264.

Majeed-Ariss, R., Jackson, C., Knapp, P., & Cheater, F. M. (2015). A systematic review of research into black and ethnic minority patients' views on self-management of type 2 diabetes. *Health Expectations, 18*(5), 625-642.

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., . . . Wood, C. E. (2013). The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: Building an international consensus for the reporting of behavior change interventions. *Annals of Behavioral Medicine, 46*(1), 81-95.

Mitchell, U. A., Chebli, P. G., Ruggiero, L., & Muramatsu, N. (2019). The digital divide in health-related technology use: The significance of race/ethnicity. *The Gerontologist, 59*(1), 6-14.

Moon, K., & Blackman, D. (2014). A guide to understanding social science research for natural scientists. *Conservation Biology, 28*(5), 1167-1177.

National Collaborating Centre for Chronic Conditions (UK). (2008). doi:NBK53885 [bookaccession]

Oldroyd, J., Banerjee, M., Heald, A., & Cruickshank, K. (2005). Diabetes and ethnic minorities. *Postgraduate Medical Journal, 81*(958), 486-490. doi:81/958/486 [pii]

Procter, S., Mutrie, N., Davis, A., & Audrey, S. (2014). Views and experiences of behaviour change techniques to encourage walking to work: A qualitative study. *BMC Public Health, 14*(1), 868.

Qiu, S., Cai, X., Schumann, U., Velders, M., Sun, Z., & Steinacker, J. M. (2014). Impact of walking on glycemic control and other cardiovascular risk factors in type 2 diabetes: A meta-analysis. *PloS One, 9*(10), e109767.

Richardson, C. R., Mehari, K. S., McIntyre, L. G., Janney, A. W., Fortlage, L. A., Sen, A., . . . Piette, J. D. (2007). A randomized trial comparing structured and lifestyle goals in an internet-mediated walking program for people with type 2 diabetes. *International Journal of Behavioral Nutrition and Physical Activity, 4*(1), 59.

Shah, V. N., & Garg, S. K. (2015). Managing diabetes in the digital age. *Clinical Diabetes and Endocrinology, 1*(1), 16.

Shamizadeh, T., Jahangiry, L., Sarbakhsh, P., & Ponnet, K. (2019). Social cognitive theory-based intervention to promote physical activity among prediabetic rural people: A cluster randomized controlled trial. *Trials, 20*(1), 98.

Tudor-Locke, C., Bell, R. C., Myers, A. M., Harris, S. B., Ecclestone, N. A., Lauzon, N., & Rodger, N. (2004). Controlled outcome evaluation of the first step program: A daily physical activity intervention for individuals with type II diabetes. *International Journal of Obesity, 28*(1), 113-119.

Webb, T., Joseph, J., Yardley, L., & Michie, S. (2010). Using the internet to promote health behavior change: A systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *Journal of Medical Internet Research, 12*(1), e4.

Williams, D. R. (1997). Race and health: Basic questions, emerging directions. *Annals of Epidemiology, 7*(5), 322-333.

Wilson, C., Alam, R., Latif, S., Knighting, K., Williamson, S., & Beaver, K. (2012). Patient access to healthcare services and optimisation of self-management for ethnic minority populations living with diabetes: A systematic review. *Health & Social Care in the Community, 20*(1), 1-19.

Wu, Y., Yao, X., Vespasiani, G., Nicolucci, A., Dong, Y., Kwong, J., . . . Li, S. (2017). Mobile app-based interventions to support diabetes self-management: A systematic review of randomized controlled trials to identify functions associated with glycemic efficacy. *JMIR mHealth and uHealth, 5*(3), e35.

Yarrish, C., Groshon, L., Mitchell, D., Appelbaum, A., Klock, S., Winternitz, T., & Friedman-Wheeler, D. G. (2019). Finding the signal in the noise: Minimizing responses from bots and inattentive humans in online research. *The Behavior Therapist, 42*(7), 235-242.

Appendix

Appendix A

Participant Information Sheet shown to participants prior to giving informed consent

Version Two: June 2020

Participant Information Sheet

Project Title: Type II Diabetes and Digital Technology

Research Background and Aims of Project

This research is being conducted in partnership and funded by the Digital Health and Care Institute. The aim of this study is to develop an understanding of the acceptability and accessibility of current online diabetes resources for the management of Type II Diabetes. In order to develop more effective online diabetes resources in the future, that takes into account cultural experiences and preferences.

Why have I been invited to take part?
You have been asked to take part due to your perspective being vitally important to the development of future tailored online diabetes resources.

Do I have to take part?
At no point is your participation compulsory. If you do decide to take part, you can withdraw your participation up to 2 weeks after the date of survey completion without the need to explain and without penalty by advising the researcher of this decision. Please note: If you withdraw, we will not use any of the data collected in the analysis. You will be asked to complete an electronic consent form to confirm your participation
You will be asked to complete an electronic consent form to confirm your participation

What will happen if I take part?
Should you choose to take part you will be randomly assigned to one of two sets of questions surrounding diabetes and digital technology.
Study 1 will involve looking at some current online diabetes resources and asking your opinions of these.
Study 2 will ask questions and your opinion on different online resources to increase walking.
The questionnaire will involve answering questions by selecting which answer you feel best represents your views. Additionally, some questions will ask you to type in an answer to explain your views.
This questionnaire can be completed on any device that has internet access and should take around 20 minutes of your time.

What other way can I complete the questionnaire?
You may request to meet with the researchers of this project online (Microsoft Teams) where they will talk you through the questions and write the answers down on your behalf. If you would prefer this method, feel free to contact Iona Henderson (ioh00002@students.stir.ac.uk) to book a time best for you. This interview would be audio recorded on Microsoft teams. After the interview has ended the recording will be saved in a secure university server where only the researchers, supervisor and administrator have access. This recorded data will then be immediately deleted from Microsoft teams. The saved recording will be deleted after the completion of the project.

Are there any potential risks in taking part?
There are no foreseeable risks in taking part. All your demographic information and question responses will be anonymous and cannot be traced to you. There are no perceived physical or emotional wellbeing risks to taking part in this questionnaire.

Are there any benefits in taking part?
Upon completion of the survey you will be asked for your email, you will then receive a £10 Tesco voucher via your email address. There will also be an option at the end of the questionnaire to select a charity we will donate to on your behalf. £100 will be donated to either, The Health and Wellbeing Project Glasgow, Pilton Community Health Project, or Saheliya. The charity with the most votes will be provided with the £100 donation. Further information regarding the charities and the work they do will be provided at the end of the questionnaire.

