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The role of mobile technology in walking in adults

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This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

Signed:

Date:

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Abstract

Physical inactivity is associated with an increased risk of developing coronary heart disease, type II diabetes, obesity, and stroke (World Health Organization, 2004). Despite this increased risk of disease, less than 40% of adults in the UK (Health Survey for Scotland, 2009; Health Survey for England, 2009) are achieving the minimum global physical activity guidelines. Research by Ofcom (2012) found that two out of every five people in the UK own a smartphone, and for many, they are an integral part of their everyday lives. This creates a potential platform for smartphones to influence behaviour change. This dissertation explored the preferences adults have for a mobile app to encourage and monitor walking by taking a user-centred design approach. The first study consisted of an online questionnaire and individual interviews. The findings from this study were used to inform the design of a Q-methodological study which explored the preferences of sedentary and low active adults for a mobile walking app. Analysis identified three types of mobile app users: users who prioritised music as a main feature of the app; users who wanted a motivational walking app; and users who wanted an informational walking app. The findings from this dissertation will be used to inform the development of an existing prototype mobile walking app created by researchers at the University of Strathclyde. Physical activity app developers should consider these differences in preferences when designing apps in the future and other researchers and physical activity practitioners should take into account that different approaches may work for different people with regards to increasing physical activity levels. This dissertation has highlighted Q-methodology as a potential method of user-centred design to inform technology development.

Contents

Introduction

The benefits of regular physical activity are well documented and contribute to a reduced risk of a number of serious health conditions and diseases such as coronary heart disease, obesity, stroke and type II diabetes (WHO, 2011). Regular physical activity can also reduce the risk of mental illnesses, for example depression (Paluska & Schwenk, 2000), and it can reduce the decline in cognitive function with age (Yaffe et al., 2001). Despite the well documented benefits, only 39% of adults in Scotland (Health Survey for Scotland, 2009) and 34% of adults in England (Health Survey for England, 2009) are achieving the minimum global physical activity recommendations of 30 minutes of moderate intensity physical activity on five or more days. These low levels of physical activity have been recognised as a global health problem with a recent paper published in the Lancet describing physical inactivity as a "pandemic" (Kohl et al., 2012). This presents a challenge for physical activity practitioners to raise activity levels.

Walking has been advocated as a highly accessible form of physical activity to increase levels in a large proportion of the general public (Morris and Hardman, 1997). National strategies have promoted walking, for example in Scotland walking has been promoted through the 'Paths for All' project, which is one of the key delivery mechanisms of Scotland's Physical Activity Strategy (PAHA, 2011).

Changing physical activity behaviour is complex and theories have attempted to explain behaviour change in the physical activity literature. Two of the most widely acknowledged approaches for describing physical activity adoption are the Transtheoretical Model (Prochaska & DiClemente, 1982) and Social Cognitive Theory (Bandura, 1986). The

Transtheoretical Model (Prochaska & DiClemente, 1982) describes the stages of change involved with physical activity adoption and how this behaviour change occurs. The stages of change include:

- Pre-contemplation: where the individual is not active and has no intention of becoming active
- Contemplation: The individual is not currently active but is thinking about becoming more active
- Preparation: the individual is preparing to become more physically active (e.g. purchasing walking shoes)
- Action: The individual is active for less than 6- months
- Maintenance: the individual has been active for more than 6- months.

A further stage, which is sometimes referred to as relapse, is when the individual moves down a stage in their attempts to get to the maintenance stage. The Social Cognitive Theory (Bandura, 1986) is a behavioural model that implies the personal characteristics (e.g. thought processes), past and current behaviours, and the environment interact with the individual to influence outcomes. Theoretical models of behaviour change are often used to inform behaviour change interventions.

A review of walking interventions by Ogilvie et al. (2007) found evidence for different approaches including brief one to one advice, active travel and group-based support. They found particular success for interventions that involved targeting interventions at sedentary and low active individuals and tailoring interventions to suit individual needs.

Despite the success found in a range of walking interventions, participation in walking remains low. The 2008 Health Survey for England found that only 41% of men and 34% of women reported doing any walking over the previous 4 weeks (Department of

Health, 2008). This suggests different approaches are needed to raise walking levels. Recently various technologies have been used in an attempt to increase physical activity levels, including: active gaming (e.g. the Nintendo Wii); online resources (e.g. online interventions, online communities); self-monitoring devices (e.g. heart rate monitors, accelerometers, pedometers); and recently and arguably one of the most persuasive technologies; the mobile phone.

Research by Ofcom (2012) found that approximately two out of every five adults in the UK own a smartphone, creating an opportunity for smartphones to act as behaviour change tools. Mobile apps have grown in popularity over recent years; over 25 billion apps have been downloaded from Apple's App Store alone (Apple, 2012). Recent years have also seen the expansion of the wellness app market with apps such as First Aid by the British Red Cross and the food diary: Calorie Counter PRO by MyNetDiary. There are also a growing range of physical activity apps available, typically aimed at runners and cyclists, including Nike+, Endomondo, Garmin Fit, and My Tracks. Some physical activity apps have adopted a gaming aspect, for example 'Zombies, Run!' combines GPS, running and a zombie storyline with various challenges and missions for the user to accomplish.

Researchers have designed and performed user studies on physical activity apps intended to encourage the user to be more active and a variety of approaches have been taken with regard to app design. Consolvo et al. (2006) carried out a user study on their app 'Houston' which encourages sharing step count data with friends. They found that participants in the sharing group were significantly more likely to achieve their step count targets than those in the individual groups. Other researchers have also focused on apps that encourage social support, for example Maitland et al. (2006) tested an app that involved sharing physical activity data with friends and found positive results and Lin et al. (2006) combined gaming with teamwork and friendly competition in their app 'Fish'n'Steps' and

participants demonstrated a significant increase in physical activity over the duration of the study. Lin et al. (2006) highlighted a plateau effect towards the end of the study whereby the novelty of the game disappeared and participants reported that the game was becoming repetitive and many participants began to reduce their use of the game. This suggests that some gaming apps may not be effective in increasing physical activity in the long term due to this potential plateau effect of the participant's engagement with the game. Consideration to this potential plateau effect should be given when designing physical activity apps in the future.

Although these apps typically received positive feedback from the participants of the user studies the studies lacked longitudinal data and the users' preferences from a mobile walking app remain unclear. Baillie, Morton, MacLellan, and Ryde (2009) found difficulties designing a physical activity app for the type of user that would make use of the app, which the authors identified as the general public with a median age of 40 years old, and they found that encouraging them to use the app was more of a challenge than they envisaged. There is clearly a potentially large platform for mobile phones to promote behaviour change; however, there is a need to explore user requirements for a mobile walking app in order to design a walking app that people will want to use.

User experience design has been defined by Vredenburg, Mao, Smith, and Carey (2002) as "the practice of the following principles: the active involvement of users for a clear understanding of user and task requirements, iterative design and evaluation, and a multi-disciplinary approach" (p. 472). Buur and Bagger (1999) found that involving users in the early design process can enhance the end product development by using dialogue to learn about user priorities and can help with more "innovative engagement in new design possibilities" as well as gaining an understanding into the users' context. Many researchers have since employed the use of user experience design and found positive results (e.g.

Lamont, 2003). Despite this, some researchers have opposed the concept of involving users in product development with the idea that "The best way to satisfy users is sometimes to ignore them" (Norman, 2005, p. 17). Lee, Popovic, Blackler, and Lee (2009) suggested this view is based on a misconstruction of the nature of users' knowledge and the user-designer relationship in collaborative design sessions.

Due to the lack of research that addresses users' preferences for physical activity apps, this dissertation has employed the use of user centred design in two studies to explore users' preferences for a mobile walking app. The first study used an online survey, followed up by individual semi-structured interviews in a selection of the participants. The purpose of Study 1 was to generate initial responses for the potential for a mobile walking app. The results of Study 1 were used to inform the design of the second study which was Q-methodological in approach. Study 2 explored participant preferences for a mobile walking app in more depth by expanding on findings from Study 1 and presents Q-methodology as a potential method when involving users in the technology design process. By focusing only on sedentary and low active individuals in Study 2, information was collected from the target market for a potential walking app. Each study will be presented in turn and the findings of this dissertation will be used to inform the development of a basic prototype walking app called the 'Stepper App' (see Table 1), designed by researchers at the University of Strathclyde.

Table 1: Main features of the Stepper App

Features of prototype walking app
1. **Points system corresponding to global physical activity recommendations** 2. **Distance in total number of steps** 3. **Total time**

Literature Review

Introduction

The aim of this literature review is to explore the use, design, and testing of mobile technology for physical activity participation. This literature review will present five broad sections: (A) A background to physical activity, (B) Psychology of physical activity, (C) Wellness technologies, (D) Human computer interaction, and (E) User studies for wellness technologies, in an attempt to gain a broader understanding into the role of mobile technology in physical activity.

Section A: A Background to Physical Activity

Physical inactivity has sparked a great deal of interest over recent years, with physical activity practitioners facing considerable challenges in their attempts to raise participation levels globally. Physical activity is a broad term which encompasses several components including active living, recreational activity, sport, exercise, play and dance (Malina, Bouchard, & Bar-Or, 2004). It is defined as movement of the body which is produced by the skeletal muscles and results in energy expenditure and an increase in heart rate above resting levels (Caspersen, 1989). There has been substantial changes estimated in physical activity and eating behaviour now since the hunter-gatherer time over 10,000 years ago, which Blair (1988) suggested was the pre-agricultural period. Blair (1988) went on to highlight three subsequent evolutionary periods including the agricultural period, the industrial period (1800-1945), and the technological period (1945-present). The changes in lifestyle between these time periods are estimated to be extensive, despite documented

evidence, with modern society living notably inactive lifestyles when compared with previous periods. This is reflected in the 2010 Health Survey for Scotland which found only 39% of adults meet the minimum physical activity guidelines, with 45% of males and 33% of women reaching recommendations. Results from the 2009 Health Survey for England were similar, with 39% of males and 29% of women reaching physical activity recommendations. The World Health Organisation has recognised these low levels of physical activity and the problems associated with them and steps are being taken to increase physical activity levels worldwide, for example the Scottish government has since included physical activity as one of the 50 National Indicators in Scotland, which are key priorities the government believe will lead to a more "successful and prosperous Scotland". In addition, increasing physical activity participation is recognised internationally by the World Health Organisation in their global strategy on diet, physical activity, and health (WHO, 2004).

These low levels of physical activity are a cause for concern because they are associated with an increased risk of chronic diseases including coronary heart disease, type II diabetes, obesity and stroke (WHO, 2004). These conditions result in absence from work and loss of productivity, and physical inactivity has been estimated to have a yearly cost of £1.06 billion to the National Health Service (NHS) in the UK alone (Allender, Foster, Scarborough, & Rayner, 2007). Increasing physical activity levels can reduce this high cost to the NHS through reducing the incidence of obesity, cardiovascular disease, type II diabetes, stroke, high blood pressure and some forms of cancer (Thompson, Gordon, & Pescatello, 2009). In addition to this, regular physical activity can improve mood state (Penedo & Dahn, 2005; Fox, 1999) and reduce the symptoms of anxiety and depression (Paluska & Schwenk, 2000). Physical activity has also been related to short-term improvements in cognitive function (Chang and Etnier, 2009), and there has also been some

evidence to suggest physical activity can reduce the decline in cognitive function over the long term (Yaffe, Barnes, Nevitt, Lui, & Covinsky, 2001; Petrovitch and White, 2005).

Walking has been identified as an easy, affordable and achievable way to increase physical activity levels in the general population and it is underlined as an ideal form of activity for sedentary or less able populations to begin exercising with (Morris & Hardman, 1997). It has also been highlighted as one of the most popular forms of physical activity in Scotland (Health Survey for Scotland, 2008). Walking has since been promoted through the Paths to Health project, one of the key delivery mechanisms of Scotland's Physical Activity Strategy (PAHA, 2011), a project which supports walking groups, provides information and support and improves the quality of walking routes throughout Scotland.

The World Health Organisation (2010) created global physical activity guidelines which suggest adults between the ages of 18-64 should aim to be active daily, and should obtain 150 minutes of moderate intensity activity each week, or 75 minutes of vigorous intensity exercise, or an equivalent combination of moderate and vigorous physical activity. Aerobic activity should be in bouts of 10 minutes or more and two or more days per week should be spent doing muscle strengthening exercises. There is some difficulty in translating these guidelines into walking requirements to achieve a health benefit. The National Health Service widely promotes the "10,000 steps a day challenge", although there is little scientific evidence to back up this recommendation. The concept can be traced back to a single Japanese walking intervention (Hatano, 1993). Tudor-Locke and Bassett (2004) suggested that although 10,000 steps a day is a reasonable target for most individuals other groups will have different requirements, such as children and older adults.

More recent evidence from a review by Tudor-Locke (2011b) suggests that 7,000 to 8,000 steps per day should be carried out by healthy adults aged between 20 and 65 to

reach a health benefit and to coincide with government guidelines, and they suggest that 3000 steps per day of this should be at a moderate to vigorous pace. Previous researchers have suggested walking 100 steps per minute corresponds to moderate intensity physical activity (Abel, Hannon, Mullineaux, & Beighle., 2011; Beets, Agiovlasitis, Fahs, Ranadive, & Fernhall, 2011; Rowe et al., 2011; Marshall et al., 2009; Tudor-Locke, Sisson, Collova, Lee, & Swan, 2005), however recent research has found that moderate intensity cadence varies from 90 to 113 steps per minute for adults depending on height and stride length, with taller individuals requiring a lower step cadence to achieve a moderate intensity (Rowe et al., 2011).

Researchers have acknowledged that children and older adults and special populations will have different requirements of intensity and duration of walking in order to achieve a health benefit. Tudor-Locke et al., (2011a) carried out a review on the walking requirements for children and adolescents. They found that walking requirements for children and adolescents were significantly higher step counts compared with those required from adults, which was not taken into account in the previously suggested 10,000 steps-a-day recommendation, and suggests that 13,000 to 15,000 steps per day in primary school aged children and 10,000 to 11,700 steps per day for adolescents equates to the government guidelines of 60 minutes of moderate to vigorous physical activity.

Tudor-Locke et al. (2011c) also published a review on the walking requirements for older adults and special populations. The findings suggest a useful guideline to reach government guidelines would be to carry out an extra 3000 steps per day in addition to the individual's baseline levels, which is also true for healthy adults, and they suggest these additional 3000 steps per day will equate to a total step count of 7,000 to 10,000 steps per day. They recognise that this figure will be lower for those living with a disability or chronic disease, due to the lower baseline level of physical activity.

This section has shown that not enough people in Scotland are reaching physical activity guidelines, and this is concerning because of the associated risks of disease and reduced quality of life. The importance of increasing physical activity has been recognized internationally by the World Health Organisation through the global strategy on diet, physical activity and health (World Health Organisation, 2004). Walking has been highlighted as an ideal method of increasing physical activity for most people, and various schemes have been created to attempt to increase walking, such as the Paths to Health Project. Walking recommendations based on recent literature were highlighted for different groups of people in order to achieve a health benefit.

Section B: Psychology of Physical Activity

This section will consider the correlates of physical activity with a view to account for the variance in physical activity levels between people. It will then discuss theoretical models of behaviour change and review the literature on physical activity interventions aimed at changing behaviour, and evaluate successful intervention strategies.

Correlates of physical activity. It is important to initially consider why people have varying levels of physical activity; this can be done by examining the four categories of physical activity correlates as proposed by Biddle and Mutrie (2008). These include personal and demographic, social, environmental and psychological correlates.

Personal variables include barriers to physical activity. These can be physical barriers (e.g. injury, poor health), emotional barriers (e.g. personal insecurities), motivational barriers (e.g. lack of energy), time, and availability (e.g. lack of money, facilities). Barriers to physical activity have been shown to be strong correlates of leisure-time physical activity,

with different populations perceiving different barriers (Trost, Owen, Bauman, Sallis, & Brown, 2002). Demographic correlates of physical activity include socio-economic status, gender, age and ethnicity. A review by Trost et al. (2002) found age and gender to be two of the most consistently reported correlates of physical activity, with males being more active than females and physical activity declining with age. They also found socioeconomic status, educational attainment and employment status to be significant determinants of physical activity participation.

Social correlates, such as social norms and social support, have been consistently shown to be related to physical activity levels. Social support is defined by Sheridan and Radmacher (1992; pg 235) as "the resources provided to us through our interactions with other people". Social support typically falls into three categories: emotional support (e.g. provide encouragement); instrumental support (e.g. provide equipment); and informational support (e.g. provide instruction). A review by Trost et al. (2002) found that support from friends and family had a positive effect on physical activity participation in adults, and they found that every study that examined social support found a strong positive association between physical activity behaviour and social support.

Environmental variables for physical activity include the availability of physical activity facilities (e.g. swimming pool, gym), the weather and the built environment. Owen, Humpel, Leslie, Bauman, and Sallis (2004) carried out a review of studies (n = 18) which evaluated the impact of environmental variables on walking. They found facilities (e.g. trails, paths), accessibility of destinations (e.g. shops), and perceptions of traffic and scenery were all associated with walking. Trost et al. (2002) found a variation in the strength of the association between environmental variables and physical activity participation levels, which could be due to differences in study design. For example, some studies were set in

urban locations and compared with rural locations yet they only examined leisure-time physical activity with no inclusion of occupational physical activity.