What happens to the data I provide?
We are carrying out this research as part of the MSc in Health Psychology course at the University of Stirling. As part of the project, we will be recording personal data relating to you. The answers you provide will be completely anonymous and will be stored securely. The only means of identification stored will be the unique participant code shown on screen. This will only be used if you wish to withdraw your data from this study.
Data will be secured on a secure university server for a period of 10 years. Any data that is provided will be separate from your email address therefore it is not possible to link email addresses to answers provided.

If taking part in an online interview your responses will be audio recorded on Microsoft teams, this will be securely stored on a secure university server and deleted after the project is completed. This audio recording will immediately be deleted from Microsoft teams.

Will the research be published?
This research will be submitted as part of the researcher's final project. A dissertation style report will be produced by each researcher based on the results of the respective questionnaires. Should you wish to read these reports please feel free to email the researchers on the emails provided above and below.

Who has reviewed this research project?
Ethical approaches of this project have been approved via The University of Stirling General University Ethics Panel.

Who do I contact if I have concerns about this study or I wish to complain?
The postgraduate researchers for this present study are Iona Henderson (ioh00002@students.stir.ac.uk) and Josef Dodgson (jed00080@students.stir.ac.uk). In case you wish to obtain further information about the project, you can contact their thesis supervisor Wendy Maltinsky (wendy.maltinsky@stir.ac.uk). To make a complaint you can contact the course coordinator you may contact Ronan O'Carroll (ronan.ocarroll@stir.ac.uk)

Thank you for your interest in this study, if you have any further questions please do not hesitate to get in touch via the emails provided.

Appendix B

Informed consent form shown to participants via the online survey to confirm consent prior to being shown the survey

Informed consent form

I confirm that I have read and understood the information sheet explaining the research project and I have had the opportunity to ask questions about the project.

I understand that my participation is voluntary and that I am free to withdraw at any time during the study and withdraw my data within two weeks without giving a reason, and without any penalty.

I understand that beyond the two-week time frame, when data analysis has started it may not be possible to remove data from the study.

I have been given the name and email address of the person to contact should I wish to withdraw my data.

I understand that my responses will be kept anonymous and I give permission for members of the research team to have access to my anonymity responses.

I agree for research data collected in the study to be made available to researchers, including those working outside the EU to be used in other research studies.

I understand that all data is fully anonymised so that I cannot be identified.

Take note of this ID number as this will be required should you wish to withdraw your data.

(the online survey will generate a random ID - participants are asked to take note of this so they can email the researchers this ID so their information can be withdrawn should they wish)

I agree to take part in this study

I do not agree to take part in this study *(If this option is selected participants are sent to a standard end of survey message)*

Appendix C

Online survey questions including joint demographic questions and this study's specific questions. These questions were imputed into the online survey software Qualtrics. Notes show the survey logic as programmed on Qualtrics

Demographic questions

If highlighted answers are selected participants will be sent to an end of survey message explaining they were not eligible to participate

Q1. Gender

- ❑ **Male**
- ❑ **Female**

Other/prefer not to say [ ]

Q2. Age *(drop down selection)*
18-31
32-45
46-58
59-71
72-84
84+

Q3. What is your ethnic group?

- ❑ **English / Welsh / Scottish / Northern Irish / British**
- ❑ **Irish**
- ❑ **Gypsy or Irish Traveller**
- ❑ **Any other White background**
- ❑ **Arab**
- ❑ **Any other ethnic group (please specify)** [ ]
- ❑ **White and Black Caribbean**
- ❑ **White and Black African**
- ❑ **White and Asian**
- ❑ **Any other Mixed / Multiple ethnic background (please specify)** [ ]
- ❑ **Indian**
- ❑ **Pakistani**
- ❑ **Bangladeshi**
- ❑ **Chinese**
- ❑ **African**
- ❑ **Caribbean**

Q4. What is your parents ethnic group? *(multiple options can be selected, and any option/combination will continue to the questions -no options will be sent to end of survey)*

- ❑ **English / Welsh / Scottish / Northern Irish / British**
- ❑ **Irish**
- ❑ **Gypsy or Irish Traveller**
- ❑ **Any other White background**
- ❑ **Arab**
- ❑ **Any other ethnic group (please specify)** [ ]
- ❑ **White and Black Caribbean**
- ❑ **White and Black African**
- ❑ **White and Asian**
- ❑ **Any other Mixed / Multiple ethnic background (please specify)** [ ]
- ❑ **Indian**
- ❑ **Pakistani**
- ❑ **Bangladeshi**
- ❑ **Chinese**
- ❑ **African**
- ❑ **Caribbean**

Q5.What is your diabetes diagnosis? *(drop down selection)*
Prediagnosis
Type 1
Type 2
Gestational Diabetes
prefer not to say

Q6. How long have you had this diagnosis? *(drop down selection)*

Less than 6 months
up to 1 year
1-5 years
5-10 years
10+ years

Q7. Where in the United Kingdom do you live?
Scotland
England
Wales
Northern Ireland
I do not live in the UK

Q8. Highest Education level to date *(drop down selection)*
secondary school
college
bachelor's degree
master's degree
Ph.D. or higher
prefer not to say

Participants will then be randomly assigned to participate in either questions related to study 1 or study 2.

All questions with text box options online have a 50-character minimum requirement on them before the next question can be accessed.

Study 2 questions

1. Please select from the following list any items you have access to (please select all that apply)
   - ❑ **Laptop**
   - ❑ **PC**
   - ❑ **Tablet**
   - ❑ **iPad**
   - ❑ **smartphone**
   - ❑ **None of the above**

2. How often do you use any of these items?
   - ❑ **Daily**
   - ❑ **Weekly**
   - ❑ **Monthly**
   - ❑ **Sometimes**
   - ❑ **Never**

3. Do you own any fitness trackers?
   - ❑ **Apple watch**
   - ❑ **Fitbit**
   - ❑ **Garmin**
   - ❑ **other please specify** [ ]
   - ❑ **none of above** *(if answer 'none of above' skip next Q)*

4. How often do you use a fitness tracker
   - ❑ **Daily**

- ❑ **Weekly**
- ❑ **Monthly**
- ❑ **Sometimes**
- ❑ **Never**

5. Do you have access to WIFI/internet where you live?
   - ❑ **Yes**
   - ❑ **No**

6.Please drag and drop any of the applications you have in order of most used. Please only drag apps that you use regularly (at least once a week) and leave apps you don't use or own.