Researchers have recognised that older populations will have further physical activity correlates in addition to correlates observed in the general population. Clark (1999) found that people over 55 years old perceive the following additional barriers associated with physical activity participation: pain (knee, back and hip pain); shortness of breath; and fear of chest pain. Chen et al. (2011) suggest that older populations reflect on past experiences which influence their future physical activity behaviour, for example, if they perceived themselves to be active and competent at physical activity during their younger years then they were more likely to be active later in life. These, in addition to the correlates discussed earlier, suggest that older adults require additional consideration when it comes to intervention design.

Van Der Horst, Chin, Paw, Twisk, and Van Mechelen (2007) also recognized that different populations have additional correlates of physical activity. They carried out a review of 60 physical activity studies which examined correlates in children and adolescents. Children's (aged 4-12 years) physical activity was related to parental support, parental physical activity and self-efficacy. Correlates associated with physical activity in adolescents (13-18 years) were self-efficacy, parental education, attitude, motivation, school sports and family influences. Biddle, Whitehead, O'Donovan, and Nevill (2005) found similar results, with the inclusion of physical self-perceptions correlated with adolescent girl's physical activity. Sallis, Prochaska, and Taylor (2000) also reviewed correlates of physical activity in children and adolescents in 108 studies. They found children with overweight parents were less active, spent less time outdoors and had a poorer diet. Sallis et al. (2000) also found a number of important correlates of physical activity for adolescents including: competence; parent support; community sports; previous physical activity; sibling physical activity;

healthy diet; and opportunities for physical activity. This suggests that different populations and groups of people have different correlates of physical activity which needs to be considered when designing interventions. It should be noted that inconsistencies in study design could reflect the differences in research outcomes found by a number of researchers and further good quality research in the area will help to better identify correlates of physical activity across different age groups and personal backgrounds.

Attitudes, perceived behavioural control and behavioural intention were studied through the Theory of Reasoned Action (See Figure. 1) and the Theory of Planned Behaviour (see Figure. 2). The Theory of Reasoned Action (Fishbein & Ajzan, 1975) suggests that a person's performance of a specified behaviour is determined by his or her behavioural intention to perform the behaviour, and behavioural intention is jointly determined by the person's attitude and subjective norm. The Theory of Planned Behaviour (Ajzen, 1985, 1991) is an extension of the Theory of Reasoned Action, and adds the concept of intention to the Theory of Reasoned Action. Perceived behavioural control is determined by availability of skills, resources, and opportunities to achieve outcomes. It has been viewed as similar to Bandura's (1997) Self-Efficacy Theory. The Theory of Planned Behaviour suggests that attitudes, subjective norms, and perceived behavioural control are direct determinants of intentions, which in turn influence behaviour. These behavioural models received weak support in the review by Trost et al. (2002) for their relation to physical activity behaviour.

Figure 1- The Theory of Reasoned Action

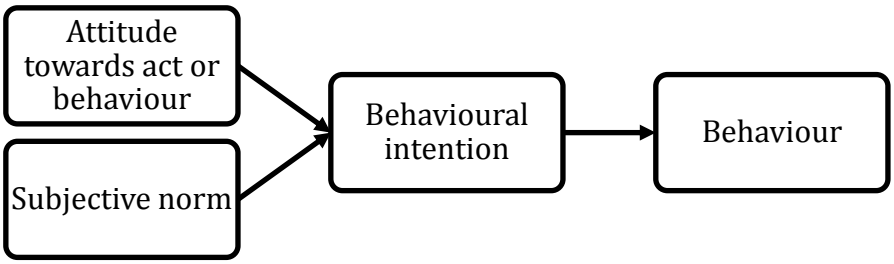
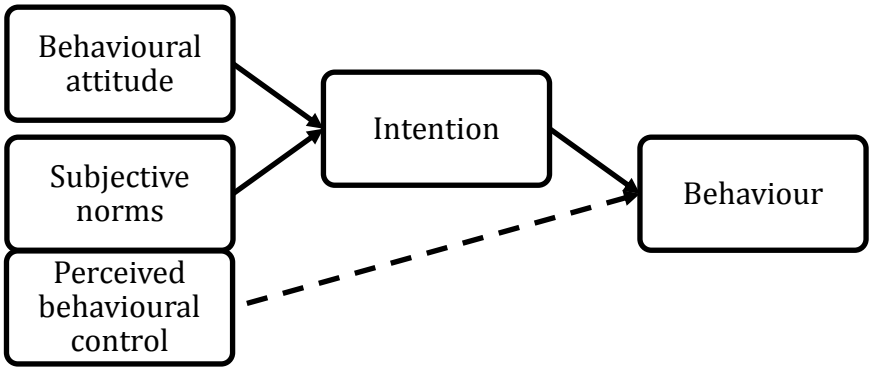


Figure 2- The Theory of Planned Behaviour



These behaviour change theories attempt to explain physical activity behaviour through including subjective norms and behavioural attitude. The Theory of Planned Behaviour also considers perceived behavioural control which could include a number of psychological variables for physical activity, for example self-motivation and perceptions of physical activity outcomes. Motivation is a key element in many constructs of psychology, and is often applied to psychology of physical activity. Motivation influences four key outcomes; choice, persistence, continuing motivation and intensity (Maehr & Braskamp, 1986). Bandura (1992) said "most human motivation is cognitively generated", through goal setting and self-regulation. Physical activity motivation has also been studied through finding out motives for participation, which has commonly included for health, tension release, fitness and as a means of controlling weight (Zunft et al., 1999).

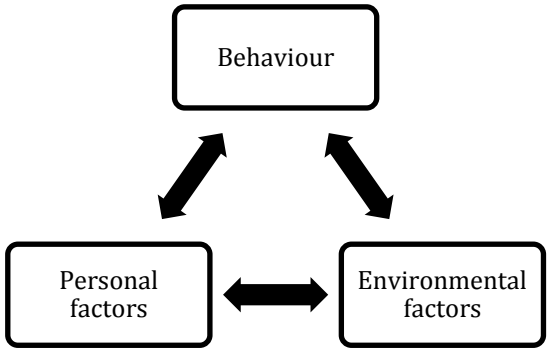
This section has discussed the four categories of physical activity correlates: personal and demographic, environmental, social and psychological, and describes differences in correlates of physical activity across a variety of age groups. Theories of behaviour, including the theory of planned behaviour and the theory of reasoned action have attempted to explain physical activity behaviour. The findings suggest there are a wide range of correlates that are strongly associated with physical activity participation and special consideration may need to be made when designing interventions for older adults, children and adolescents or other hard to reach groups (e.g. those with medical conditions) because these groups have additional barriers for physical activity that need to be addressed.

Theoretical models of behaviour change. By evaluating the correlates of physical activity we are able to determine the reasons why people are inactive or active, and this can help us to address these issues in a practical way through behaviour change interventions. There are several theoretical models that have attempted to explain behaviour change in the physical activity literature. Three of the most widely acknowledged approaches for physical activity adoption include the Transtheoretical Model (Prochaska & DiClemente, 1982), Social Cognitive Theory (Bandura, 1986) and the Health Belief Model.

The Social Cognitive Theory (Bandura, 1986) (see Figure.3) is a behavioural model that implies the personal characteristics (e.g. thought processes), past and current behaviours, and the environment interact with the individual to influence outcomes. Bandura (1986, p.18) said that in the social cognitive view people are "neither driven by internal forces nor automatically shaped and controlled by external stimuli". This assumes that we reflect on past and present experiences, and expectancies and consequences affect future behaviour. This combines the concept of social support, where those close to individuals who provide support for physical activity will influence behaviour. It also highlights the importance of social modelling, where the individual observes a friend or family member

perform the behaviour (e.g. walking) which encourages them to carry out the behaviour. Self-efficacy is also an important component of the Social Cognitive Theory, as it implies that if an individual is confident in their ability to carry out a task (e.g. daily walking) they are more likely to perform that task. It also suggests that if they are confident that they will achieve a benefit from the task they are also more likely to perform the task.

Figure 3- Social Cognitive Theory



There is limited evidence in the literature to support the use of Social Cognitive Theory in physical activity behaviour change however, Griffin-Blake and DeJoy (2006) carried out a comparison study of two self-help physical activity behaviour change interventions based within a workplace. One was based on Social Cognitive Theory and the other was based on the Transtheoretical Model. Participants (n = 208) were given printed self-help physical activity information packs that were either matched to the participants stage of change within the Transtheoretical Model or they were based on Social Cognitive Theory. Information consisting of physical activity questionnaires was collected at baseline and after a follow-up period. Griffin-Blake and DeJoy (2006) found that both interventions yielded similar results, with 34.9% in the stage-based intervention progressing and 33.9% in the Social Cognitive Theory intervention progressing which suggests that both Social Cognitive Theory and the Transtheoretical Model may provide a useful framework for physical activity interventions.

The Social Cognitive Theory may provide a useful framework in designing physical activity behaviour change interventions, however there is a lack of evidence in support of it. Griffin-Blake and DeJoy (2006) found some evidence in support of the use of the Social Cognitive Theory in physical activity interventions; however, further evidence is needed before the Social Cognitive Theory is advocated as the theoretical framework in behaviour change interventions.

A further model known as the Health Belief Model was first developed by Rosenstock (1974) to explain various health behaviours and it has been applied to numerous health behaviours, including physical activity. It was developed in an attempt to explain the poor success of several US Public Health Services schemes in the 1950s, such as free tuberculosis screening (Baum, Newman, Weinman, West, & McManus, 1997). It has since been developed by a number of researchers (e.g. Becker, 1974; Janz & Becker, 1984). The model predicts that people will not seek preventative health behaviours unless they have the knowledge and motivation to do so, view themselves as susceptible to conditions, perceive a risk from the disease, believe the preventative treatment will be effective and believe there to be few difficulties associated with the treatment. For example, an inactive adult may believe they are at risk of developing health related diseases (perceived susceptibility). Developing a health related disease (e.g. coronary heart disease) will have a major negative impact on the person's quality of life (perceived severity). The person will participate in the health improving behaviour (physical activity) if they feel the benefits will outweigh the barriers. Most of the research surrounding the Health Belief Model is based on negative health behaviours (e.g. smoking) with little evidence surrounding physical activity adoption and participation.

Early research that focused on the Health Belief Model and physical activity by Janz and Becker (1984) showed promising results for the model through a sample of over 40

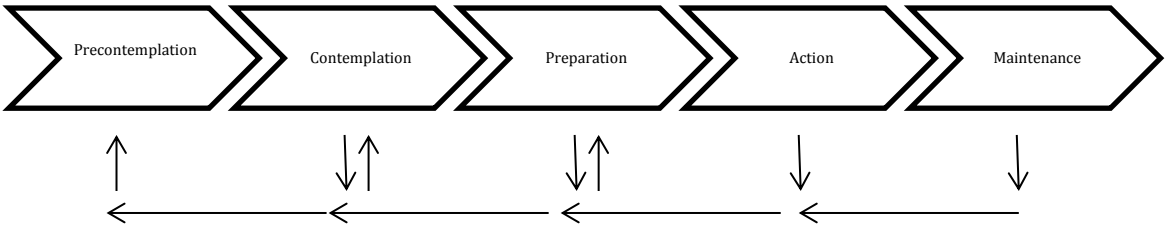
studies. The studies had to include at least one behavioural outcome and the literature was limited to medical conditions and to studies of health beliefs and health behaviours. They found perceived barriers to be consistently associated with physical activity behaviour. Later evidence was less positive, with Harrison, Mullen and Green (1992) finding small but significant effect sizes among the four dimensions of the Health Belief Model. Only 16 studies met the author's inclusion criteria, which included peer reviewed articles that were based on the four dimensions of the Health Belief Model: susceptibility, severity, benefits and costs. The studies each measured a behavioural dependent variable and included measures of reliability. The mean effect sizes were Pearson correlations and ranged from 0.01 to 0.30 and the authors suggested these weak effect sizes and lack of homogeneity in the studies make it difficult to ascertain the validity of the Health Belief Model. This suggests the positive results from Janz and Becker (1984) may have been due to inclusion of studies which the stricter inclusion criteria by Harrison et al. (1992) excluded.

Stroebe and Stroebe (1995) recognised the limitations of the Health Belief Model. They explained that the model does not account for a person's enjoyment of negative health behaviours (e.g. smoking), and they concluded that people's health behaviours are not always motivated by health outcomes, for example, some people are motivated to carry out physical activity because they think it will make them more attractive. They also highlight that social influences are not accounted for in the model, which has previously been shown to be an important correlate of physical activity (Trost et al., 2002). This, along with the findings from the review articles by Janz and Becker (1984) and Harrison et al. (1992), suggests that further evidence is necessary before the Health Belief Model can be advocated for use to describe physical activity behaviour.

A further model called The Transtheoretical Model (Prochaska & DiClemente, 1982) (see Figure. 4) describes the stages of change involved with physical activity adoption

and how this behaviour change occurs. The Transtheoretical Model provides a useful behaviour change model to understand physical activity participation and behaviour. Researchers in other fields (e.g. smoking cessation) have found the Transtheoretical Model an effective means of guiding interventions (e.g. Spencer, Pagell, Hallion, & Adams, 2002). The factors described as changing behaviour include stages of change, processes of change, self-efficacy and decision balance. The stages of change include: pre-contemplation (where the individual is not active and has no intention of becoming active), contemplation (the individual is not currently active but is thinking about becoming more active), preparation (the individual is preparing to become more physically active), action (the individual is active for less than 6- months) and maintenance (the individual has been active for more than 6- months). A further stage, which is sometimes referred to as relapse, is when the individual moves down stages in their attempts to get to the maintenance stage. The process of change is suggested by Marcus and Simkin (1994) as being cyclical, meaning that the individual will move back and forth between the stages and will make several attempts at change before they reach the maintenance stage.

Figure 4- Transtheoretical Model of Behaviour Change



In order for an individual to progress through the stages of the Transtheoretical Model, three concepts are considered important: decisional balance; self-efficacy; and the processes of change. Targeting decision balance is considered a key strategy for successful

behaviour change in the model. In the early stages of the model, the disadvantages have been shown to outweigh the advantages to changing behaviour whereas those in the later stages will perceive more disadvantages to changing behaviour (Marshall & Biddle, 2001). Trying to influence perceptions of advantages and disadvantages may then serve to support promotion through the stages of the Transtheoretical model and reinforcing the disadvantages to changing behaviour may help prevent relapse in those who are in later stages of the model.

Self-efficacy underpins the Transtheoretical Model, as well as playing a key role in the other models discussed, and it is defined by Bandura (1997, p.3) as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments". Relating this to physical activity, self-efficacy is a person's situation-specific self-confidence of their ability to reach a goal or perform a task (e.g. the individual believes they can walk for 30 minutes each day). Self-efficacy has also found to be a strong correlate of physical activity in adults (Trost et al., 2002). An individual has to be confident in their ability to make and maintain changes in physical activity behaviour in order to successfully progress through the stages of the model and prevent relapse.

The process of change component of the Transtheoretical Model describes mechanisms in which an individual changes their behaviour. These consist of cognitive, affective, evaluative and behaviour strategies. There have been 10 processes of change identified, including five experimental processes (1-5) and five behavioural processes (6-10). Marshall and Biddle (2001) found that individuals use all 10 processes of change when attempting to increase their physical activity behaviour:

1. Consciousness raising: Learning about physical activity and the benefits of being physically active

2. Dramatic relief: Worrying about being inactive or feeling inspired/hopeful when others are able to successfully modify their behaviour
3. Environmental re-evaluation: Realising how being inactive can affect those around them
4. Self-re-evaluation: Realising being physically active is important to them
5. Social liberation: Realising that society is more supportive of those who are physically active
6. Counter-conditioning: Replacing inactive thoughts/behaviours with active thoughts/behaviours
7. Helping relationships: Having people who support the change
8. Reinforcement management: Rewarding positive behaviour change
9. Self-liberation: Believing in their abilities to change their activity behaviours and committing themselves to these changes
10. Stimulus control: Stimulus to encourage physical activity

The effectiveness of Transtheoretical Model in physical activity behaviour change has been studied a great deal over recent years. A randomised control trial by Mutrie et al. (2002) examined the effect of an information pack for walking to work: Walk in to Work Out, based on the Transtheoretical Model, in a group of employees (n = 295; 64% female) from three places of employment in Glasgow. The participants were in the contemplation or preparation stage of the Transtheoretical Model. The intervention consisted of a control (no change made) and an intervention group (received the Walk in to Work Out information pack). The information pack contained printed material that guided participants to choose walking routes, walking safely and information on where to safely store bicycles. There was also a physical activity wall chart, local maps that showed walking and cycling routes, and

reflective clothing. A questionnaire was completed at the start of the intervention and follow up questionnaires were distributed to the participants after 6 months and 12 months to both groups. Focus groups were also carried out on a sample of the participants after 6 months. This included participants who had moved up a stage or who had relapsed.