Items	Please drag and drop the apps you use at least once a week
Facebook	
Phone call	
Facebook messenger	
WhatsApp	
Skype	
Twitter	
SMS/text	
Instagram	

7.Please list in the text box below any applications you currently use to manage your diabetes or walking (i.e. Strava, mapmywalk, mapmydiabetes etc..)

8.Are you currently an active member of any diabetes forums/groups online? *(if no is selected next question is skipped)*
   - ❑ **Yes**
   - ❑ **No**

9. Do you feel like these groups have helped you to increase your physical activity such as walking? If so in what way (i.e. social support, increased confidence, educational information etc..)

10. Please tell me about your previous experiences with walking

11. If you wanted to increase your walking, what would you do?

12. Tell me about your biggest challenges in increasing your daily walking and ways you feel you could overcome these challenges

13. How do you track or monitor your daily walking?

14. If someone was giving you encouragement or advice to increase your daily walking what would you like them to say or do?

15. If you could pick someone else to join you in increasing your walking who would you pick and why?

16. We are interested in how an online resource might help to increase your walking. Please select 3 of the following examples you feel would help to increase your walking.

- [ ] An app where you can log your walking and compare to other people with type 2 diabetes
- [ ] Whatsapp (or other messaging app) with other people with type 2 diabetes who want to increase their walking
- [ ] Seeing a friend on social media going for a walk
- [ ] An app where you can log your walking and earn virtual medals/reward
- [ ] Reminder text about walking from a friend
- [ ] An app with interactive maps to find other people
- [ ] A website that shows nearby walking route
- [ ] Reminder notification about walking from a health professional via an app
- [ ] A device that measures your walking
- [ ] A text service from a health professional to give information and reminders about walking
- [ ] Keeping a walking diary by imputing steps and distances into an app
- [ ] An app where you can set walking goals (e.g. 5,000 steps a day)
- [ ] Whatsapp (or other messaging app) with friends and family who want to increase their walking
- [ ] An app to monitor your steps and progress with graphs
- [ ] A website that detailed health benefits of walking

19. We would like to use your ideas to develop a digital resource. Thinking of the three examples you selected, can you describe how you think these could work for you? (i.e. when you would access this resource, how often would you access or what it might look like?)

20. How might these examples you selected help to increase your walking? (i.e. How would these resources help you to overcome previously mentioned challenges surrounding walking?)

21. Can you think of any additional digital resources you could (or already) use to increase your walking? (Please describe how these could/do work for you)

22. This list contains the same examples as before. This time please select 3 examples that would NOT increase your walking.

- [ ] An app where you can log your walking and compare to other people with type 2 diabetes
- [ ] Whatsapp (or other messaging app) with other people with type 2 diabetes who want to increase their walking
- [ ] Seeing a friend on social media going for a walk
- [ ] An app where you can log your walking and earn virtual medals/reward
- [ ] Reminder text about walking from a friend
- [ ] An app with interactive maps to find other people
- [ ] A website that shows nearby walking route
- [ ] Reminder notification about walking from a health professional via an app
- [ ] A device that measures your walking
- [ ] A text service from a health professional to give information and reminders about walking
- [ ] Keeping a walking diary by imputing steps and distances into an app
- [ ] An app where you can set walking goals (e.g. 5,000 steps a day)
- [ ] Whatsapp (or other messaging app) with friends and family who want to increase their walking
- [ ] An app to monitor your steps and progress with graphs
- [ ] A website that detailed health benefits of walking

23. Please explain why you feel these would not work for you?

All participants will then be directed to the same debrief information

Appendix D

Participant debrief form shown to all participants after completing the final question of either study's specific questions

Version Two: June 2020

Participant Debriefing Sheet

Thank you for participating in this research project

Project Title: Type II Diabetes and Digital Technology
Background, aims of project
During this study you were randomly assigned to complete questions related to either study 1 or study 2. These are detailed as follows:

Study 1- Investigating the acceptability and accessibility of current online diabetes resources for the management and prevention of type II diabetes for minority ethnic populations in the UK.

Study 2- Investigating what an acceptable and accessible digital resource could look like to increase walking for the management and prevention of type II diabetes for ethnic minority populations in the UK?

This research is being conducted in partnership and funded by the Digital Health and Care Institute.

Type II diabetes is on the rise particularly in Scotland with 1 in 25 people being affected (Diabetes.co.uk, 2019). Belief, attitudes and cultural norms play an important role in the health behaviours of individuals and as such this may impact on their management of diabetes. Current UK Type II diabetes interventions and educational programmes are carried out primarily face to face with some use of technology in the forms of apps and social networking groups. This software however has been created centred on western civilisation and therefore may not be as suited for use by members of multi-ethnic populations within the UK. Limited research has been conducted looking at online resources of self-management of type II diabetes with regards to being accessible and appropriate for ethnic minority populations in the UK.

After the survey is closed, the responses will be collated, transferred and stored separately. This stored data will be completely anonymous, researchers will then analyse this data and produce written reports based on this analysis. This report will be shared with the Digital Health and Care Institute and the University of Stirling, no personal information will be published in the report and no raw data will be shared out with the research team.

You will be provided with an option to leave your email in order for the researcher to contact you so that you can receive your £10 Tesco voucher. Additionally, £100 will be donated to either, The Health and Wellbeing Project Glasgow, Pilton Community Health Project, or Saheliya. The charity with the most votes will be provided with the £100 donation.

If you wish to withdraw your data.
Please email researchers Iona Henderson (ioh00002@students.stir.ac.uk) or Josef Dodgson (jed00080@students.stir.ac.uk) and quote your unique participant code up to 2 weeks after completion of the study. If you have any questions about the research or any queries you wish to raise please feel free to contact Wendy Maltinsky (wendy.maltinsky@stir.ac.uk). To make a complaint contact course coordinator Ronan O'Carroll (ronan.ocarroll@stir.ac.uk)

Thank you for your participation.

Participants will then be directed to these questions before being taken to the end of the survey

Please select the charity you would like us to donate £100. Please note, only the charity with the most votes will receive the donation.