Mutrie et al. (2002) found that the Walk in to Work Out pack increased walking to work over 6 months, measured using a 7 day physical activity recall questionnaire. The intervention group increased their walking from 52 minutes per week to 79 minutes per week on average, compared with an increase from 50 to 60 minutes per week in the control group. Mutrie et al. (2002) found that 25% of the intervention group were found to be regularly actively commuting after 12 months, with no significant increases in cycling. Despite the overall success of the intervention, the processes of change from the Transtheoretical Model did not explain changes in active commuting behaviour which the authors suggest is due to the lack of specificity of the model to active commuting.

Woods, Mutrie, and Scott (2002) also carried out an intervention based on the Transtheoretical Model to encourage inactive adults to participate in physical activity. Participants included a group of students (n = 2943 baseline information, n = 203 intervention) in the pre-contemplation and contemplation stage of the Transtheoretical Model from a University in Scotland. The intervention consisted of two information packs which targeted processes of behaviour change within the Transtheoretical Model. The first pack focused on raising awareness and social limitations and involved the participants reading the information that was sent to them. The second pack focused on three processes of change: self-re-evaluation, self-liberation and counter-conditioning, helping relationships and reward management. Self-re-evaluation involved the participant thinking about their inactivity and considering their values with regard to physical activity. Self-liberation refers to the participant deciding to make a change to their physical activity levels and believing in

their ability to positively change their behaviour. Counter-conditioning involved replacing sedentary behaviour with physical activity. This encouraged social physical activity interactions with peers and encouraged participants to reward themselves for being active.

Woods et al. (2002) found that 80% (n = 88) of the intervention group improved their stages of change from baseline, of which 45% percent (n = 50) of the intervention group were regularly active in the action or maintenance stage. In comparison, 68% (n = 72) of the control group improved their stages of change from baseline, of which 33% percent (n = 36) were regularly active in the action or maintenance stage. The processes of change were evaluated in terms of those who improved their stages of change from baseline and those who did not. Those who moved up a stage scored significantly higher, on all behavioural processes and four cognitive processes, in the processes of change compared with those who did not improve. This accounted for seventy percent of the movement in stages of change from baseline. This suggests that there could be potential to use the theory behind processes of change within the Transtheoretical Model in future investigations in attempt to change behaviour.

Several physical activity researchers have based physical activity behaviour change interventions on the Transtheoretical Model (e.g. Woods et al., 2002; Mutrie et al., 2002), however, there is a need for further research into the Transtheoretical Model to gain a better understanding into the interaction within and between stages of change. Biddle and Mutrie (2008) proposed three limitations to the use of the Transtheoretical Model in physical activity interventions including: weakness in study design during model testing, the need to standardise and improve the reliability of measurement across studies, and the need to better understand the processes of change within the Transtheoretical Model for physical activity behaviour change.

Three theories of physical activity behaviour change have been discussed including Social Cognitive Theory, The Health Belief Model and the Transtheoretical Model. Both the Social Cognitive Theory and the Health Belief Model have limited evidence in support to their application for physical activity behaviour. Researchers have discussed the limitations of the Health Belief Model (e.g. Stroebe and Strobe, 2000), suggesting that the model does not account for a person's enjoyment of negative health behaviours, it does not include social influences and it does not account for people being motivated to change their behaviour for reasons other than to improve their health. There is a larger body of evidence in support of the Transtheoretical Model in physical activity behaviour change (e.g. Woods et al., 2002; Mutrie et al., 2002) however as Biddle and Mutrie (2008) highlighted, there are limitations that need to be addressed including weakness in study design during model testing, the need to standardise and improve the reliability of measurement across studies, and the need to better understand the processes of change within the Transtheoretical Model for physical activity behaviour change. Despite this, because of the evidence in support of the Transtheoretical Model, it may help inform physical activity interventions.

Interventions/behaviour change strategies. The information from the Transtheoretical model, social cognitive theory and other conceptual models as well as the knowledge gained from studying the correlates of physical activity has shaped the development of interventions aimed at increasing physical activity behaviour. This section will present and review interventions aimed at increasing physical activity levels in adult populations, and discuss behaviour change strategies which have proven successful in previous studies.

Kahn et al. (2002) did a systematic review of interventions that promote physical activity. Interventions were all based on the Transtheoretical Model or the Health Belief Model. They found strong evidence to suggest that interventions targeting social aspects of

physical activity (e.g. buddy systems, walking groups) lead to increases in physical activity. They also found strong evidence for interventions tailored to the individual to be effective in increasing physical activity. They suggest that goal setting, social support, self-reward schemes, relapse prevention and incorporating physical activity into daily life schemes were particularly effective in increasing physical activity participation.

The Health Development Agency in the UK (Hillsdon, Foster, Naidoo, & Crombie, 2004) carried out a review of systematic reviews and meta-analyses (n = 10). The inclusion criteria included reviews or interventions between 1996-2001, focused on adult's ≥ 16 years, included clear methodology, and with the main measure being self-reported physical activity. They found evidence to suggest that interventions aimed at increasing physical activity within communities is effective in changing behaviour short-term, and that they are likely to lead to long term physical activity behaviour change. The evidence also suggests that interventions based on behaviour change theories (e.g. the Transtheoretical Model, Health Belief Model), which are designed to address the requirements of specific people or groups is more likely to produce long term physical activity behaviour changes. The findings also highlight that walking interventions are particularly effective in increasing long term physical activity behaviour change. Similar results were found in groups of adults aged 50 and over, however, there was little evidence for adults from black and ethnic minority groups or from adults with medical/limiting conditions (e.g. arthritis, back pain and chronic obstructive pulmonary disease). Hillsdon et al. (2004) highlighted features of successful interventions which include personalised advice and support, goal setting, verbal support, encouraging participants to monitor their physical activity levels and interventions that encourage participants to use cognitive techniques associated with physical activity adoption (e.g. consider the benefits of physical activity and self-efficacy for physical activity). They also found interventions targeting moderate intensity activities (e.g. walking) to be most effective.

Some consideration has to be made to different populations and groups of people when designing interventions. King, Rejeski, and Buckner (1998) carried out a review of physical activity interventions (n = 29) targeting adults over 50 years, of which 41% were 10 months in duration or longer. Selection criteria included 26 community based randomised controlled trials and three quasi-experimental design with a comparison group, which included baseline and post-intervention physical activity levels and participant numbers. The authors evaluated the studies according to eight broad areas including effectiveness, maintenance, potential public health impact of current intervention approaches, effects on subgroups, replication, generalizability, cost-effectiveness and implementation. The authors concluded that due to lack of good quality research in physical activity interventions in older adults, the ideal setting for physical activity interventions is unclear, however, they found the most effective interventions used behavioural or cognitive-behavioural strategies (e.g. goal-setting, relapse prevention, self-monitoring), in addition to instruction alone.

A more recent systematic review of reviews by Greaves et al. (2011) evaluated the effectiveness of 30 reviews of physical activity and dietary interventions in adults where the outcome included weight loss or an increase in time spent doing physical activity. They found self-monitoring, personalised interventions and goal setting in conjunction with the use of pedometers was related to an increase in physical activity. They also found that long term behaviour change was related to time management techniques and encouraging self-talk.

Müller-Riemenschneider, Reinhold, Nocon, and Willich (2008) carried out a review of the long-term effect of physical activity behaviour change interventions. They investigated randomised controlled trials (n = 25) where the outcome measure was physical activity. The interventions had a follow-up period of at least 12 months and it included adults over 18 years old. Müller-Riemenschneider et al. (2008) suggest that increases in

physical activity participation after behaviour change interventions were evident in interventions, with follow up periods of up to 24 months. This included increases of energy expenditure of almost 1000 kcal per week, and this coincided with improved physical fitness, although physical activity participation decreased over time following the intervention period. Results were similar to the walking review by Ogilvie et al. (2007) in that interventions were found to be most effective when they were tailored to the requirements of the target population.

Some authors have considered the effect of specific types of interventions for increasing physical activity behaviour, in addition to general intervention behaviour change strategies. Marcus, Owen, Forsyth, Cavill, and Fridlinger (1998) carried out a review on 28 physical activity interventions published between 1983 and 1997 which used mass media, print technology, and information technology as a means of changing behaviour. The inclusion criteria included studies that used a media-based approach and included an outcome measure of physical activity behaviour change. These media-based interventions have been formed based on information from conceptual behaviour change models, including Social Cognitive Theory and the Transtheoretical Model, as well as Social Marketing frameworks and health education. The results of the review suggest that media approaches (e.g. telephone, self-help printed materials) to behaviour change were positive in the short term. They also found that studies where there was a greater level of communication with participants and those that were better aimed at the target population were most effective.

The effectiveness of 48 walking interventions was reviewed by Ogilvie et al. (2007) on the ability of interventions to promote walking. They found that interventions aimed at sedentary populations or individuals with the intention to increase their physical activity levels can increase walking levels, by an average of up to 30-60 minutes per week,

at least for a short-term duration, both individually (e.g. through one-to-one advice) or through groups. It was not clear whether these interventions were successful in changing behaviour in the long term because many interventions lacked follow-up data. The authors found two features to be most effective which they classified as 'targeting' and 'tailoring'. Targeting included aiming interventions at sedentary and low active participants who want to increase their physical activity levels. Tailoring included designing an intervention that was suited and tailored to the individual's needs, and they suggest that different people may respond to different approaches based on their personal backgrounds and psychological preferences and this should be considered when designing walking interventions.

This section has highlighted several behaviour change strategies within the physical activity literature. There seems to a great deal of support for including techniques such as goal setting, social support, self-reward and cognitive behaviour strategies that lead to success of physical activity interventions (e.g. Kahn et al. 2003; Hillsdon et al. 2004; King et al. 1998). Several authors highlighted the importance of targeting interventions at the individual (e.g. Greaves et al. 2011; Kahn et al. 2003; Hillsdon et al. 2004; Marcus et al. 1998; Ogilvie et al. 2007), which was found to be more successful at changing physical activity behaviour. Specific intervention types have been reviewed, for example, Marcus et al. (1998) found that media approaches for physical activity promotion have positive short-term effects. Ogilvie et al. (2007) found success for walking interventions to increase physical activity, and other authors have also noted the success of walking interventions (Hillsdon et al. 2004).

This section has highlighted some correlates of physical activity participation, with a consideration to different ages and groups of people. It went on to discuss theoretical models of behaviour change, including the Transtheoretical Model, the Health Belief Model and the Social Cognitive Theory. This information has help researchers design physical

activity behaviour change interventions, and finally, strategies and components of successful interventions were discussed.

Section C: Wellness Technologies

The use of technology in health promotion has risen dramatically over recent years, with several self-monitoring health technologies and games available for free, to purchase, or through the National Health Service. These technologies aim to encourage and support people to achieve and maintain health and fitness goals, and are sometimes considered to be persuasive technologies. Fogg (2003) defines persuasive technology as technology that has been designed to change attitudes or behaviours of the user through persuasion and social influence. Common health technology examples include pedometers, heart rate monitors and accelerometers.

Pedometers. Pedometers are small, lightweight, self-monitoring devices that vary in price and quality. They are attached to the users' waistband and record the users' steps based on movement of the device. Some pedometers are also capable of estimating energy expenditure and distance, and are widely used as an objective measures within the physical activity literature. The measurement accuracy of pedometers has been studied extensively and pedometers have been shown to be effective at measuring accurate step counts (Tudor-Locke, Williams, Reis, & Pluto, 2002; Schneider, Crouter, Lukajic, & Bassett, 2003), although slow walking was found to reduce the accuracy of step counts (Tudor-Locke et al., 2002).

Despite this, many commercially available pedometers are typically much cheaper and less reliable than those used for research purposes are purchased and are used by

members of the public. Cocker, Cardon and De Bourdeaudhuij (2006) carried out a validity study on 973 commercially available, inexpensive pedometers. Participants (n = 35) wore pedometers daily in conjunction with the validated 'Yamax Digiwalker'. Only 25.9% (n = 252) pedometers met the researchers' validity criteria, which was a maximum deviation of step counts when compared with the 'Yamax Digiwalker' of 10%. In 36.6% of the commercial, inexpensive pedometers the difference in steps was greater than 50%, with 64.8% of pedometers overestimating the users step count. This suggests that cheap, commercial pedometers may not be suitable for use, as they could potentially send out the wrong message and make the user believe they are being more, or less, active than they actually are.

Despite the measurement accuracy and associated limitations, pedometers have been used frequently over recent years in physical activity interventions as a behaviour change tool, as a means of motivating individuals to walk more. Kang, Marshall, Barreira, and Lee (2009) carried out a meta-analysis on the effect of pedometer based walking interventions (n = 32). Studies were categorized into three groups based on duration (<8 weeks, 8-15 weeks, >15 weeks). The authors calculated an overall effect size for the use of pedometers as a behaviour change tool using a random effects model and found that the use of pedometers has a moderate and positive mean effect size of 0.68 on the increase in walking behaviour during intervention studies. This was found to be similar across a variety of participant ages and intervention lengths. Greater effects were observed in females and in interventions that set a goal of 10,000 steps per day. Despite these positive results, the majority of the studies included were less than 15 weeks long which makes it hard to determine whether pedometers can act as a motivational tool to change physical activity behaviour in the long term.

Tudor-Locke and Lutes (2009) expanded on this and carried out a review of meta-analyses on the effect of pedometer based walking interventions. They reviewed users' acceptability of pedometers and found commercial pedometers to be easy to use and understand, unobtrusive and inexpensive. Focus groups following a pedometer intervention found pedometers to be useful for goal setting and users reported that pedometers made them more aware of their physical activity levels. They published a list of guidelines that were successful in increasing physical activity in previous pedometer based interventions including interventions based on behaviour change theory, self-monitoring, goal-setting, feedback, opportunities to build self-efficacy and building support networks.

This section has evaluated the use of pedometers as self-monitoring devices, and has shown that many researchers have found pedometers to be accurate at measuring step count data (Tudor-Locke et al., 2002; Schneider et al., 2003). Despite this, there are measurement accuracy limitations associated with cheap, commercially available pedometers (Cocker et al., 2006).This highlights that commercially available pedometers may send out the wrong message to users and make them think they are being more active than they actually are. There has been some evidence to suggest that pedometers can be used as a behaviour change tool, with positive short term effects (Kang et al., 2009), however, more evidence is needed to examine the long term effect.

Physiological measurement tools. Other wellness technologies include heart rate monitors and physiological sensors (e.g. SenseWear). SenseWear is a device worn on the upper right arm, over the triceps muscle. The cost of SenseWear is expensive, with the device costing £625.00 for the armband alone, and £1175.00 for the accompanying software, although the software can be used with multiple units. It records skin temperature, dissipated heat from the body, galvanic skin response, accelerometer and demographic information such as height and weight to estimate total energy expenditure. Algorithms

created by the manufacturer are used to estimate total energy expenditure. SenseWear provides, in addition to energy expenditure, data on step counts and sleep quality.

Jakicic et al. (2004) tested the validity of the SenseWear during four different physical activities including: treadmill walking; stair stepping; cycle ergometry; and arm ergometry. Participants (n = 40) included an equal mix of males and females between 19-35 years old. Energy expenditure was measured using open-circuit calorimetry in addition to the SenseWear. Jakicic et al. (2004) found that SenseWear significantly underestimated total energy expenditure by 14.9 ± 17.5 kcal during treadmill walking, 32.4 ± 18.8 kcal during cycle ergometry, 28.2 ± 20.3 kcal during stair stepping and it overestimated total energy expenditure during arm ergometry by 21.7 ± 8.7 kcal ($P \leq 0.001$). When exercise specific algorithms were applied to the data, the accuracy of the SenseWear was improved, suggesting that energy expenditure is not accurate unless specific algorithms are applied to specific exercises including 4.6 ± 18.1 kcal for treadmill walking, 0.3 ± 11.3 kcal for cycle ergometry, 2.5 ± 18.3 kcal for the stair stepping and 3.2 ± 8.1 kcal for the arm ergometry. This suggests there could be a limited accuracy for the everyday use of the SenseWear to record energy expenditure data across a range of activities. Other potential limitations to the use of SenseWear are the high cost which makes the use of SenseWear impractical for physical activity measurement amongst the general public.

Accelerometers. Accelerometers (e.g. ActiGraph) are devices that measure body movement by acceleration over planes of motion including anterior-posterior, medial-lateral and vertical planes. The data are stored on the device and can be downloaded for analysis. Acceleration is measured by piezoelectric sensors that measure tension or bending upon acceleration that then generates a voltage signal proportional to acceleration. Accelerometry data can be used to classify intensity of physical activity in terms of sedentary to vigorous and can be used to provide a graph of physical activity over the day so the user can see

where they have been active and inactive. Accelerometry data can provide an estimation of energy expenditure, step counts and metabolic equivalents and they can measure quantity and quality of sleep. Some limitations to accelerometers are that they do not detect upper body and other movements, load-bearing and they do not provide information on sources of physical activity.