- ○ Health and Wellbeing Project Glasgow - The Health and Wellbeing Project is a service user community based project and caters for Black Minority Ethnic communities living in Scotland infected and affected by HIV, Bloodborne Viruses, and other related health conditions.
- ○ Pilton Community Health Project Edinburgh - Pilton Community Health Project has been working in the Pilton area since 1984 – that makes it the oldest community health project in Scotland. They believe it is as much about the quality of your emotional and social situation as about your experience of disease or disability.
- ○ Saheliya - Saheliya is a specialist mental health and well-being support organisation for black, minority ethnic, asylum seeker, refugee and migrant women and girls (12+) in the Edinburgh and Glasgow area.

Participants will then be directed to a separate study to add their email address to receive the £10 voucher. This will be separated to ensure the email addresses cannot be linked to participants responses.

Thank you for your responses, should you wish to receive a £10 Tesco voucher please leave your email address below. This email will not be linked to your responses and therefore will remain anonymous.

End of study message shown to any participant who did not fit the inclusion criteria and were directed out of the study for this reason

End of Survey

Thank you for following the link to our survey, you have been directed to the end of our study as unfortunately you do not meet our participant inclusion criteria.

This questionnaire is randomised to present questions relating to the following two studies:

Study 1- Investigating the acceptability and accessibility of current online diabetes resources for the management and prevention of type II diabetes for minority ethnic populations in the UK.

Study 2- Investigating what an acceptable and accessible digital resource could look like to increase walking for the management and prevention of type II diabetes for ethnic minority populations in the UK?

This research is being conducted in partnership and funded by the Digital Health and Care Institute.

If you wish to find out more or have any questions please email researchers Iona Henderson (ioh00002@students.stir.ac.uk) or Josef Dodgson (jed00080@students.stir.ac.uk). Alternatively, please feel free to contact supervisor Wendy Maltinsky (wendy.maltinsky@stir.ac.uk). To make a complaint please contact course coordinator Ronan O'Carroll (ronan.ocarroll@stir.ac.uk)

Table showing walking questions and their related SCT concept.

Walking question	**SCT concept**
How do you track or monitor your daily walking?	*Self-regulation*
If you could pick someone else to join you in increasing your walking who would you pick and why?	*Social support*
If someone was giving you encouragement or advice to increase your daily walking what would you want them to say or do?	*Social support/Self-efficacy*
Tell me about your biggest challenges in increasing your daily walking and ways you feel you could overcome these challenges	*Self-regulation/self-efficacy*
Please tell me about your previous experiences with walking	*Self-regulation/self-efficacy*
If you wanted to increase your walking, what could you do?	*Behavioural capability*

Appendix G

Table showing SCT concept, definition and key themes identified.

SCT Concept	**Definition with regards to walking**	**Key themes identified**
Behavioural capabilities	Knowledge, understanding and skills to increase their walking	• Importance of doing small amounts every day and increasing walking slowly overtime • Setting small achievable walking goals for themselves • Having people to keep them company whilst walking • Having the correct protective footwear • Knowledge and self-awareness of their abilities and safety whilst walking
Social support	To what extent and in what way do participants feel social support could influence their walking	• Type of social support was focused on close family members and friends, these individuals may also have type 2 diabetes. • Other support mentioned was a professional fitness coach • Verbal motivation and positive encouragement mentioned as a way participant would like social support to help to increase their walking • Would want social support to give advice and share with them the benefits of walking • Attributes of preferred socials support: familiar, have common interests and a common language • Ability to act as a distraction whilst walking
Outcome expectancy	Expected outcomes from walking/increasing walking	• Positive changes to the whole body and long-term health benefits • Positive outcomes of doing physical activity such as walking • Mental health benefits of walking
Self-efficacy	Confidence to increase walking and the ability to overcome barriers to walking	• Challenges of motivation and confidence regarding walking abilities • Would benefit from positive encouragement from others specifically: motivational quotes, reinforce positives of walking, advice on walking planning and social company • Shared past positive experiences of walking • Positive links with other physical activity which has helped with increasing walking • Challenges/barriers identified; weather, time restraints, health concerns, motivation and mental attitude • Overcoming barriers thorough; social support, walking alternatives where needed, planning, having protective clothing
Self-regulation	The management of walking behaviours using planning and self-monitoring.	• Monitoring walking by using; fitness and mobile devices and apps, social accountability from walking groups/friends • Goal setting and planning behaviours such as walking itinerary

Appendix H

Framework showing codes, sub-themes and themes for the SCT concept behavioural capability.

Themes (BC)	**Sub-themes**	**Codes**	**Description**	**Extracts**
Regularity		Specific times	Participants responses contained words to describe particular times of the day they would walk. Words such as 'every' and 'daily' were included showing frequency.	"daily" "every morning" "every day" "weekends"
		Frequency		"…exercise frequently"
		Persistence		"…only by persistence we can achieve the goal of exercise"
Accumulation		Slow	Participants focused on the importance of making progress slowly and building their walking over time.	"I would start slowly"
		Increasing		"increase your daily steps"
		Pace		"do not expect to do it overnight"
Goal setting		Walking plan	A range of specific plans were mentioned by participants these were all plans made for themselves by them and no mention of a health professional setting these	"I will make a walking plan, increase the walking distance, and walk according to my own plan"
		Small changes		"I would try and park at the furthest parking space to increase my walking"
		Setting own goals		"we should increase the amount of walking we set for ourselves"
Social support		Friends and family	Participants mentioned having company from family and friends whilst walking would help them to increase their walking	"take family or friends so have company"
		Company		"Just need other people to walk with"
Protective clothing	Appropriate footwear	Type of shoe	Participants mentioned the importance to increasing their walking to be having appropriate shoes	"fit, light and antiskid sports shoes"
		Footwear		"of course, we need some good shoes"
Knowledge and self-awareness	Safety	Pain	Participants emphasised how they felt it important to ensure they had the right knowledge and had tested their abilities prior to increasing their walking.	"avoid cramp in my foot"
		Education		"how to walk in the face of certain road conditions"
		Information gathering		"what kind of route to take"
	Testing abilities	Testing		"we must do tests"
		Ability awareness		"testing foot strength, physical ability and emergency response ability"

Appendix I
Framework showing codes, sub-themes and themes for the SCT concept social support

Themes (SS)	**Sub-themes**	**Codes**	**Description**	**Extracts**
Type of social support	Family	Partner	Participants used words like partner, hubby, wife, family, child and dog to describe the person they would pick to join them to increase their walking.	"I will choose my partner to accompany me"
		Wife		"I hope my wife and I will walk together"
		Hubby		"I would like my hubby"
		Family		"my family to walk with me "
		Dog		"I would take my dogs for a walk"
	Friends	Friends	Participants stated that they would want "my friends" to join them to increase their walking.	"my friends"
		Friends and family with diabetes		"Friends and family members with the same disease"
	Professional	Fitness coach	A professional fitness coach was mentioned by participants to join them in increasing their walking to "… give me professional advice and encouragement"	"I want my fitness coach... to walk with me"
Verbal contributions expected from social support	Motivation and positive encouragement	Motivational quote	Some participants responded that they would like to hear meaningful quotes about health and encourage them by saying how well they are doing	"…as long as you do not give up, the lost will always win back"
		Motivation		"motivate me"
		Encouragement		"say I'm doing well"
	Education	Advice	Participants also indicated they would like to hear practical advice on how to increase their walking and how increasing their walking would benefit them	"new ideas about walking"
		Knowledge		"how to keep interested in walking"
		Benefits of walking		"I hope they tell me more about the benefits of walking"
Attributes of preferred social support		Familiar	When asked why they would pick this specific person to join them on increasing their walking. Participants focused on familiarity of the people selected to them and how they have shared interests	"…because my partner and I are most familiar"
		Know best		"…he is the one who knows me the most"
		Common interests		"…common interests to discuss on the way"
		Common language		"…have a common language"

		A distraction	so these could be shared whilst walking and this would distract them form the walking itself.	“time would pass quicker talking whilst walking”

Appendix J

Framework showing codes, sub-themes and themes for the SCT concept outcome expectancy.

Themes (OE)	**Sub-themes**	**Codes**	**Description**	**Extracts**
Body changes	Overall and long-term health	Health	the use of 'more and more' to suggest a continual increasing benefit over time	"your body will be more and more healthy"
		Vitality	Responses identified ways in which participants felt walking could benefit them including positive effects it had already had on their health	"gain a strong body and strive for my vitality"
		Aging	The long-term benefits of physical activity by mentioning the absence of aging as a result	"you will not grow old if your exercise properly"
		Strength	The use of 'stronger' twice emphasises the building effect over time of walking	"walking can make me stronger and stronger"
	Specific health changes	Bodily functions	Participants showed knowledge of different body change outcomes	"increase the use of glucose to mobilize fat and improve cardiorespiratory function"
		Organ health	Looking at the effect of walking on the function of internal organs (something that cannot be seen)	"we can adjust the function of all organs and promote metabolism"
		Sleep	Sharing positive experiences had with improving sleep due to walking	"since walking, sleep is getting better and better"
Physical activity outcomes		Exercise	The outcomes expected from exercise are stated by participant	"Exercise: improve physical strength and endurance"
		Active	The perception that walking is achievable by using words 'simple' and 'easy'	"walking is a simple and easy way to get active"
Mental Health benefits		Mind	Participant mentioned the ability to have more control over the 'mind' and the reduction in anxiety as a result of walking	"control mind"
		Anxiety		"not anxious"

Appendix K
Framework showing codes, sub-themes and themes for the SCT concept self-efficacy

Themes (SE)	**Sub-themes**	**Codes**	**Description**	**Extracts**
Encouragement from others	Motivational quotes	Perseverance	Responses to how participants would like to be encourages by others consisted of positive motivational quotes around the subject of health	"always remind yourself you should always be on the road"
		Positive impact		"health lies in the exercise, the dance enlivens the body and mind"
	Positive encouragement	Reassurance	Reassurance and encouragement from others is what participants stated they would like to hear from someone to help increase their walking	"saying I'm doing well'
		Encouragement		"encourage me"
	Reinforce positives effects of walking	Benefits	Participants shared they felt if someone shared with them the benefits of walking this would help to increase their walking	"tell me more about the benefits of walking"
		Changes		"changes after walking"
		Effects		"the effect of walking"
		Health		"your body will be more and more healthy"
	Planning advice	Daily	Specific planning ideas surrounding increasing walking was present in participants responses	"keep exercising every day"
		Duration		"walk twice a day for an hour or more"
		Routine		"daily walking routine"
	Social company	Accompany	Participants shared different occasions when they have been walking with others and how they enjoy having other people to go walking with.	"I would like them to accompany me to walk together"
		Together		"walk to the park together"
		Talking		"talk with each other
		Company		"I do enjoy the company"
Experiences		Challenges	Sharing some difficulties in increasing their walking	"it's been hard to get back up to speed"
	Positive social experiences	Friends	Responses included positive experiences of walking in a social setting. Using words such as 'enjoyed' to describe this experience. Additionally using 'a lot' to describe the number of friends	"I've made a lot of friends on foot"
		Family		"With a family member I enjoyed it"

			made through walking	
	Positive links to other physical activity	Motivation	Participants mentioned other physical activity they participate in and how this positively impacts their 'motivation' and 'attitude' towards walking and other sports.	"taking part in some marathons… which has increased the motivation of walking"
		Positive attitude		"kept a positive attitude towards sports"
Walking challenges and barriers	Weather	Can't walk	Mention of weather conditions being a barrier to walking. Participants also stating how they would overcome this barrier by wearing 'protective clothing' in these conditions.	"the biggest challenge is the weather, rainy days, snowy days, the weather where I can't walk"
		Conditions		"weather conditions"
		Protective clothing		"weather" (could have protective clothing)"
		Rainy		"Sometimes when its rainy, I put on my raincoat and go walking"
	Time restraints	Busy	Fitting walking into daily life was stated as a barrier for increasing walking by participants.	"Making the time during busy day to day life"
		Working		"my working hours may hold me back a bit"
		Lockdown		"during lockdown and working from home my walking is limited to possibly 20-30mins a week during my weekly shopping trip"
	Health concerns	Limited walking	Some barriers of increasing walking for participants was existing injuries and health concerns. The consequences of these are highlighted by words such as 'pain', 'tired' and 'uncomfortable'	"I only walk when I have to, as I have too much pain nowadays"
		Muscle pain		"I feel that my muscles are very painful"
		Diabetes		"diabetes complications"
		Health problems		"high blood pressure and coronary heart disease"
		Injury		"I broke my ankle a couple of years ago