Hendelman, Miller, Baggett, Debold, and Freedson (2000) tested the validity of accelerometry for moderate intensity physical activity. Participants (n = 25) completed two phases, the first phase involved four bouts of over ground walking at various intensities from "leisurely" to "brisk". Phase two involved playing two holes of golf, and completing 5 minute sessions of various household tasks (e.g. vacuuming, cutting the grass). Energy expenditure was measured using a portable metabolic system called AeroSport, and a Yamax Digiwalker pedometer, a uniaxial Computer Science Applications accelerometer and a Tritrac accelerometer recorded physical activity. Regression analysis was used to predict metabolic cost from the various different activities performed. The results found that accelerometers underestimated the metabolic cost of golf and household tasks by 30-60%, which the authors suggest could be due to the inability of accelerometers to detect upper body movement, muscular activities and changes in terrain. This could limit the accuracy of using accelerometers for everyday use.

The measurement accuracy of accelerometers was further examined by Plasqui and Westerterp (2007) who reviewed accelerometer validation studies (n = 28) which compared accelerometer data with indirect calorimetry. Eight accelerometers were included in the review which aimed to determine the accuracy of the accelerometers to accurately determine daily physical activity. The results found that the CSA/MTI and Tracmor are the most validated accelerometers.

Other areas within the field of wellness technologies primarily aim to encourage physical activity rather than many of the self-monitoring devices previously mentioned. Exergames are computer games that encourage and combine physical activity. One of the most popular exergames is the Nintendo Wii Fit, which sold over 21 million copies (Nintendo, 2009). One of the issues surrounding the use of exergaming, and other persuasive health technologies, is the lack of guidelines for users as to how much physical activity they need to achieve to reach the governments physical activity recommendations.

Online resources. Online resources have become popular tools in the promotion of physical activity through acting as information sources, delivering web-based interventions and through online physical activity communities. There are various online information sources specifically aimed at recreational walkers, including www.walkit.com, which provides users with routes as well as estimates of journey time, calorific expenditure, step count and carbon saving and www.walk4life.info which allows users to log recent walks and track their progress online. The Ramblers have an informational website, www.getwalking.org, which is funded by the Big Lottery Fund and supported by local councils and National Health Service trusts. It provides various resources for those starting out with walking including walking plans, information on group walks, local walking routes and information on the benefits of walking.

Online communities allow users to connect with friends and find other users, which are primarily aimed at providing and increasing social support for physical activities. A widely known online community for running is www.Nike+.com, which allows users to upload information on recent runs and participate in friendly competitions with other users in their local area. Similar online support communities have become available for recreational walkers over recent years internationally, for example www.americawalks.org,

which provides walkers with an online forum to connect with other recreational walkers to share walks and providing support.

White and Dorman (2001) reported several advantages and disadvantages to online support communities. Benefits included the convenience of accessing information, allowing users to overcome various barriers including time constraints and travel, and anonymity of the online support communities allows users to discuss concerns and speak freely without embarrassment. The main disadvantages to online support communities highlighted included the 'digital divide' in that some people do not have access to the internet and there is the potential for key messages to be misinterpreted due to the lack of facial expressions and body language. They also suggest there is a potential for some individuals to post hurtful messages and harass other users.

Ciccolo et al. (2010) attempted to address these issues through a randomized controlled trial to investigate the impact of an online community in conjunction with an internet-based walking intervention in sedentary adults (n = 324). Participants were randomized into either the online community group, which enabled them to post and read messages from other members, or the control group in which there was no access to the online community. The results found both groups increased their average daily step count from baseline levels. The mean change in step count for the online community group was 2494 steps, compared with 2402 steps in the control group. Those within the online community group participated for a longer duration than those who did not have access to the online community (P = .02), and those who had lower levels of baseline social support were more active in the online community (P < .001). In addition, 13% more participants completed the investigation in the online community group than those in the no online community group (P = .02). The results suggest the addition of an online community to an

online physical activity intervention could improve adherence, however further evidence is needed to fully understand the relationship.

Online physical activity resources also include web-based physical activity interventions. These have been introduced as a way of replacing the more traditional print-based physical activity interventions because they have the potential of providing a more cost-effective physical activity intervention that could reach a wider population. Marcus et al. (2007) carried out an intervention on 249 sedentary (≤ 90 minutes of physical activity per week) participants who were randomized into one of three physical activity interventions including a motivational internet based intervention (n = 81), a motivational print based intervention (n = 86) and six physical activity websites available to the public (n = 82).

The internet based and print based interventions had the same content and measures for the participants were taken at baseline, at 6 months and at 12 months. The content of the interventions included educational and motivational information, including tips, physical activity logs and goal setting. The print and internet based interventions also included feedback tailored to the individual, which was not included as part of the informational website group. After 6 months participants reported achieving a median of 112.5, 120 and 90 minutes of physical activity per week for the print based intervention, the internet based intervention and the informational website group, respectively which was classified as a significant difference between the groups using a Pearson X^2 test (P = .15). After 12 months participants reported achieving a median of 90, 90 and 80 minutes of physical activity per week for the print based intervention, the internet based intervention and the website group, respectively and there was no significant difference between the three groups (P = .74). The results suggest that all three interventions increased physical activity levels to a similar extent. This suggests that internet based interventions could be used as cost-effective alternatives to print-based interventions. Similar results were found by

Vandelanotte, Spathonis, Eakin, and Owen (2007) who carried out a review of internet based physical activity interventions (n = 15). Eight of the studies reported an increase in physical activity levels however effects were not sustained long term. The authors highlighted the need for improved study design and standardized outcome measures.

This section has highlighted three types of online resources available for physical activity promotion including informational websites, web-based interventions and online support communities. The findings suggest that online resources have good potential to support users and help them to increase their physical activity levels and replace more traditional methods (e.g. paper based interventions/materials) and allow users to overcome barriers (e.g. time/travel constraints).

Mobile phones as a behaviour change tool. The number of people with access to a mobile phone has increased significantly over recent years, with Ofcom (2012) reporting that two fifths of adults in the UK own a smartphone, a multi-functional device which can provide internet access; act as a media player and storage device; provide GPS navigation and other functions not often available on traditional mobile phones. Of these smartphone users, 47% have downloaded a mobile web application. Mobile web applications, or mobile apps, have grown dramatically over previous years, alongside the recent growth of smart phones. There are numerous categories of apps available for download; of particular interest are health apps. These include interactive health care apps, such as First Aid by the British Red Cross which acts as an educational tool for emergency first aid, advising users on various life saving techniques such as treatment for choking, head injuries and heart attack. Other mobile health care apps include My Fitness Pal which allows users to enter the foods they have consumed throughout the day as well as log their daily exercise, and provides feedback on how many calories they have consumed and whether they are consuming the optimum amount. It also allows data to be shared amongst the user's friends.

Mobile phones are an important part of many people's everyday lives for communication, organisation and entertainment and could therefore act as a potential tool to support, promote and measure behaviour change. Early research on the potential for mobile phones to act as a behaviour change tool focused on text messaging to drive behaviour change. Cole-Lewis and Kershaw (2010) carried out a review on studies that examined the role of text messaging on disease management. They found evidence to support text messaging as a tool for behaviour change in 8 out of 9 studies. This concept has been employed for use in Africa to educate and promote wellbeing related issues to people throughout the country by a charity called Text to Change (www.texttochange.org) who aim to raise awareness through text messaging.

Mobile web applications, or mobile apps, have grown dramatically over previous years, alongside the recent growth of smart phones. There are numerous categories of apps available for download; of particular interest are health apps. These include interactive health care apps, such as First Aid by the British Red Cross which acts as an educational tool for emergency first aid, advising users on various life saving techniques such as treatment for choking, head injuries, and heart attack. Other mobile health care apps include My Fitness Pal which allows users to enter the foods they have consumed throughout the day as well as log their daily exercise, and provides feedback on how many calories they have consumed and whether they are consuming the optimum amount. It also allows data to be shared amongst the user's friends. Many widely known physical activity apps are aimed at runners and cyclists, for example Nike+, Endomondo, and My Tracks. Mobile app's have a huge potential to act as a behaviour change tool for physical activity adoption because they can collect information, educate the user, act as a motivational tool or as an exergame which creates an exciting platform for physical activity researchers and mobile app developers, as well as other health behaviour change researchers. Despite this potential platform for behaviour change, and the thousands of health care apps currently available, the design of

apps is a potential issue with lack of apps based on theories of behaviour change and a lack of reporting of how apps have been designed or tested by users. It is unclear whether apps which have been designed for sedentary individuals have been designed by physically active individuals based on what they think sedentary people would want or whether sedentary individuals have been involved in the design process.

Summary. This section has discussed wellness technologies associated with the adoption of physical activity. Self-monitoring devices form a key role within this group, particularly pedometers. The use of accelerometers and heart rate monitors was also discussed, in addition to more recent technologies such as physiological monitoring devices (e.g. SenseWear). Finally, the use of online resources was discussed as a means of providing physical activity behaviour change interventions, as an information source for physical activity and for use as an online community for physical activities followed by the potential for mobile phones as behaviour change tools; raising some potential design and testing issues of current mobile physical activity apps.

Section D: Human Computer Interaction

Human computer interaction is the study, planning, and design of the interaction between users and computers. A basic goal of human computer interaction is to improve interactions between users and computers by making computers more usable and receptive to the users' needs. Human computer interaction literature draws from the human side, including social science and cognitive psychology, as well as the machine side, such as programming languages and operating systems. Human computer interaction research covers a range of technologies for example basic interactions (e.g. development of the mouse to replace light pens), applications and programs (e.g. word documents) and up and

coming areas (e.g. virtual reality, 3D technology) and it includes both corporate and university research. Human computer interaction incorporates different types of interactions including ergonomic research (e.g. ease of use of buttons, mouse), aesthetic (e.g. layout, appearance), and purpose (e.g. what does the user want the technology to do, does the system fit the users' needs).

Computer acceptance testing is an importance aspect of testing in information technology (IT) that has governed a great deal of research over the past decade. Researchers have attempted to describe the determinants of computer acceptance and explain user behaviour through various models, with the most widely known models being the Technology Acceptance Model (Davis, 1985), the Theory of Reasoned Action, the Theory of Planned Behaviour and The Unified Theory of Acceptance.

The Technology Acceptance Model suggests that when users are presented with a new technology, a number of factors influence their decision about how and whether they will use it, particularly perceived usefulness and perceived ease-of-use. Davis (1985) defined perceived usefulness as "The degree to which a person believes that using a particular system would enhance his/her job performance", and ease-of-use as "The degree to which a person believes that using a particular system would be free from effort". Legris, Ingham, and Collerette (2003) carried out a review of 22 articles published between 1980-2001 (n=22) and found that the technology acceptance model could help to understand and explain use behaviour in information system implementation, and suggest that the Technology Acceptance Model Two is an improvement on the first.

Venkatesh, Morris, Davis, and Davis (2003) reviewed 8 user acceptance models including the Theory of Reasoned Action, the Theory of Planned Behaviour, the Technology Acceptance Model, the Technology Acceptance Model 2, Motivational Model, Model of PC

Utilization, Innovation Diffusion Theory and the Social Cognitive Theory. They then formulated the Unified Theory of Acceptance and Use of Technology Model (UTAUT) based upon conceptual and empirical similarities across the models. The UTAUT model was empirically validated, and the findings suggest that the UTAUT model outperforms each of the eight original models.

The models presented are commonly used within business and industry, where the technology is usually compulsory for use. When the user is presented with a commercially available technology, or a technology in which there are several options available, a different concept is necessary. This is particularly relevant for persuasive health technologies. It is particularly important for commercially available technologies to be enjoyable to use and to meet user need. Computer user satisfaction aims to explore this. Computer user satisfaction (also known as system satisfaction, user satisfaction, computer system satisfaction and end user computing satisfaction) is defined by Doll and Torkzadeh (1988) as "The opinion of the user about a specific computer application, which they use". It can be extended to user satisfaction with any computer-based electronic appliance.

Mobile human computer Interaction has developed as a field of research over recent years alongside the growth of mobile technology, particularly with recent growth of smartphone technology. Kjeldskov and Grahan (2003) carried out a review of mobile human computer interaction research methods and identified that most mobile human computer interaction evaluations are carried out in laboratory settings which limits the generalizability of the results into real life settings. They have since updated this review (Kjeldskov & Paay, 2012) and found that human computer interaction evaluations have improved and there is now more research in real life settings including both quantitative and qualitative research designs, but they suggest there is a need for a deeper understanding in human computer interaction evaluations by carrying out longitudinal designs or in depth case studies. They

also highlighted a need for human computer interaction research to improve collaborations with developers. Despite this; Bort-Roig, Gilson, Puig-Ribera, Contreras and Trost (2014) identified only 12 out of 26 studies had included a measurement of participant perspectives of a smartphone application for physical activity in a recent systematic review, and as Kjeldskov and Paay (2012) identified, the quality of some of these measurements need improvement.

There are many methods that can be applied to test user experience. User interviews, contextual enquiry, questionnaires, focus groups, card sorting and usability testing are all widely used (Unger & Chandler, 2009) depending on the technology being tested. Contextual enquiry describes visiting participants in the usual settings and observing them. This type of research would be suited within a business setting, and is less applicable to testing user experience of health technologies. Card sorting describes giving users cards with topics on them and asking the users to sort the cards into groups based on importance. Usability testing can be related to how users perform tasks using a new technology, for example, it may look at the function of a mobile phone by examining the hand movements the user makes whilst using the device. The three most commonly used research techniques for health promoting technologies include focus groups, which give an in depth view of greater number of participants experiences. Individual interviews are also employed to provide further, in-depth insight into the experiences of the user. Surveys are also used by researchers to gather information from a wider group on user preferences, rather than actual performance of technology. It is common to include a variety of research techniques when testing user acceptance, depending on the technology being tested (Unger & Chandler, 2009).

In order to improve user experiences of new technology many researchers and designers have involved users in the early stages of the design process. This is called user

centred design (or user experience design) and it is a concept that many have found to be important in designing technologies that will provide users with positive experiences. User experience design is defined broadly as "The creation and synchronization of the elements that affect users' experience with a particular company, with the intent of influencing their perceptions and behaviour" (Unger & Chandler, 2009, p.3). User centred design describes a direct contact with users at the early stage of a product development process and has been understood to be an important initiator for product improvement and innovation. Design tools and guidelines were published to assist practicing designers to work with users (Preece, Rogers, & Sharp, 2002), and have since been employed in the design process of various technological products and services.

Section E: Pilot Studies

User studies typically provide researchers with data on users' perceptions and thoughts on emerging technology, which is important within the wellness technology field. Several authors have created mobile applications or games within the exergaming field that are specifically aimed at increasing physical activity and have carried out pilot studies to test how the participant's responded to the technologies.

Fukuoka, Kamitani, Dracup, and Jong (2011) carried out a 3 week pilot study to evaluate user acceptance and compliance of a physical activity intervention based on the use of a mobile phone in conjunction with a pedometer. The participants were 41 sedentary women aged from 25 to 70 years old. The intervention included an introductory session which provided participants with information on the physical activity program, health benefits of physical activity, counselling, increasing social support for physical activity and safety. During the 3 week study, the participants recorded their daily step counts in the

mobile diary at the end of each day. They were asked to increase their daily step counts by 20% each week. Participants also received daily text message prompts which included information and questions based around the introductory session. Participants received additional prompts if they had not entered their step counts into the mobile diary by 8:30 PM each evening. The mobile diary asked participants a series of questions before they could enter their step count data. They then received a bar graph of their daily step count to allow them to see their progress, which was green, yellow or red based on the participants step count progress.

During the intervention period the total compliance with the pedometer was 93.8%, with 71% (n = 29) of the participants achieving 100% compliance. The mobile phone diary had a compliance of 88.3%, which participants explained was due to the program crashing and due to participants forgetting to log their step counts between 7pm and midnight, as required by the program. The participants were not told that the pedometers stored their step count data in addition to the mobile diary, so the researchers were able to compare the data on the pedometers and the mobile diary. The results suggested that 7.3% (n = 3) of the participants reported higher step counts than their actual pedometer reading during weeks 2 and 3 of the intervention, when the goal of increasing daily step counts by 20% was introduced. The authors attributed this difference to social desirability bias however it could also be random variability.

A similar mobile application, which is used in conjunction with a pedometer, was created by Mattila et al. (2008) who created a wellness management application called the Wellness Diary. Wellness diary is a self-observation application based on cognitive behaviour therapy. Cognitive behaviour therapy is a technique that is used to try and overcome problems by changing the way people think, behave and their emotional responses. Wellness Diary allows users to upload information about their eating, sleeping

and step counts in conjunction with the use of a pedometer. They carried out a 3-month usability study on the application which involved interviewing participants (n = 27) on two separate occasions and a questionnaire. The authors separated and presented results in terms of those who lost weight (n = 12), those who did not lose weight (n = 13) and all subjects (n = 27). Significant differences were found with the number of entries between those who lost weight and those who did not for food and drinks, weight and steps. Participants found Wellness Diary as easy-to-learn (93%, 89%), first and second interview respectively, and useful (90%, 79%). In addition, 79% said that the application assisted them to manage their weight. The usage of Wellness Diary was high throughout the study and it did not significantly decrease during the study.

Consolvo, Everitt, Smith, and Landay (2006) carried out a 3-week pilot study investigating the user experiences of a prototype mobile application fitness journal called Houston, in conjunction with a pedometer, which enables sharing of step count data amongst peers. Participants included three groups of female friends (n = 13) who were classified within the Contemplation stage (n = 1), Action stage (n = 1), Preparation stage (n = 2) and Maintenance stage (n = 9), according to the Transtheoretical Model of behaviour change (Prochaska, 1977). Each of the three groups consisted of four or five friends, with group 1 and group 2 using an application that allows sharing of step-count data within their friend group, and group 3 using an individual version of the application.

Participants were interviewed individually on three occasions (pre-, post- and during the 2-week intervention period) and their feedback yielded positive short-term results, with the authors reporting that several participants had planned to increase their physical activity levels, although the authors did not specify how many participants. Interestingly, the sharing groups were significantly more likely to meet physical activity goals set for them ($p < 0.05$), when comparing the percentage of days that step goals were

met by the participants, than those using the individual version. The individual goals were determined by recording their step count for 7 days and using the highest value as the daily goal for the following two weeks. The percentage of days in which individual goals were met were compared between the sharing (groups 1 and 2) and non-sharing (group 3) groups, with daily average step counts increasing from 5% to 61% of previous step counts. Through analysis of the qualitative data, four themes emerged from the data. These included (A) give users proper credit for activities, (B) provide personal awareness of activity level, (C) support social influence, and (D) consider the practical constraints of users' lifestyles. Participants also highlighted that the manual inputting of their physical activity data into the app was a burden, and they suggested that a device that automatically entered physical activity data would be more appealing.

Potential limitations to this study are that a variety of baseline physical activity levels were present in the participants tested, which were highlighted by participants within different stages of change of the Transtheoretical Model, with most of the participants within the maintenance stage. The authors did not report the participants' baseline step counts, however, they noted that there was a high variance in step counts with lowest step count median being 2,767 steps and the highest median step count being 15,649 steps, which could be attributed to differences in baseline physical activity levels. Those who are just beginning to introduce physical activity regularly into their lives may have different requirements of a mobile application, such as Houston, than those who are recreationally active. Targeting individuals with similar baseline physical activity levels may have yielded more valuable results and given researchers a better insight into what features and requirements a specific group of users have from this type of mobile application, which could potentially be different in low active users to the requirements of those who were already exercising regularly. In addition, the study duration was only three weeks long which makes it difficult to determine the long term effect of the app on participants' physical activity levels.

Expanding on the mobile fitness journal created by Consolvo et al. (2006), Maitland et al. (2006) created a prototype technology, named Shakra that records GSM cells (Global System for Mobile Communication) and their signal strengths to the nearby antenna masts. Shakra is similar to the more traditional accelerometer except it benefits from being conveniently loaded into the user's mobile phone. The technology can distinguish between stationary behaviour, moderate activity (e.g. walking) and travelling (e.g. bus, car or train). It does this by comparing the signal strength fluctuations of the GSM cells using an artificial neural network, so for example in periods of high signal strength fluctuation this would imply the user is travelling by a car or train. It is also able to cancel out any noise by applying task knowledge, so for example if the user stops at traffic lights then moves again this would still be classified as travelling because this change would be compared with the previous two and a half minutes of signal strength fluctuations. It then gives the user a graph of total active minutes at the end of each day and it allows the user to share their active minutes with other users. It expands on the technology created by Consolvo et al. (2006) by addressing barriers to the technology as highlighted through their research, which includes the burden of manually entering physical activity data each day, through automatically recording and storing data.

Maitland et al. (2006) carried out a 10 day user study in a group of adult participants (n = 9) to explore the use of Shakra as a means of raising awareness and encouraging physical activity. Data were collected after an initial 2 day training period through user log diaries and by individual interviews at the end of the study. During the 10 day study, the participants recorded whenever they carried out different activities. The focus was on user experience with a view of determining if the application was effective for increasing awareness and motivating users to be more physically active. The results suggest that users found the application easy to use, enjoyable and reliable. Users also reported that the application made them more aware of their physical activity behaviour. Despite this,

only four of the nine participants reported doing more physical activity than normal. This could have been attributed to the varying baseline levels of physical activity of the users with those who were already highly active perhaps reaching a plateau in physical activity levels and those who were low active perhaps increasing their physical activity levels. Participants reported that they enjoyed sharing their activity levels with their peers and most participants enjoyed some competition with other users.

The application was found to be less reliable than in previous, controlled experiments carried out by Anderson and Muller (2006) when the authors compared the data from the application to the participant's diary logs. Running was occasionally misinterpreted as travelling and the application was particularly less reliable when used in rural areas, where signal strength was weaker. Similar to Consolvo et al. (2006), there was a low number of participants in the study (n = 8) and they varied in their activity levels prior to the study. Two participants were inactive or fairly inactive, 4 participants were moderately active and two participants were highly active. This low number of participants with varying levels of physical activity served as a limitation to the study. A study including only inactive or low active participants, or aimed at the potential users of the app, may have yielded different results.

A different approach to encouraging physical activity participation was taken by Lin, Mamykina, Lindtner, Delajoux, and Strub (2006) who created a computer game called Fish'n'Steps which is used in conjunction with a pedometer. Participants were required to upload a photograph of their pedometer step count daily, including their pedometer ID, and a member of the research team entered the information into a database. Participants were given a step count goal that was determined by an average increase of 2,000-3,000 steps on baseline step values up to 12,000 steps. The participants were given incentives for making progress towards their daily and weekly goals. This was achieved through growth and

development of fish in a fish tank available to participants on their computers. If participants were reaching their daily and weekly goals their fish would grow and keep growing, if participants continued to reach their goals, baby fish were added to the tank. Fish would look happy if users were reaching their targets, angry if users were not quite reaching their goals or sad if users were not making sufficient progress based on their targets. There were two versions of the program including an individual version and a competition version.

There were 19 participants, aged from 23 to 63 years old included in the intervention. Participants ranged in baseline activity levels from 3,700 steps to over 11,000 steps per day and the participants all had sedentary jobs. The participants came from a technological background and were all educated to degree level or above, which limits the generalizability of the results as this group would presumably be more open to new technologies. There were three components of the intervention, including a 4 week pre-intervention phase where baseline physical activity was recorded using the pedometers. This was used to establish individual goals for the participants for the second component of the study. The intervention phase was 6 weeks in duration and participants were assigned to take part in either the competition or the individual game. The final component of the study was a 4 week long post-intervention phase where the use of the game ended but the participants were still required to wear their pedometers.

Interviews were carried out at four points during the study: before and after the pre-intervention stage; after the intervention stage; and after the post-intervention stage. Interviews lasted about 30 minutes and allowed participants to discuss their experiences and thoughts regarding the various stages of the study and their thoughts on Fish'n'Steps. Lin et al. (2006) found that applying the Transtheoretical Model to review the participants behaviour change throughout the study highlighted the positive impact that Fish'n'Steps had on 14 out of the 19 participants involved in the study. This positive impact was achieved

through increasing their daily step counts (n = 4), increasing their stage in the Transtheoretical Model (n = 3) or both (n = 7).

The majority of the participants (n = 14) became emotionally attached to their fish and found the game motivated them to walk more and be more active, although, this emotional attachment to the fish caused some users not to want to look at their fish at all because they did not want to see their fish angry or sad as it made them feel guilty. For example, one participant said:

"I didn't want to check on it, because I knew it was going to be sad."

There were mixed reactions regarding the game, with some participants enjoying the competition aspect to the game more than the fish component, although most participants enjoyed the fish in conjunction with the competition aspect to the game. Some participants found the game to be repetitive and got bored of it during the intervention, although most of the participants (n = 10) used the game daily. This highlights sustainability issues regarding the game and other apps, and suggests these types of games and apps may only be effective in increasing physical activity in the short term. The authors recognise this and highlighted that the game was not created for long term use. The authors also found that participants were more likely to change their attitude and their physical activity behaviour if they were originally classified within the preparation, action or maintenance stage of the Transtheoretical Model. Those who were in the pre-contemplation stage were most likely to change their attitude to physical activity however they were less likely to increase their step counts. Participants highlighted the inconvenience of wearing the pedometers and having to upload pictures of the pedometers each day, therefore, overcoming this inconvenience may lead to longer term use of similar games or self-monitoring devices.

Conclusion

There is a clear need to increase physical activity levels globally and walking could provide an achievable, cost effective way of increasing physical activity levels across the population. Walking interventions have had some success in the short term however walking levels are still low and people are not achieving minimum physical activity guidelines. This suggests a need for new, innovative methods of increasing physical activity. Technologies that focus on increasing levels of physical activity have grown in popularity over recent years with technologies aimed at self-monitoring physical activity levels (e.g. pedometers) and technologies aimed at promoting physical activity behaviour (e.g. exergames). There is a potential issue with current physical activity apps in that the design and user testing process is often poorly reported. The lack of reporting on the design process of physical activity apps leads to uncertainty as to whether physical activity apps aimed at low active and sedentary individuals have been designed by active individuals based on what they think less active people would want or whether the target users have been involved in the design process. In order for new, commercially available physical activity technologies to be successful it is important to involve the end user in the design process to assist developers in designing technology that will meet the needs of the user.

Methods - Study 1

The purpose of Study 1 was to employ user centred design to gather initial user preferences for potential during- and post-walk features of a mobile walking app. This user centred design study was intended to inform the design of a prototype walking app developed by researchers at the University of Strathclyde.

Participants

Participants were invited to complete an online questionnaire (see Appendix A) through personal contacts and using social media. 186 participants completed the online questionnaire, and of these, 92 participants expressed an interest in completing further research. 11 participants located in or around Glasgow were invited to carry out individual interviews, one person was no longer able to take part therefore 10 people completed the individual interviews (see Appendix B).

Measures

An online questionnaire (see Appendix A) consisting of 15 questions was created in Qualtrics (v. 3423010.216s, Qualtrics Labs Inc., Provo, UT) to collect baseline information. Physical activity levels were measured using the Jackson et al. (2007) PA5 scale, a validated subjective one question tool that allows us to derive information on the respondents' stage of change in the Transtheoretical Model, and information was collected

regarding the participants' mobile phone use. The main focus of the online questionnaire was to establish whether participants would consider using a mobile walking application to help them monitor their physical activity levels and determine what features participants would like from a mobile walking app. Participants were asked to rate how important they perceived 3 during-walk features and 7 post-walk features (see Appendix A) using a 4-point Likert scale, from highly important (1) to not important (4). Participants were also asked at the end of the questionnaire whether they would consider taking part in a follow up investigation and those who agreed were asked to name the city/town they were located in and provide a contact email address.

A semi-structured interview schedule (see Appendix B) was created to expand on the participants' responses to the online questionnaire in attempt to understand why participants ranked features as they did. The questions were developed to avoid leading the participants, with accompanying prompts and probes to ensure the smooth running of the interview. An introductory statement was read out at the start of each interview to explain: the purpose of the interview; key terms; and confidentiality. The introductory statement was also intended to encourage the participants to feel at ease with the researcher and it served to stimulate the participants' memory of the topic area. The interview schedule consisted of 7 questions which included a question intended to act as an ice-breaker (see Appendix B). A question was also provided at the end that allowed participants to expand on anything or discuss anything they felt was not included in the interview and participants were thanked at the end of the interviews. Two pilot interviews were carried out to review the effectiveness and the clarity of the interview schedule and to provide feedback on interviewing style and techniques. The researcher selected one pilot interview audio file which was listened to by another researcher and the two project supervisors. Further to this, it was decided to add a prompt about listening to music whilst walking to the interview schedule.

Procedures

Participants were invited to take part in the online survey by emailing personal contacts and through social media websites in February of 2012. The survey was left open over a period of 4 weeks and upon closing the survey participants who highlighted an interest in participating in follow-up research were selected and invited to carry out a follow-up investigation. The questionnaire was re-opened in May of 2012 to increase the number of low active and sedentary participants; generating a further 60 responses. Selection criteria for the individual interviews included participants who were located in or around Glasgow and who represented a mixture of self-reported activity levels. The interviews were held in a public place at a time and place convenient to the participant and lasted between 10 and 20 minutes. They were audio-recorded, using an Olympus Dictaphone (Olympus, Tokyo), and later transcribed verbatim yielding 46 pages of single-spaced text (see Appendix C).

Analysis

A pragmatic approach was taken with regards to data collection and analysis, as suggested by Johnson and Onwuegbuzie (2004) pragmatism attempts to "find a middle ground between philosophical dogmatisms and scepticism and to find a workable solution" and it "endorses a strong and practical empiricism as the path to determining what works". This approach allows for a mixed method approach to data collection and analysis and in Study which the researchers deemed as an appropriate method to answer the research question, which the researchers believed could not fully be accounted for by quantitative or qualitative methods alone.

Descriptive statistics and frequencies were prepared for each question in the online survey using SPSS (v. 20, SPSS Inc., Chicago, IL) and these were used for comparison purposes, particularly within the features section to determine the features that were consistently reported as highly important or not important by the participants.

A thematic analysis approach was adopted with regard to the qualitative interview data analysis, using guidelines by Braun and Clarke (2006). Interview transcripts were reviewed using the NVivo9 software package (vs. 9, QSR International Pty Ltd, Cambridge, MA). The researcher developed an understanding of the content of the transcripts through several methods. Each transcript was read several times, notes and nodes were created on each transcript, and a project journal was used to express early ideas. Each line of text was coded using an open coding method that initially generated 96 codes. These codes were reviewed throughout the analytic process and were subsequently reduced to 79 codes by combining codes with similar meanings. Constant comparative analysis was employed to keep checking the groupings of themes to ensure all variations within the data were recognised in order to develop conceptualisations of the data. This involved continuous movement through the themes and sub-themes. The data were arranged using both inductive and deductive processes, for example themes were informed by the researchers' prior knowledge and developing ideas as well as the concepts emerging from the data. As Pigeon (1996, p. 82) suggested "what appears to be the 'discovery' or 'emergence' of concepts and theory is in reality the result of a constant interplay between data and the researcher's developing conceptualizations". Finally, themes were formed that were comprised of sub-themes and codes and these formed the basis for a thematic framework (See Appendix D). The final themes and the thematic framework represent the underlying meaning of the text. The arrangement of the thematic framework was discussed with the project supervisors and two project researchers and minor changes were integrated based on discussion and agreement.

Trustworthiness of Data

The trustworthiness of the data was established by providing a thick description of the text extracted from the data through participant quotes to allow the reader to develop their own insights into the meaning of the data.

Ethical Approval

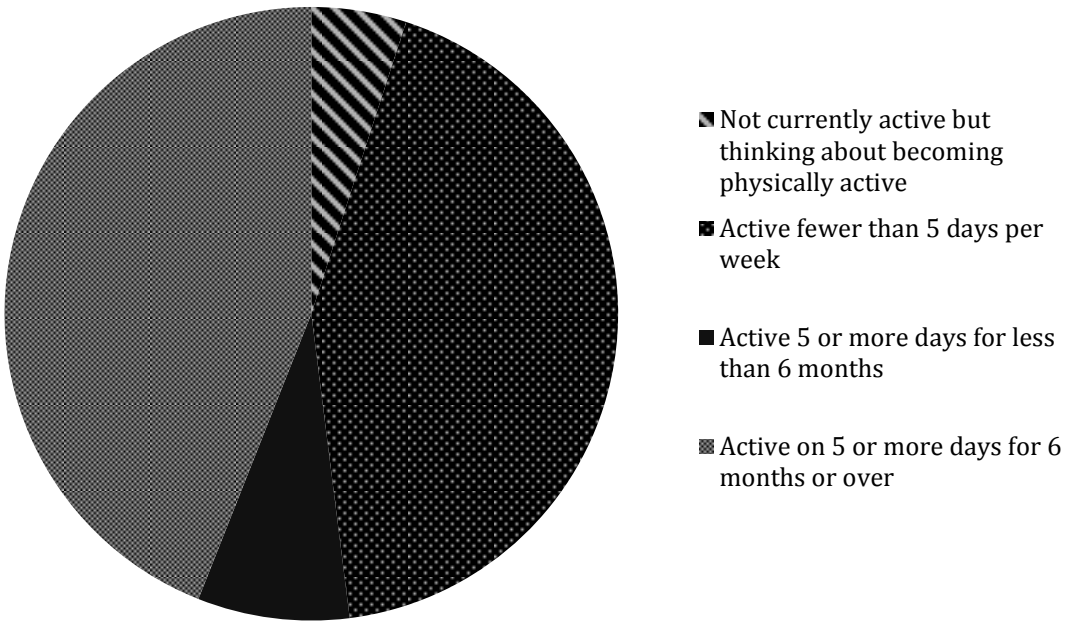
Ethical approval was granted from the University of Strathclyde School of Psychological Sciences and Health Ethics Committee. The participants who completed the online survey were given an informative introductory paragraph and the option to leave the survey if they did not wish to participate (see Appendix E). The participants who took part in the individual interviews were given information sheets (see Appendix F) and completed informed consent forms (see Appendix G) prior to the interview.

Results - Study 1

Online Survey

A total of 186 participants (mean age = 34, SD = 13 years), predominantly female respondents (73%) completed the online survey. Gender limits were not imposed in order to maximise survey responses. Participants varied in their baseline physical activity levels; with 52% of respondents achieving government physical activity guidelines of 30 minutes of physical activity on five or more days per week and placing within the action or the maintenance stage of the Transtheoretical Model (see Figure 5).