		Knee problems		"the knee is obviously out of order"
		Fatigue		"I feel very tired"
		Uncomfortable		"I felt very tired and uncomfortable"
	Motivation/ mental attitude	Give up	Words such as 'give up' and 'push myself' show participant recognition of motivation and their attitude with regards to their ability to increase their walking. Mention of a 'walking plan' as a goal to push themselves to achieve links self-regulation with these mental barriers.	"the biggest challenge is when I can't hold on and want to give up"
		Mind		"I will finish it with my own mind"
		Fear		"overcoming fear is the greatest gain"
		Attitude		"attitude to push myself to the daily walking plan"
		Walking perceptions		"I think it's too bad. I think it's normal to be able to walk 80 kilometres a day"
		Motivation		"want to give up"
		Ability		"can't keep up"
Overcoming walking challenges/barriers	Social support	Confidence	Different forms of social support mentioned by participants in response to overcoming challenges to increasing their walking	"I'm not confident to go on"
		Enjoyed		"with a family member I enjoyed it"
		Accompany		"he must have someone who can accompany him for a long time"
		Company		"company (friend/colleague)"
		Professional advice	When unsure of abilities and regarding any negative symptoms as a result of walking	"seek professional advice"
	Alternatives to walking	More suitable exercises	Non walking specific ways participants identified to increase their physical activity.	"take it easy either in a chair or in a pool"
		Online tools		"use online resources to help me run"
	Planning	Plan	Having a plan to overcome motivation barriers to increasing walking	"draw up a plan"
		Walking plan		"daily walking plan"
	Combating weather conditions	Clothing	Identifying practical solutions to overcoming weather conditions which	"protective clothing"

		Weather	have previously been a barrier for walking	“put on my raincoat”

Appendix L
Framework showing codes, sub-themes and themes for the SCT concept self-regulation

Themes (SR)	**Sub-themes**	**Codes**	**Description**	**Extracts**
Monitoring	No tracking	Tracking	Words such as 'don't', 'no regular' and 'minimal' were used to describe the current walking tracking habits of some participants	"I don't keep track of my walking I should invest in a Fitbit"
		Minimal		"I don't track or monitor my walking because it is fairly minimal"
		Inconsistent		"no regular monitoring"
		Steps		"I don't really track the amount of steps that I walk"
	Mobile phone tracking	Pedometer	Several participants shared that they monitored their walking using the built-in pedometer on their mobile phones	"the mobile phone pedometer"
		Step counting		"using mobile phone to count steps"
	Social support	Diabetic	Participants identified specific social contacts who held them accountable for walking	"I sometimes call on my diabetic friends to run with me"
		Walking friends		"supervise each other with my walking friends"
	Fitness trackers and apps for monitoring	Tracker	A range of other mobile phone-based apps and fitness trackers were mentioned as ways participant currently track their walking. Both by step counting and route recording.	"I'm using a sports tracker now"
		Apple fitness		"I use the apple fitness tracker to record every step I take"
		Route		"download track my tracks… and monitor my route"
		App		"download track my footprints"
Walking experiences	Specific walking experiences	Marathons	Some shared experiences of specific walking routes taken when on holiday or specific events involving physical activity and walking, they had taken part in	"I take part in some marathons every once in a while, which has increased the motivation of walking"
		Long-distance		"Three long-distance walking experiences so far"
		Trips		"the main route passes Torres del Paine National Park for about a week"
Goal setting		Plan	Self-regulation through regular walking planning	"I usually make a walking itinerary plan"

Appendix N

Framework showing codes, sub-themes and themes for participant responses to questions regarding a digital resource to increase walking.

Themes (diabetes online groups)	**Sub-themes**	**Codes**	**Description**	**Extracts**
Social support		Cooperation	Using words such as 'cooperation' 'group' in connection with describing participating in 'activities' as a group and 'idea' gathering as part of a group. Describing benefits of being part of an online diabetes group.	"collective cooperation"
		Activities		"take part in more group activities"
		Ideas		"an excellent group can gather more ideas together"
		Large group		"large group cooperation"
		friends		"friends"
Confidence		Increased confidence	Describing how online diabetes groups have increased participants confidence .	"given me a lot of confidence"
		Confidence in abilities		"confidence to exercise"
		Self-confidence		"improving my self-confidence"
Education		Information	Participants describe different ways in which they have gained "information" or "knowledge" from online diabetes groups, which they have been able to use to help them.	"they give me more information about exercise"
		Different ideas		"when they encounter problems, they have different levels and directions of thinking"
		Communication		"I use my little knowledge to communicate"
		Wisdom		"I find or erase some sparks of wisdom"
		Understanding		"enhance tacit understanding"

Themes (Features of a digital resource)	**Sub-themes**	**Codes**	**Description**	**Extracts**
Social support		Like minded	Participants described a digital resource for them would have social features where they could "find" and "invite" other people who were like them. Reasonings for this feature ranged from having others to go walking with to learning from them and also coming together to motivate each other.	"hope to find like-minded individuals to potentially join them walking"
		Diabetics		"find patients with diabetes can increase motivation together"
		Sharing		"we hope to see friends with type 2 diabetes sharing their life in an app"
		Invite		"invite friends"

Rewards		Pocket money	Participants described that they would like an online feature where they could earn rewards 'money' for increasing their walking and/or to encourage them to do so.	"make money every day and earn some pocket money"
		Earn		"earn encouragement money"
		Prizes		"lucky draw"
Motivation	Reminders	Updates	General description of ways in which a digital resource could remind participants about walking	"live updates"
		Alerts		"alarm alert"
		Reminders		"reminding me or texting me to go for walks"
	Driving force	Pushed	Describing how motivation and encouragement through a digital resource would increase walking	"I just need someone pushing me"
		Encouragement		"Encouraging me"
		Motivation		"lacks motivation"
		Change behaviour		"motivate to walk instead of driving"
Feedback and goal setting	Feedback	Accurate	The importance of getting feedback regarding their walking from a digital resource	"the tracker can give me accurate feedback"
		Progress information		"will let me know how much I have moved faster"
		Praise		"reassuring"
		Reinforcement		"confirms achieving"
		Achievement information		"tell me whether my plan is completed"
	Goal setting	Goals	The ability to set walking goals	"setting goals"
		Predetermined		"pre-set walking goals"
		Enjoy		"I like setting goals"
	Diary log	Real data	Participants describe having access to 'accurate' data that they can look back on to see improvements.	"the walking steps and distances that I do in real life will show up on the app"
		Accurate		"accurate record"
		Types of data		"historical data, cumulative steps: motion analysis"
		Data		"data can give me strength"
		Tracking		"monitor the number of steps I take everyday"
		Adjustable		"adjust the exercise time every day for walking, jogging, swimming, climbing stairs, cycling"
		Visual record		"see how many steps I have done to do more"
	Interface features	Upgrades		"Version upgrades"