Figure 5: Participants' Physical Activity Levels



184 of the respondents had a mobile phone and only 2 participants did not have one. Of all the respondents, 142 said they would consider the use of a mobile phone to help

them become more physically active or maintain their current levels of physical activity. 97 respondents were happy with their current levels of physical activity and 89 respondents said they would like to do more physical activity.

During-walk features. The highest rated during-walk feature was for the app to provide the user with their distance (88.5%). The next most endorsed during walk feature could tell the user if they were walking too slowly to gain health benefits, with 78.4% of participants finding this highly important or important. 57.6% of participants wanted the app to encourage them to keep walking (see Table 2).

Table 2: Frequencies of highly important and important during-walk features

Feature	Highly important	Important	Cumulative total
Distance	53.0%	35.5%	88.5%
Tell me if I am walking too slowly to gain health benefits	39.5%	38.9%	78.4%
Encourage me to keep walking	24.5%	33.2%	57.6%

Post-walk features. The highest rated post-walk feature was for the app to tell the user how far they walked (94.1%), followed by a feature which could tell the user their cadence (81.4%) (see Table 3). Features that were rated of lesser importance were for the app to tell the user how many steps they took, with 42.5% rating this feature as of little importance or not important, and the ability to share walking data and interact with other

users online, with 71.4% rating this feature as of little importance or not important (See Table 3).

Table 3: Frequencies of post-walk features

Feature	Highly important/ important	Of little importance/ not important
Tell me how far I walked	94.1%	5.9%
Tell me how many calories I burned	78.8%	21.2%
Provide me with a map of my route	70.9%	29.1%
Tell me how fast I walked	81.4%	18.6%
Tell me how many steps I took	57.5%	42.5%
Let me share my walking data and interact with other walkers online	28.6%	71.4%

Interviews

This section presents the results of the individual interviews. This includes a background of the participants and three themes identified from the data including: (1) Feedback features; (2) Engaging features; and (3) First impressions.

Background of the participants. Participants (n = 10) (mean age = 38 ± 11 years) reported varying background levels of physical activity however all participants carrying out

some form of physical activity. The majority of participants (n = 6) were reaching government physical activity guidelines and the remaining participants (n = 4) were not reaching government guidelines but were somewhat active. Those who were not achieving high levels of physical activity attributed this to barriers such as family commitments, injury and illness, feeling self-conscious about doing physical activity and not enjoying physical activity.

The participants that were achieving government physical activity guidelines tended to be very positive with regards to doing physical activity and spoke about the social aspect of physical activity, appreciating their surroundings, doing physical activity to escape the stresses of daily life and enjoying the physical activities they do.

Participants discussed walking specifically as a form of physical activity, with 8 participants highlighting that they walk for health purposes. Participants also discussed walking for commuting (n = 4) and for recreational purposes (n = 3).

Participants also discussed their use of mobile phones and mobile apps, with some participants having and regularly using a number of different apps on their phones (n = 5) and other participants having few or no apps (n = 5). Participants discussed apps they have for monitoring physical activity, including Nike+, and one participant spoke positively about using a Garmin watch for running.

Feedback features. Features that provide the user with information about their walk were grouped together into a theme that was named feedback features. Feedback features emerged as one of the main themes and is comprised of several sub-themes which will be discussed in turn, including: distance, speed, energy expenditure, map of route and other feedback features.

Distance. All of the participants wanted the app to provide them with their distance and participants said they are not always aware of how far they have been walking. The prospect of being updated with their distance through the use of an auditory cue was discussed and participants were positive about this possibility, however, they wanted the app or auditory cue not to be overly obtrusive whilst they were walking. For example:

> ". . . I would like it to say if I was listening to a song if say I hit that ten mile mark it would say well done and it would just voice over the song and then go back to playing so it would almost like it would be running in the background so it didn't actually feel like I was using an exercise app." (Participant ID: PAR07)

Many participants indicated that miles and kilometres are a more meaningful measure of distance to them compared with total number of steps, highlighting that total number of steps is unappealing. One participant also suggested that in terms of training for a distance walk knowing how many miles or kilometres they are achieving would be a better indicator for training purposes:

> ". . . I would have thought distance would have been more meaningful to people because quite often people are maybe using walking so eventually they can maybe walk a certain distance or maybe they want to walk the West Highland Way or they want to or you even just do a 10 mile sponsored walk or whatever and in real terms they need to know that they are capable of walking a mile then build up to two miles." (Participant ID: PAR10)

Speed. Participants consistently discussed the importance of knowing what speed they were walking at and noted its importance for monitoring improvements and maintaining rhythm whilst walking. A during-walk auditory cue aimed at increasing speed was discussed, with participants (n = 5) finding that maintaining a good pace whilst walking

can be challenging and an audio cue to remind them to keep walking quickly might be helpful.

> ""Move faster"! (Laughs) I dunno, probably some kinda audio cue em… cos it's very easy especially if you're walking with music on to just sort of forget and slow down so it would be useful to just have something that em just kept reminding you yeah I suppose an audio cue." (Participant ID: PAR01)

Some participants (n = 3) also discussed the potential for the app to give them an indication of how to alter their walking speed to achieve a health benefit, for example, for the app to tell them if they had been walking fast enough to achieve health benefits. One participant said that having speed as a feature would not be important for her.

Energy expenditure. Energy expenditure was also an important feature for the majority of participants (n = 7), however, 3 participants did not find energy expenditure an important feature.

> "I'd probably like to know, not so much how many calories but what benefit it's had to my overall fitness. I'm not interested in how many calories I've burnt." (Participant ID: PAR07)

Map of route. Several participants discussed the potential for the app to have a map function. Participants expressed a number of reasons for wanting to have a map function. Some participants would find a map useful when they are unfamiliar with the area they are walking in (n = 2) with one participant suggested having the app provide information on local cafés or shops during a walk would be helpful. Other participants said a map would be

helpful for them to monitor their own performance (n = 3), allowing them to distinguish performance differences in varying terrains. Participants also highlighted that a map would be important to them prior to walking for planning purposes (n = 2). Although some participants did not feel that a map function would be helpful for them (n = 2) and indicated that they would not be interested in referring back to a map of a route they walked.

Monitoring performance. Other feedback features discussed by participants included the ability for the app to store previous walks (n = 4), provide them with their total walking time (n = 6) and provide heart rate data to monitor performance efficiency (n = 2).

Engaging features. The final broad theme that presented from the results included features that did not fall into a homogeneous category. These were broken up into three sub-themes: Sharing physical activity data; music and misc. features.

Sharing physical activity data. Participants expressed a number of positive benefits of sharing physical activity data including the motivational benefits associated with sharing data and having friends encourage them to do physical activity (n = 3). For example:

> "Well, as you can tell I'm not Scottish and I do have friends that live all over the UK and there's a couple of friends who, that started getting into things like running, walking and whatever as a consequence of me starting and so, we sort of, eh encourage each other quite regularly and post things and it's nice to share and say "Oh you did well today" or somebody shares it and says "Oh I only did four miles today it was really hard" you think but yeah at least you got out there, you're doing it. So it's nice, encourage people's persistence." (Participant ID: PAR08)

One participant commented on the importance of sharing routes with others and explained that sharing this information allows others to explore alternative routes and learn about short-cuts and paths they would not have otherwise been aware of.

Despite these positive comments, a number of participants were unsure of the idea of sharing physical activity data. Several participants (n = 5) said they thought there was no perceived value in sharing physical activity data, and two participants thought that physical activity levels were too personal to share. In addition, one participant expressed safety concerns related to sharing physical activity data and highlighted that she would not want others knowing when she was out the house and where she was exercising for safety reasons.

Music. Many participants spoke positively about doing physical activity with music. Some participants (n = 3) stated that music gives them motivation to do physical activity and participants (n = 4) also said they found that music distracts them in a positive way whilst they are doing physical activity. For example, one participant said:

> ". . . it keeps you motivated and it stops you thinking "oh God I've got another 5 miles to walk" or something (laughs). Just sort of yeah you're singing along and you forget what you're doing to a degree." (Participant ID: PAR08)

Two participants said they found music encourages them to maintain a desired speed whilst they do physical activity because they will try to walk or run to the beat of the music. However, some participants (n = 3) were concerned that the app might have pre-loaded music rather than allowing them to access their own music libraries and they highlighted that music preference is personal.

Three participants said they do not enjoy listening to music whilst doing physical activity for a number of reasons. One participant found running with music gave her headaches. Another participant expressed safety concerns with listening to music whilst exercising because music can serve as a distraction from surrounding hazards such as cyclists or cars and one participant found listening to music whilst walking disturbed the tranquillity of walking itself.

Misc. features. Participants discussed the potential for a number of miscellaneous features which could be integrated into the app. Three participants spoke about having a facility within the app to set goals and one participant wanted the app to recognize when they were achieving sub-sections of their goals.

> "Well I'd like to maybe input my goal and for the app to be able to recognise when sub categories of that goal was achieved. So like, say for example I had to walk 10 miles in a week I'd like it to tell me when I'd walked a quarter of that." (Participant ID: PAR07)

Two participants wanted the app to tell them if they were walking fast enough to achieve health benefits and, if they were not achieving health benefits, how they could modify their walks in order to do so.

First impressions. At the end of the interview, participants were introduced to a prototype walking app developed by researchers at the University of Strathclyde. The prototype app measured the users' total number of steps and was quite basic in appearance and functions, a brief summary of the features can be found in the Introduction section (see Table 1). Participants' impressions of the app were separated into two sub-themes including: feedback about the stepper app and points system.

Feedback about the stepper app. Most of the participants gave positive feedback after seeing the prototype walking app and many were impressed by it. The participants suggested the stepper app could be a useful tool for beginners who are new to physical activity and for those who may require additional help to become physically active. Some participants also spoke positively about the simplicity of the app (n = 3), appreciating the fact that the app was straightforward to use and understand. Participants also noted the convenience of the app being loaded onto their mobile phone without the need for any additional equipment. Others suggested there are already similar technologies currently available and highlighted that the app is not much different to a pedometer.

Points system. Several participants (n = 4) thought the clarity of the points system needed to be improved because they were unsure what the points meant. Participants were interested to know how the points system related to government guidelines and distance and how many points they should be aiming to achieve. Despite this, many participants (n = 4) liked the idea of having a points system as part of the app. One participant suggested the points system might encourage a level of interpersonal competition through trying to exceed previous point totals. Two participants suggested that using a points system could be motivational because it would allow them to set daily or weekly point targets. However, one participant raised the concern that the use of a points system could potentially have a negative effect and serve to demotivate participants who are failing to reach point goals or targets.

Discussion - Study 1

Participants discussed the potential for a number of features that would allow them to monitor their walking performance; which seemed to be of particular importance for many. Distance was the most consistently mentioned feature. Participants noted that they are not always aware of how far they have walked and they liked the idea of being able to monitor their walking progress by having their final and during walk distance information available on their mobile phones. A key consideration for having a distance feature is that many participants suggested that miles and kilometres are a more appealing measure of distance than steps. This is an interesting finding because many walking interventions use steps rather than miles and kilometres (For example: Baker et al., 2008; Tudor-Locke et al., 2002) and they provide guidelines in terms of steps. In a review of walking interventions, pedometers formed a key part of the intervention for 15% of the studies (7 out of 48 studies) included in the review (Ogilvie et al., 2007). Participants may have a preference for miles and kilometres because they are a common measure for other activities (e.g. driving) and therefore may be easier for participants to interpret than steps in terms of understanding their progress. This could be an important consideration for future walking intervention studies.

Social features caused mixed responses amongst the group. Some participants thought sharing walking data would be motivational but others perceived physical activity data as too personal to share. Physical activity app user studies have received positive reactions for sharing features (Consolvo et al., 2006; Maitland et al., 2006) which contradict the findings from Study 1, although in these studies users shared data with other study participants, many of whom they were already familiar with. Participants in Study 1 discussed sharing physical activity information with a variety of people using social media. This could explain why these user studies (Consolvo et al., 2006; Maitland et al., 2006) with

a sharing function have received positive feedback. If a walking app has a sharing function it would be important to consider who this data would be shared with.

Music was important for many as a motivational tool and as a distraction from the physical effort of physical activity. These findings are consistent with the results of a study by Potteiger, Schroeder and Goff (2000) who found that participants had a lower rating of perceived exertion when listening to music compared with no music. Two participants suggested that music encourages them to maintain a desired speed because they try to walk or run to the beat of the music. This concept was previously investigated by Styns, van Noorden, Moelants and Leman (2007) who found that people can synchronize their walking speeds with music. They also found that people walked further in the same amount of time when listening to music compared with metronome stimuli. Not all participants wanted music and some participants highlighted that music can be a distraction from potential hazards and can disturb the tranquillity of walking. With this in mind, music may be best suited as an optional feature.

Three participants discussed the potential for a facility that would allow them to set goals as part of the app and one participant said it would be useful if the app could recognise when sub-parts of the goal were achieved. This idea has been previously employed in a physical activity app by Consolvo et al. (2006) who gave participants step count goals and found that participants were motivated by monitoring their performance against their goal. They were additionally motivated by being congratulated on reaching their goal by the app, suggesting that goal setting could potentially be a motivating feature within a mobile walking app. A review by Shilts, Horowitz and Townsend (2004) also found positive effects for goal setting to increase physical activity behaviour however the evidence was not sufficient to support this theory. This gives rise to the possibility of goal setting being an

effective component of a mobile app for increasing walking behaviour, alongside other features.

Participants responded well to the prototype app, expressing an appreciation for the app's simplicity. Many participants liked that the app would be loaded onto their mobile phone without the need for supplementary equipment. This was found to be an issue for participants of other physical activity app user studies where users complained about large, unattractive devices that they had to strap onto their waistbands (Consolvo et al., 2006) and the inconvenience of having to upload their daily steps at a kiosk (Lin et al., 2006). The prototype walking app overcomes both these issues by being loaded onto the users' mobile phone without needing any additional equipment and through automatically updating the users' daily activity without the need for the user to do it manually and it has the potential to upload using wireless communications technology.

Limitations

The design of the online questionnaire made it difficult to determine the relative importance of features for different people; the Likert scale used for rating the importance of a number of features meant that many participants selected the same response for each feature (e.g. rated each feature as 'Highly important'). This made it difficult to determine the features that were most or least important to the participants. A different approach for collecting this data may have provided more meaningful data. It should be noted that 60% of the participants in the individual interviews were meeting government physical activity guidelines and the rest were active but not achieving guidelines. This seemed to influence participants' responses as some of the highly active participants relating their responses to features they would like if they were running. This suggests they would be unlikely to use a

walking app. Many participants discussed features they thought low active individuals or sedentary people would want from a walking app. This limits the reproducibility of the findings to low active or sedentary individuals and highlights the need to target individuals with an interest in using a mobile walking app for future user-centre design studies.

Recommendations

Developers should take into consideration the differences in user preferences when designing a walking app. The results of this study suggest that different features are appealing to different users therefore an app that accounts for these differences in preferences and allows users to self-select the features they would like to use may appeal to a larger number of users. Participants consistently reported a preference of distance in terms of miles and kilometres rather than steps. There was also considerable evidence in support of having music as part of a walking app which is worthy of further exploration. Participants also liked the convenience associated with the app; requiring no additional equipment or manual uploading. Many participants spoke negatively about having social networking features as part of an app, therefore, developers should integrate these features in a walking app with caution.

Methods - Study 2

This section presents the methods for Study 2 which was Q-methodological in approach and informed by the results of Study 1. The purpose of Study 2 was to explore sedentary and low active individuals' preferences for a number of potential features of a mobile walking app in participants who specifically stated they would consider using a mobile walking app. The results of Study 1 informed the selection of participants and the content of the Q-methodology study, for example additional potential features were highlighted by participants for further exploration. Individual, semi-structured interviews followed the Q-methodological study which served to expand on the results in more depth.

Method

Q-methodology was invented in 1935 by William Stephenson and has since been developed by researchers in psychology (Brown, 1993). It has been employed previously in health psychology on a range of issues ranging from personal accounts of smoking behaviour (e.g. Collins, Maguire, & O'Dell, 2002) to experiences of living with chronic disease (e.g. Stenner, Dancey, & Watts, 2000) and to exploring racial differences in mental health studies (e.g. Stowell-Smith & McKeown, 1999).

In Q-methodology, a participant is presented with a number of statements on a given topic and they are requested to rank the statements through a process called Q-sorting against a pre-determined rating scale, for example 'agree' to 'disagree'. This is traditionally carried out in person with the use of cards and a sorting grid; however various online resources have become available over recent years that enable participants to complete this

activity online. A web-based method of Q-methodology was selected for use in Study 2 for convenience. Using a web-based method meant participants only needed to attend one session with the researcher for a follow-up interview as they could complete the online Q-study at home. A web-based resource was also selected for use so that the results of the Q-sort could be analysed in advance of individual interviews in order to inform the development of the interview schedule so that the interviews could account for the differences in responses to the Q-sort. This study utilised the web-based sorting program Q-Assessor (www.q-assessor.com). Q-Assessor was selected because it is a free, open-access resource that allows results to be stored, accessed and analysed, and it allows the researcher to select the number of statements required for the study.

Q-methodology is both a quantitative and qualitative technique: quantitative because it uses a form of factor analysis to identify patterns in the participants' responses which can help to explain the issue under consideration, and qualitative because the emerging factors are followed up by an interview to allow the participant to expand on their responses and ultimately tell a story based on their Q-sorts. Q-methodology was selected for use in this study because it is subjective and creates a forced distribution that can later be compared with other respondents. This forces separation of item ratings rather than participants rating all items similarly which was an issue that arose in, and was discussed as a limitation to, Study 1. It also allows the researcher to follow up on participants' responses. Similar responses are grouped together which creates distinct factors based on participant preferences for a prototype walking app. This study required participants to arrange the features of a mobile walking app from greatest to least importance in two stages (See Figure 6 and 7).

Figure 6: Q-sort stage 1

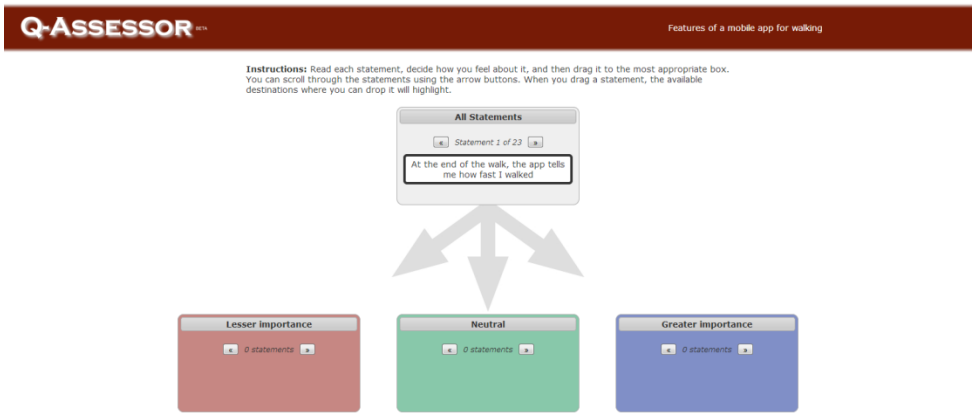
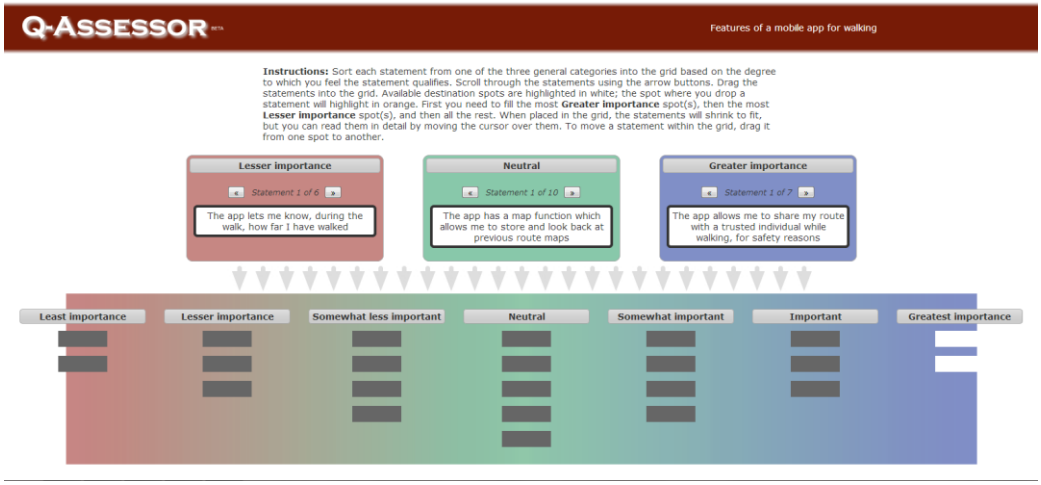


Figure 7: Q-sort stage 2



The statements were created based on the findings from Study 1 and through the researcher's own exploration of currently available physical activity apps and self-monitoring devices. The researcher aimed to represent all of the viewpoints presented in the results of Study 1, which was achieved by exploring the themes relating to potential features of a mobile walking app that emerged from Study 1 and creating statements that corresponded to the viewpoints from each theme and sub-theme. The themes included: (a) Feedback features; (b) Engaging features; and (c) First impressions. The statements were

initially prepared and then reviewed by the primary researcher and by the two project supervisors. This resulted in some minor changes being made to the statements (e.g. the clarity was improved to aid participant understanding). The final Q-sort consisted of 23 statements (see Appendix H); each describing potential features of a mobile app for walking. Participants were requested to rank the statements from greatest to least importance.

Participants were requested to initially sort the statements into one of three broad categories (least important, neutral or most important) (see Figure 6). When this was completed, participants were taken to a new screen requiring them to further separate the statements into seven categories; from 'greatest importance' to 'least importance' (See Figure 7), using the rating scale below (see Figure 8).

Figure 8: Q-sort rating scale

Rank	-3 Least importance	-2 Lesser importance	-1 Somewhat less important	0 Neutral	1 Somewhat important	2 Important	3 Greatest importance
Number of statements under each rating	2	3	4	5	4	3	2

A pilot Q-sort was completed to ensure the clarity and ease of use of Q-Assessor, which resulted in the creation of an instructional YouTube video to explain how to use the program (http://www.youtube.com/watch?v=c0TyXpkBJ0M). This was created because the pilot participant was not confident she was using Q-Assessor correctly so the instructional video aimed to assist participants in completing the Q-sort task. The

instructions on the initial screen of the Q-study were also amended with a view of improving the participants' clarity and understanding.

A semi-structured interview schedule was created (see Appendix I) after analysing the Q-sort data to follow up on the participants' responses to the online Q-sort. Factor analysis aims to identify patterns in the relationships between the variables (e.g. the statements) particularly to determine whether the variables can be explained in terms of a smaller number of variables called factors. Three factors were identified from the Q-sort: 'The Musically Motivated', 'The Goal Setters' and 'The Well-Informed', representing three groups preferences for a mobile walking app. An introductory statement was read out at the beginning of the interviews to the participants to explain the purpose of the interview, which was to follow up on participant responses to the online Q-sort; key terms; and the introductory statement aimed to remind participants about the topic area. The interview schedule consisted of nine questions including an ice-breaker question to ease and relax the interviewee. The remainder of the interview schedule was split up into three sections: group responses, individual responses and rank order statements. The group responses section aimed to discuss the group the participant belonged in based on their responses and the factor analysis, and to explain the differences and similarities between the participant's group and the two other groups. The focus of this part of the interview was to get the participant to think about why they were placed in that particular grouping and to determine if the participant agreed with the group they were placed in.

The focus of the next section of the interview was on participants' individual responses to the online Q-sort. This section explored the two features the participants ranked as being of most and least importance in the online Q-sort to determine the reasons behind their choices and to discuss potential ways of making low-ranked features more appealing for the participants.

The purpose of the final section was to explore how the statements were ranked overall by all of the participants which involved asking participants to discuss any features that were ranked as very high or low overall. Participants were given the opportunity at the end of the interview to discuss anything they felt was not covered during the interview and each participant was thanked before they left. The questions were developed alongside accompanying prompts and probes to ensure the smooth running of the interview (see Appendix I). A pilot interview was carried out in advance of data collection to evaluate the effectiveness of the interview schedule. This resulted in the primary investigator improving the clarity of the tables and graphs used to explain the results of the Q-sort.

Ethical Approval

Ethical approval was granted from the University of Strathclyde School of Psychological Sciences and Health Ethics Committee. The participants who completed the online Q-sort were given an informative introductory paragraph (see Appendix J) and the option to leave the survey if they decided they did not wish to participate. The participants who took part in the individual interviews were given information sheets (see Appendix K) and they completed informed consent forms (see Appendix L).

Participants

This study comprised of participants from Study 1 who expressed an interest in participating in further research. 26 participants met the selection criteria and were invited to carry out the online sorting task. Of these, 13 participants responded to this invitation and carried out the online Q-sort and 11 participants carried out the follow-up interviews.

The selection criteria for this study included adults located in or around Glasgow or Edinburgh between the ages of 18 and 65 years old. The location was selected for the researcher's convenience as she was based in both Glasgow and Edinburgh. Participants were selected for inclusion in the study if: they were not meeting physical activity guidelines (determined using the Jackson et al. (2007) PA5 scale which was completed in Study 1); they were unhappy with their current levels of physical activity; and they expressed an interest in using a mobile app to assist them with their physical activity levels. Invitations to participate in the study were sent out through email automatically from the web-based Q-sort program Q-Assessor and if participants failed to respond to emails within 5 days a reminder email was sent out. Participants were given the opportunity to decline this invitation. Those who completed the online Q-sort were invited to participate in a follow-up interview, which was held at a time and place convenient to the participant and lasted between 20-30 minutes. Interviews were audio-recorded, using an Olympus Dictaphone (Olympus, Tokyo), and later transcribed verbatim, yielding 70 pages of single-spaced text (see Appendix M).

Quantitative Analysis

The Q-sort data were analysed following guidelines by Brown (1993) using PQ method, a program that correlates each person's Q-sort of features against the others to identify Q-sorts that have been sorted similarly and then groups them together in factors. A varimax rotation was performed, creating three classifications of Q-sorts with eigenvalues greater than 1. Eigenvalues measure the variance in the variables for a factor. An eigenvalue is the sum of squared loadings for a factor that represents the variance accounted for by a factor. Factors with eigenvalues greater than 1 are typically included for further exploration in Q-methodology because they explain more of the total variance than those with values

less than 1. These were analysed and later renamed based on their content to 'The Musically Motivated', 'The Goal Setters', and 'The Well-Informed'.

Qualitative Analysis

A thematic analysis approach was adopted to analyse the follow-up interviews, using guidelines by Braun and Clarke (2006). Interview transcripts were reviewed using the NVivo9 software package (vs. 9, QSR International Pty Ltd, Cambridge, MA). The primary investigator transcribed the interview data to assist with familiarisation of the interview transcripts, in turn aiding the analysis process. Each transcript was read several times, notes and nodes were created on each transcript and an online project journal was used in the NVivo9 package to express early ideas. Each line of text was coded using open coding: a process involving labelling, defining and developing concepts; which initially generated 202 nodes. These codes were reviewed throughout the analytic process and were subsequently reduced to 194 nodes. Axial coding involves grouping the codes generated by open coding to create sub-themes and themes. This was carried out using both inductive and deductive processes and the themes and sub-themes formed the basis for a thematic framework. Induction involves generating meaning and conceptualisations from specific data (e.g. codes inform sub-themes) and deduction involves working backwards from themes and conceptualisations (e.g. broad themes inform sub-themes). There was constant movement between themes and sub-themes until the researcher was satisfied with the thematic framework as a tool to represent the underlying meaning of the text. The arrangement of the thematic framework was discussed with the project supervisors and minor changes were integrated based on their suggestions.

Results - Study 2

A total of 13 participants (mean age = 38, SD = 15 years, 85% female) carried out the online Q-sort and 11 participants (mean age = 36, SD = 15 years, 83% female) carried out the follow-up interviews. Participants were not meeting physical activity guidelines and were predominantly in the preparation stage of the Transtheoretical model (85% for the Q-sort, 82% for the follow-up interview). The remaining participants were placed within the contemplation stage of the Transtheoretical model. All but one of the participants had at least one app and 54% used their mobile apps daily. All of the participants said they would consider using a mobile walking app.

Statistical overview

Q-methodology is a form of factor analysis; a statistical method used to describe variance in variables (e.g. statements) in terms of larger variables called factors (or groups). Three factors achieved an eigenvalue greater than 1 and were considered worthy of further exploration. These factors were named: Factor 1 - The Musically Motivated; Factor 2 - The Target Driven; and Factor 3 - The Well-Informed, and these will now be presented in turn. Each group (or factor) represents the viewpoints of one or more participants and explains their preferences for a prototype walking app. Typical Q-grids were created for each factor to demonstrate the patterns of each factor (see Figures 9-11), and these Q-grids highlight distinguishing features for each factor. The typical Q-grids were based on the ranking of features and represent the average responses of participants in each group, and the participants preferences for a prototype walking app. Distinguishing features are features that have been placed a minimum of three ranks apart from their placing compared with

other factors. Participants agreed to some extent on the classification of a number of features which will be presented after each of the three groups in a section called ‘Consensus between the three groups’, this section describes features that all of the participants wanted or did not want and why.

Factor 1- The Musically Motivated

Four participants loaded most strongly on factor 1, the Musically Motivated group (see Appendix N). Table 2 shows the list of statements used in the Q-sort and Figure 9 shows the typical Q-grid, or the prototypical walking app preferences, for the Musically Motivated group.

Table 2: Table of Q-sort statements

Statements
1. The app allows me to set goals for myself 2. The app provides an audio cue to tell me to walk faster 3. The app lets me know, during the walk, how far I have walked 4. The app has a points/rewards system based on my walking 5. The app provides audio encouragement (for example, clapping) while I walk 6. At the end of the walk, the app tells me how fast I walked 7. At the end of the walk, the app tells me my overall distance for the walk 8. The app provides distance information in miles/kilometres 9. At the end of the walk, the app tells me how many calories I burned 10. At the end of the walk, the app tells me my average heart rate 11. At the end of the walk, the app tells me the total time I spent walking 12. At the end of the walk, the app tells me my distance in number of steps taken 13. The app stores data (distance, time, calories burned) from previous walks 14. The app has a map function which allows me to store and look back at previous route maps 15. The app allows me to post walking data on social media websites (e.g. Facebook) 16. The app allows me to listen to music whilst walking 17. The app tells me if I am walking fast enough to achieve health benefits 18. The app provides me with a map of my route while walking 19. The app provides local information (drinking water, toilets) while walking 20. The app provides usage instructions to maximise the health benefits of walking 21. The app allows me to store walking data on a desktop or laptop computer 22. The app allows me to share my route with a trusted individual while walking, for safety reasons 23. The app allows me to connect to an online walking community and arrange/view organised group walks with other members in my local area

Figure 9: Typical Q-grid for the Musically Motivated group

-3	-2	-1	0	1	2	3
22	23	11	13	3	9	7
5	4	19	1	2	17	16*
	15	10	6	20	18	
		12	21	14		
			8			

* Indicates distinguishing feature

Music was a key feature for those in the Musically Motivated group. Participants attributed this to the motivation that music can provide to do physical activity and because music acts as a distraction from the physical effort of exercising. Music was considered by many to be a motivational tool, with participants saying that music motivates them to perform better. One participant said that music was a key motivational tool for her running performance:

". . . music as I said before, that's what motivates me as well (as calories) to do well" (Participant ID: PAR007)

Participants also discussed how the tempo of the music motivates them to walk to the beat of the music and encourages them to keep moving at that pace rather than slow down. They noted that when they run to music with a good beat they perform better than if they were to run with no music at all.

> "I think it's more for me I'd want distance and music to keep me occupied when I start walking because I find that kind of I tend to amble if I've not got the beat of the music to keep going to, I'll sort of slow down and watching where I'm going rather than concentrating on my walking." (Participant ID: PAR010)

> ". . . it could help if it was like really fast pumping music and I find when I'm listening to music like that say if I'm running it automatically makes me run a lot faster because you try and run to the beat and you sort of think "yeah, this is really good"." (Participant ID: PAR009)

One participant (Participant ID: PAR010) suggested having playlists or selections of music that could correspond to certain walking speeds, based on the sort of music the user likes. She spoke enthusiastically about her idea of being able to tell the app that she wanted to walk for 30 minutes at a brisk pace and for the app to provide music to allow her to walk to the beat with gentle music for a cool down at the end, saying if an app could do that then "that would be brilliant". The same participant also discussed how this could be potentially linked in with the user walking fast enough to achieve health benefits, as a means of providing music beats that would get the user walking at the right pace.

Another participant (Participant ID: PAR009) found that music can act as a distraction by taking their mind off the physical effort of exercising and another participant discussed how they can sometimes find walking quite boring and they enjoy listening to music to keep their mind occupied. One participant (Participant ID: PAR009) also said "I think it's just nice to have something there", which suggests again, that music provides a distraction. Participants also discussed enjoying listening to music whilst they do physical activity and several participants suggested potential emotive benefits of listening to music whilst exercising. One participant (Participant ID: PAR009) talked about the potential for

music to relax them whilst they are exercising and they discussed how listening to music can make physical activities that they do not really like doing more enjoyable.

The importance of having the app work alongside personal music libraries was discussed by another participant, with one participant stressing the importance for the app to be able to work whilst they use their music library, which also highlights the importance for the participant of having music whilst they walk.

> "I have to be able to listen to music while I'm walking but I don't necessarily have to be able to control it from inside the app but I'd have to be able to leave the app, control the music and then go back in without losing all my settings and things." (Participant ID: PAR008)

Energy expenditure was another important feature for those in the Musically Motivated and many participants found there to be motivational benefits associated with finding out how many calories have been expended during physical activity, with participants enjoying being able to see that the activities they have done have had an impact on their energy expenditure.