Technology design and additional features		Easy	Describing the visual features important in using a digital resource for increasing walking	"easy steps"
		Warm		"interface of the software should be warm"
		Professional		"give me a very professional feeling"
		App display		"mobile phone app as active screen display"
	Information features	Informative	Sharing specific information, they would benefit from having access to via a digital resource	"tell me there is a shop or rest station"
		Area maps		"app with maps of walks in the area"
		Safety information		"have all walks in the city with information regarding any hazards and minimum preparation needed"
		Activity participation		"take part in popular activities"

Themes (How would these features increase walking)	**Sub-themes**	**Codes**	**Description**	**Extracts**
Motivation		Behaviour change	Participants mention different ways in which they feel a digital resource could help to increase their motivation.	"extra motivation to walk instead of drive"
		Exercise		"if I am motivated, I will increase my exercise"
		Exploring		"motivate to explore new walks in the local areas"
		Motivation		"increase motivation"
Monitoring/tracking	Data recording	Comparison	Describing desired recording features to help increase walking with emphasis of 'real time' and 'any time' access to information.	"walking data…view each other's data at any time"
		Steps and calories		"by tracking steps and calories burned"
		Real time		"monitor the number of my walks in real time"
	Plans and goals	Professional plans	Plan and goal setting from both the individual and having advice regarding planning walks.	"provide me with professional exercise plans and some first aid knowledge"
		Preparation		"take time to prepare for the walk and gradually increase the time and difficulty of walking"
		Reaching goals		"by completing the amount of steps that I need to do"
		Target setting		"probably because I like setting targets"
Social support		Connection		"connect my partner"

		Contacts	The ability to meet new people and connect with current friends regarding walking information.	"develop acquaintances"
Barriers		Problems	Using resources to overcome existing walking barriers such as lack of interest and boredom in relation to walking.	"These resources can be used when I have problems walking"
		Interest		"increase my interest in walking"
		Uninterested		"I am bored with sports"
		Lockdown		"I used to go every day to exercise gym on treadmill when lockdown started, I've not been able to go"
Overcoming barriers		Information	Using a digital resource to help participants overcome barriers to walking.	"I can log into the app and find out what I want to know to help me get through the difficulty of walking"
		Relaxation		"I can play music or some jokes… because these can relax my mood"

Themes (additional resources)	**Sub-themes**	**Codes**	**Description**	**Extracts**
No ideas		No ideas	Uncertainty shown by participants regarding if and how a digital device could help to increase their walking.	"I can't think of anything"
		Don't use		"don't really use anything"
		No digital resource ideas		"I can not think of any digital resource that my help me increase my walking"
Tracking/monitoring	Maps/apps	Mapping app	Emphasis of using maps and other diabetes apps on digital devices to monitor walking.	"Map my walk"
		Areas		"map of the area"
		Currently using		"I'm using the MapMyWalk tracker now"
		Diabetes app		"I used Mysugr"
		Interactive routes		"with maps and inter-active route display"
	Tracking devices	Mobile phones	Participants shared how they are currently monitoring their walking using different digital devices.	"mostly mobile phones and watches"
		Smart watches		"using smart apple watches right now"
		Mobile phones		"mobile phones"
		Apple watch		"my apple watch"
		Still use		"I still use apple watch now"
		Fitbit		"Fitbit"

		Robust		"robust activity watch"
	Types of information tracked	Personal health	Participants shared what type of information they would benefit from being recorded to increase walking. The word 'all' was used frequently to describe the importance of a device recording everything in relation to walking and other health data.	"tracking personal health numbers"
		Movement tracking		"keeps track of my movement all the time"
		Daily recording		"kept record of my daily exercise volume"
		Minimum tracking		"tracking at least one personal health data, such as walking or heart rate"
		Variety of data		"monitor all kinds of activity data"
		All activity recorded		"tracking and recording all activity"
	Thoughts on the effectiveness of these tracking devices	Convenient		"I think it's very convenient"
		Records	Describing specific features surrounding recording and alerts of information.	"this is my favourite device, because it records what I need"
		Alerts and social connection		"alerts about exercise statistics, but also listen to friends' replies to exercise posts on Facebook and Twitter as you walk"
		Accuracy		"accurate data"
		Inclusive and available		"I feel that all the functions I need are available and comprehensive"
Outcome expectancy/ results		Walking volume	Participants shared positive effects they already have experienced from walking and outcomes they expect to happen should they increase their walking.	"increase my walking volume"
		Positive body changes		"my body is getting better and better"
		Maintenance		"walking allows patients to maintain their ideal weight and improves metabolic levels"
		Improvement		"increase my fitness and walking level"

Themes (not work for you)	**Sub-themes**	**Codes**	**Description**	**Extracts**
Time		Reading	Participants identified that having lots of information regarding walking in a digital format was time consuming to read.	"no time to read"
		Busy		"don't get time for myself or get going out for a walk"
		Manual data input		"input into an app is time consuming
Privacy		Private		"I find it personal"

		Security concerns	Some participants shared reluctance to have their personal information recorded and stored in this way due to privacy concerns.	“It makes me feel like these websites and digital resources are peeping into my life without any sense of security”
		Privacy violation		“they will violate my privacy
Lack of motivation		Step motivation	Participants share their struggles with motivation and do not feel a digital resource could help increase their motivation and influence their walking.	“there’s no way to motivate me to take more steps”
		No way to motivate		“there’s no way to motivate me”
		Not socially motivated		“the words with friends can’t motivate me to exercise”
		Health professionals		“health professionals can’t motivate me to increase exercise”
		Not motivating		“don’t think its motivating enough for me”
Too detailed		Too detailed	It was shared in responses that participants found some digital resources had too much information and this was overwhelming or uninteresting.	“information about sports walking is too detailed”
		Not simple		“their interface is not simple enough”
		overwhelming		“makes me dazzled and I don’t know where to find the information I need”
		uninteresting		“I have too many groups to keep up with, not interesting”

Appendix O

Table showing key themes identified from participant responses regarding digital resource preferences and experiences.

Digital resource	**Key themes identified**
Desired features of a digital resource for increasing walking	• Social support • Rewards • Motivation • Feedback and goalsetting • Technology design and additional features • Overcoming barriers • Outcome expectancy • Tracking and monitoring
Current experiences with online diabetic groups	• Social support • Confidence • Education
Concerns regarding digital technology to increase walking	• Lack of time • Privacy • Lack of motivation • Too detailed

Appendix P
Signed section of ethics approval

By signing below (digital signatures accepted), you certify that the information provided is true and correct to the best of your knowledge. You agree to conform to the University's ethical standards and to inform your supervisor if further ethical issues arise during the conduct of your project.

STUDENTS

Applicant's signature: JDodgson **Date:** 23/04/2020

FOR SUPERVISORS:

	Initials
I have read and approved this project application and affirm that it has received the appropriate academic approval.	
I will ensure that the student investigator is aware of the applicable policies and procedures governing the ethical conduct of research at the University of Stirling	
I have informed the student investigator of discipline specific guidelines regarding the ethical conduct of research. Examples include: Click here to enter text.	
Should unexpected ethical issues arise during the conduct of the project I will ensure these are appropriately recognised and addressed.	
I agree to provide supervision to the student investigator for this project.	

Please sign below to confirm that you are happy with the arrangements detailed above and recommend this project for approval.

Supervisor's signature: **Date:22.05.2020**

Please submit your completed form as a WORD document to the relevant delegated authority inbox

Stirling Management School: Please submit via **Canvas**	Arts & Humanities: Please submit via **Canvas**
Faculty of Social Sciences: Please submit via Canvas or fossfacultyoffice@stir.ac.uk	Faculty of Health Sciences & Sport: Please submit via **Canvas**
Computing Science & Maths: ethics@cs.stir.ac.uk	Psychology: psychethicssubs@stir.ac.uk
Aquaculture: aquaguep@stir.ac.uk	BES: besguep@stir.ac.uk

If in doubt please submit your completed and signed form in WORD format to guep@stir.ac.uk copying in your supervisor.

SECOND APPROVER: I have read this project and associated documents. My recommended outcome for this project is recorded below (please sign and date next to your recommended outcome).

Recommendation	**Second Approver Signature**	**Date**
Approved	Dr Lesley M. McGregor	23.05.20
Approved with minor amendments		
Approved with major amendments		
Referred to Delegated Authority		

Reflective Portfolio

Reflection on the experience and success (or not) of your HPSP112 Behaviour Change exercise.

The behaviour change intervention chosen aimed to increase individuals daily step count within a group setting. The group created clear goals with regards to the exact number of steps we wanted to achieve daily. Although goal setting was implemented, further individual goals could have been created to assign a specific time or place where this could be integrated into daily life.

Daily steps were measured on a designated trial week to identify a baseline. These values were not shared until post intervention. During the intervention week, daily step count was shared to a private Facebook page where group members had access. This accountability was designed to increase motivation. The first day of the intervention week I did not meet my step goal and felt apprehensive to share this with the group. However, the majority of the group were also unsuccessful and in the same position. Resulting in group justification and support when we did not reach our goal rather than when we did. This resulted in reduced motivation for reaching a daily step goal due to a lack of social consequence for not achieving the step goal.

Reflection on ethical and recruitment issues of your research project.

The target population for my research project was ethnic minority populations within the UK with type 2 diabetes. This participant group are considered high risk and appropriate ethical approval was required. Recruitment was conducted in partnership with Pilton Health Community Project (PHCP) due to their contacts. PHCP sense checked documents to reduce the risk of causing offense or misinterpretation. Due to the COVID-19 outbreak, focus

groups were cancelled and transformed into a single online qualitative survey. This was a positive change, as the survey could be distributed to more participants from a range of ethnic minority groups and reach a wider audience across the UK. Despite these advantages, several issues arose using an online survey with this population. After publishing the survey and receiving very few responses. Ethics was resubmitted for approval to add interview options so participants could complete questions with the researcher to make it more inclusive and accessible. A £10 incentive for every participant was also added, this encouraged participation but also attracted fake responses where the survey was completed several times to receive multiple vouchers. Consequently, recruitment changed to be exclusively through gatekeepers to reduce fake responses, this led to overall fewer responses.

What was the most challenging part of the research process and why?

The most challenging aspect of the project was the production and running of a joint online survey with another student. This was made particularly difficult as the only contact between the researchers during the COVID-19 outbreak was online which made communications difficult. As this joint survey required ethical approval using the same documentation and this process was conducted collaboratively, this meant ideas or understanding was sometimes lost between email conversations and Microsoft teams meetings. This led to confusion regarding most up to date documents prior to ethic submission. Due to the nature of this collaboration between researchers, the process of applying for ethics took more time, this then had a knock-on effect on the time available for the recruitment of participants. This was further complicated when further ethics had to be submitted to allow for the implementation of new recruitment incentives to reduce the risk of more fake responses being recorded.

If you were starting the project again on 1st September 2020, what would you do differently and why?

If this project was to be conducted again, a change in data collection methods. Recruiting participants using appropriate gatekeepers was found to be effective in recruiting eligible participants for the study. However, having data collection relying only on individuals completing a qualitative questionnaire which requires around 20-30mins of participants time and involves open-ended questions resulted in few fully completed survey responses. Despite a 50-character minimum for open-ended questions participants wrote very little, resulting in limited useable data. If this project was to be conducted again, it would be advised to use the same questions but ask these directly to participants in an interview style compared to an online survey. This would help reduce the number of participants only completing some of the questions and give the researcher the opportunity to seek clarification from participants regarding their answers. Participant misunderstanding in questions was apparent when using an online survey. Conducting interviews would reduce this misunderstanding and allow participants to ask for clarification. Although time and resources conducting interviews may reduce sample size the quality of responses would be expected to be higher than those gained from an online survey. Using telephones or Microsoft teams to conduct interviews would still allow for the reach of the study to replicate that of the online survey.

If you were a critical reviewer for the British Journal of Health Psychology, what are the main constructive criticisms/suggestions you could make of your research project and dissertation?

The main criticism of this project would be the quality of the sample population. This study aimed to investigate attitudes and qualities of a digital resource to help increase

walking for individuals from ethnic minority groups within the UK. However, only 15 participant responses were analysed. This small sample size means the results found from this study cannot be applied to the general population of ethnic minority groups within the UK. Furthermore, participants included in the analysis of this study self-identified to be from a range of different minority ethnic groups within the UK. This meant a comparison between results found from different ethnic minority groups could not be conducted due to the small sample size for each ethnic minority group represented.