> "Well I think for me I feel like say if I can like if you're at the gym and you're on a treadmill and it tells you how many calories you've burned it really helps. Because actually it emphasizes that you have done something, you have burned some calories and it's sort of like a confirmation that you've done the exercise." (Participant ID: PAR009)

One participant (Participant ID: PAR007) discussed how she found energy expenditure data useful because she tries to monitor her calorie intake and balance it with her energy expenditure, describing how she finds motivation from expending a certain

amount of calories based on her calorie intake therefore having energy expenditure data would be of particular importance to her.

Participants discussed the potential for the app to provide them with local information whilst they were walking and information on where they could find nearby toilets, cafés and parks were highlighted as useful information for the app to provide. Participants in the Musically Motivated group considered being able to access this information important for them and they discussed how this information would also serve to reassure them that there would be facilities available if they needed them. They also discussed the potential motivational benefits associated with learning new routes and places to go in their local area, highlighting the encouraging aspect of setting off to a specific area or on a specific walk rather than just walking for the sake of walking in an area they are already familiar with.

Two participants in the Musically Motivated group discussed the importance of the app being able to store data from previous walks and explained that this feature would allow them to track their progress over time. Participants discussed how having their previous activities available to see would encourage them to improve their performance the next time they go out, highlighting the potential for this feature to encourage self-competition. Participants also discussed that being able to see they were making improvements would be encouraging and motivational in itself, to continue to improve their physical activity performance.

Participants in the Musically Motivated group saw little importance in other motivational features and reported negatively on the potential to have a points/rewards system as part of the app with one participant saying she felt a points system would have no real value for her. She explained that she would rather decide on her own goals and work

towards those rather than using a points system, and stressed that she would probably not look at such a feature even if it was a feature of a walking app. Steps were similarly unimportant for participants in the Musically Motivated group and one participant discussed how they do not find steps to be a meaningful measurement for them and they do not find them to be important.

Participants in the Musically Motivated group were motivated by having music as a feature of a mobile walking app, and discussed the many benefits of listening to music whilst exercising. They also expressed importance for a number of feedback features such as distance and energy expenditure, and other features such as local information and being able to store physical activity data.

Factor 2- The Target Driven

Two participants were significantly placed within the Target Driven group (see Appendix O). Figure 10 shows the prototypical walking app preferences, or the typical Q-grid, for the Target Driven group.

Figure 10: Typical Q-grid for the Target Driven group

-3	-2	-1	0	1	2	3
15	22	20	8	21	1*	7
5	16*	11	12	17	13	4*
	18*	23	6	14	9	
		19	2	3		
			10			

* Indicates distinguishing feature

Participants discussed their physical activity habits and expressed a number of barriers for physical activity, with the key barriers being lack of time and poor motivation to do physical activity.

> "I tend to have very poor motivation, I know this, but I struggle still to do anything about it." (Participant ID: PAR004)

Participants in the Target Driven group clearly recognised they have trouble motivating themselves to be more active and they recognized the importance of having an app that would encourage them to be more physically active and both participants said that a motivational walking app would be a priority for them.

Participants discussed a number of potential motivational features that could be implemented into a mobile walking app. The prospect of having a points/rewards system was considered as an important feature for one of the participants in the group (Participant ID: PAR004). She explained how she struggles to find motivation for physical activity but

liked the idea of having small achievements that could accumulate into larger achievements and goals and she thought it could motivate her to be more active. She also discussed a walking campaign she participated organised by Walking Streets that involved collecting points based on the walking she did over a period of a month, which included various challenges and a gaming aspect. She said the challenge and the points system motivated her to do more walking. The other participant (Participant ID: PAR005) in the Target Driven group thought that a points system would not work for her, commenting that she would not be interested in gaining points.

Both participants placed a great importance on the ability of the app to be able to set personal physical activity goals, expressing the importance for them in having something to work towards. One of the participants (Participant ID: PAR004), who previously discussed completing a points challenge, said she found that not having a larger goal or target to work towards in that particular challenge was a slight downside to it and having something to work towards, for example she discussed signing up for a long walking event, and how she found that events or goals can be very motivational for training purposes by encouraging her to get out and train more.

> "If I had actually been working towards a goal of walking a certain distance in a month or doing or achieving a certain fitness level by a particular time, having that kind of, something to work towards is quite important for me." (Participant ID: PAR004)

Music as a motivational tool was discussed and both participants considered being able to listen to music whilst doing physical activity to be important , with one participant discussing the potential for the app to select music that was at a particular tempo to

encourage walking speed, which was also mentioned by participants in the Musically Motivated group.

> ". . . having that kind of thing set up so you can just go tap I'm doing a 30 minute walk today at this speed and having that music that's pre-set to help you walk at that speed I think would actually be quite useful and it would be good, as I say I don't think it would be essential and I would probably use it without it but it would definitely be something that would encourage me to use it more. And I think I would probably get more from it as well if I had say something that was keeping me at the right pace, the right rhythm, that kind of thing." (Participant ID: PAR004)

Although motivational features were regarded as the main priority for participants in the Target Driven group, in addition to the consensus statements (see section 'Consensus between the three groups), energy expenditure was also considered an important feature for the participants in the Target Driven group.

It should be noted that although participants in the Target Driven group expressed an appreciation for feedback features, participants in the Target Driven group would relate feedback features to motivational features. For example, one participant in the Target Driven group noted that overall distance links in with goal setting because it can be used to build up to something more meaningful. Similarly, participants noted that having the ability to store data ties in with goal setting because it allows the user to look back over previous walks and establish whether they are making progress and achieving goals.

> "I think, yeah. I think having that ability and again it ties into I guess the goal setting and the building things up into a big sort of health package, the ability to go back and look at what you've done or see for it to store the data and show you a trend pattern and "hey look you were doing really well 2 weeks ago but you've been a

> total slacker this week". On a graph kind of thing and like "you were doing really well but it's really dipped" so the ability to store that data and display it I think would be quite good for me." (Participant ID: PAR004)

The ability to store data was highlighted as an important feature by the participants in the Target Driven group for a number of reasons. Participants discussed the usefulness of being able to look back over their previous performances and be able to identify trends in their performance. One participant (Participant ID: PAR004) discussed how having the information there would be motivational in itself and how having that information would help her to improve her performance.

The other participant discussed how she finds it very motivational to plan her activities and her free time on a spread sheet and it would be particularly motivational and helpful to have her physical activity data alongside that, allowing her to incorporate physical activity plans into her schedule of her free time.

> "Yeah I think if I was able to do that from an app on my phone I think that would be very useful and very motivational because that's something that I would definitely use and as I said it's personal to me. I wouldn't be broadcasting it to Facebook I would be logging it onto my computer, tracking it that way." (Participant ID: PAR005)

Local information was another feature that one of the participants in the Target Driven group considered to be important, and useful to have, in order to display parks and other points of importance when they are walking in new areas. One participant suggested how having this information available on the app would be quite convenient for them, and would prevent them from having to search for the information elsewhere. This participant stressed that she struggled to place this feature in the online sorting task; originally placing it

as a feature of lesser importance. She noted during the interview that after considering it again she found it to be more important than she had originally rated it. She explained her reasoning behind her choice:

> "I just didn't want it to be too all-encompassing, I wanted it to have the simplicity factor but that was why I was being sort of, keeping that part of it out, because I was just not wanting it to be too complicated an app." (Participant ID: PAR005)

Participants in the Target Driven group wanted an app that would help motivate them to be more physically active. They wanted to be able to set goals and they wanted the app to store physical activity data so they could monitor their own progress. Participants in the Target Driven group also found feedback features to be important, including overall distance, speed and local information, relating these features back to the motivational features. For example, knowing their overall distance for a walk would help them achieve goals as part of a goal-setting feature.

Factor 3- The Well-Informed

Five participants loaded onto this factor. Figure 11 shows the prototypical walking app preferences for the Well-Informed group.

Figure 11: Typical Q-grid for the Well-Informed group

-3	-2	-1	0	1	2	3
15	2*	12	13	11*	18	7
5	9*	22	1	8	19*	17
	4	23	20	14	3	
		21*	10	6		
			16*			

* Indicates distinguishing feature

Participants in the Well-Informed group were particularly focused on feedback features, in addition to the consensus features, suggesting they wanted a highly informational walking app. Those in the Well-Informed group typically responded negatively to motivational and social features. Local information was an important feature for participants in the Well-Informed group, with participants saying it would be helpful to access information on weather and the location of nearby facilities for example cafés and transport links. Transport links seemed to be information that participants would find quite reassuring to have available, in case they needed to drop out of a walk for any reason. One participant thought that having weather information would be helpful and another participant said he would like to learn things about the areas he is walking in.

Within the motivational features category, participants had mixed opinions on having music as part of the app and they reported negatively on being able to set goals as part of the app, having a points system and audio encouragement. Some participants talked about music acting as a distraction from the effort of physical activity and they said they

thought that music takes their mind off feeling tired. Some participants said music could be distracting in a negative way, distracting them from what is going on around them for example traffic, cyclists and other pedestrians, with one participant saying she feels there is a need to "keep your wits about you" (Participant ID: PAR002) whilst out walking. Some participants talked about how music can keep them going and motivate them to perform better through providing emotive benefits, as discussed in previous groups, with one participant saying certain songs can inspire her to keep going. One participant said it would be important for him to have the ability to play his own music alongside the app, rather than having a walking app with pre-loaded music. Other participants talked about how they like to walk mostly in groups so listening to music would not be of interest to them.

Participants spoke negatively about the potential to have an audio cue and offered a number of reasons for not wanting this feature. One participant said she felt like if the app was counting her distance and periodically informing her, it would probably feel longer to her compared with not being aware of how far she was walking until she finished and another participant said she would not listen to it. Another negatively reported feature for participants in the Well-Informed group was energy expenditure. Participants discussed not being interested in counting calories and one participant found monitoring how many calories they burned during exercise to be demotivating because it often does not seem like they are burning many calories at all compared with their food intake.

Having goal setting and a points system as part of the app was unappealing for the participants in the Well-Informed group, with participants saying they would not be interested in setting physical activity goals for themselves, for example "I'm not much of a goal setter" (Participant ID: PAR001). Participants similarly commented on the prospect of having a points system, saying that they would not be motivated by points and it would have no appeal for them. One participant explained that she walks and does physical activities for

herself, not for collecting points or for how much physical activity or walking others are doing.

The participants in the Well-Informed group wanted an informational walking app. They were not particularly interested in motivational features and they had mixed opinions on having music as part of the app with some participants seeing a potential value and others saying they would not be interested.

Consensus between the Three Groups

There were a number of statements that participants placed a similar importance on across the three groups. Positive consensus statements include:

'At the end of the walk, the app tells me my overall distance for the walk'

'The app tells me if I am walking fast enough to achieve health benefits'

'The app lets me know, during the walk, how far I have walked'

'At the end of the walk, the app tells me how fast I walked'

'The app has a map function which allows me to store and look back over previous route maps'

This group of features highlights the basic preferences every participant had for a mobile walking app. There was a clear interest in overall distance and for the app to tell users if they are walking fast enough to achieve health benefits, both features were rated of greatest importance from the group as a whole. During walk distance was also important, with speed and a map function also important.

Participants discussed many reasons why distance was important to them including performance monitoring, for planning purposes and for self-motivation. Participants wanted to know their distance to allow them to monitor the distances they were covering and monitor their progress, and for those in The Goal Setters, for relating to pre-determined walking goals. Some participants wanted to plan their walks in advance and they suggested a feature which would allow them to plan out stops and transport links would be helpful for them. Some suggested being able to look at the app and see they were covering a good distance would be motivational, particularly if they had walked further than they expected. Participants also highlighted that distance information would be more meaningful for them displayed in miles or kilometres rather than steps. Many suggested they would find it easier to relate to miles or kilometres than steps, with one participant saying one reason for this is because ordinance survey maps are in miles or kilometres.

The ability of the app to tell users if they are walking fast enough to achieve health benefits was another feature that was important to the majority of the participants. Some participants explained that they did not know how fast or long they should be walking to achieve health benefits therefore having a feature that could tell them would be important to them. Walking for health was a key priority for participants; they found it to be more important or equally important as losing weight and they wanted to know how they could improve their stamina and heart health. Others wanted to know what health benefits they were getting from a walk so they know what they are doing is worthwhile to allow them to make the most of their time and if necessary, how they could improve their walks to enhance the benefits they would be getting to their health.

There were some differences amongst the participants with regards to having a map function. Those who did not think they would use a map function said it was because they normally walk in areas they are familiar with and therefore have no real need for a map

and also because they already have apps on their phone for a map. Many found a map function would be beneficial if they got lost because it could give them very specific directions that are clear. Some said having a map is reassuring when in a new area and a map can be helpful for planning purpose because it allows the user to plan out maps in advance and establish key variables such as distance and terrain. Two suggested it would be helpful to have to access an offline map due to the often very rural areas they walk in with poor internet access.

There was one neutral feature that was placed similarly across the three groups:

'The app provides usage instructions to maximise the health benefits of walking'

One participant commented on the prospect of having usage instructions and said that he probably would not read them even if they were there and another participant said it could be a positive feature that would help the user get the most benefit out of the app.

There were three features that all three groups placed as less important:

'The app allows me to connect to an online walking community and arrange/view organised group walks with other members in my local area'

'The app provides audio encouragement (for example, clapping) while I walk'

'The app allows me to post walking data on social media websites (e.g. Facebook)'

The potential to have an online walking community as part of the app was generally reported negatively across the three groups; participants felt that it would not be something that would work for them. They imagined an online walking community as an online area where they could talk to like-minded walkers, exchange walking routes and organise group walks. One participant said that she likes to be spontaneous with her walking

rather than have to plan out walks in advance, some also suggested they do not have the time to organise or participate in arranged group walks due to work and other commitments. One participant said she would be worried she would not be able to walk as fast and as long as others in a walking group, one said she does not enjoy doing physical activity in groups and another participant thought it would be boring.

Participants thought that audio encouragement would be irritating and they did not want to be interrupted during their walks by an audio cue. Some participants said that they would not want it to voice over their music; others said they do not need audio encouragement when they are doing physical activity; and several participants imagined it would be patronising.

> "As for the audio encouragement I just thought it was a bit, I dunno, a bit patronising. "You got here, congratulations, you can walk" (laughs)." (Participant ID: PAR001)

Posting walking data to social media was another feature that participants consistently reported negatively on. Participants thought there would be no value to themselves or others in sharing physical activity data and some participants suggested physical activity information is personal and they would not want to publicise what they are doing. One participant commented that physical activity is linked to her weight and so she would not want to share what she was doing with others.

> ". . . I do use social media but I'm not the kind of person that publishes really kind of personal stuff and to me walking and activities is quite it's really tied to my weight and sort of therefore self-esteem and quite personal issues that I really don't want to be publicising." (Participant ID: PAR004)

Another negatively reported feature across the three groups was the ability to share a walking route for safety reasons. Many participants thought this feature would not be applicable to them based on the type of walks they do, for example some participants walked the same route every day through busy, well-lit areas. One participant said she would always tell somebody where she is going so the feature would not be beneficial for her and many participants said when they do go on rural walks they tend to walk as a group so a safety feature would not be necessary. Some participants could see the potential value in a safety feature and highlighted the dangers of walking alone at night or walking alone in rural areas in case of accidents or injury.

Participants recognized the potential value to features that they themselves would not use. For example, one participant said she personally would not want to have audio encouragement as part of the app but she could see how it might be beneficial for those who are just starting out with walking and another participant said that she would not use a map function but she could see how it would be useful for others. The importance on having an easy to use app was also expressed by several of the participants and one participant stressed the importance of an app which works properly; commenting that technologies that do not work effectively can dampen the users' experience.

This section has presented three groups of app users based on their preferences from a walking app: The Musically Motivated group; The Target Driven Group; and the Well-Informed Group. Each group represents different preferences for a mobile walking app, although the three groups agreed to some extent on the importance of a few features.

Discussion - Study 2

Three factors emerged from the Q study: the Musically Motivated, the Target Driven and the Well-Informed. Each factor represents the preferences for a mobile walking app of its members, which suggests different people have different preferences for a mobile walking app. There were differences amongst the groups in terms of how happy participants felt with their current levels of physical activity and this seemed to influence the respective factor they loaded on to. Some participants spoke positively about the activities they do, for example, one participant spoke about how she is training for a walking challenge whereas other participants said they did not enjoy doing physical activity. This seemed to play a role in how participants rated the importance of a number of potential features of a mobile walking app and what factor they were ultimately placed into. Ogilvie et al. (2007) suggested different approaches may work for different people when it comes to encouraging physical activity adoption in physical activity interventions and this may also be true for physical activity apps. This should be taken into consideration when designing technologies or interventions to increase physical activity participation. This concept was supported by Consolvo et al. (2006) who found that different participants were motivated by different aspects of a prototype mobile app and in particular they noted that less active individuals were happy to work towards individual goals whereas more active participants enjoyed competing against others. In Study 2, those who said they struggled to be physically active placed within the Target Driven group and wanted an app which would encourage them to walk more whereas the more active individuals, or those who spoke more confidently about physical activity, seemed to prefer features that would allow them to monitor their progress and improve the walking they were already doing.

The concept of having music as part of an app was a priority for participants in Factor 1 and these participants attributed this to a number of reasons with one of the most frequently reported including the potential for music to provide motivation to do physical activity. Many of the participants discussed enjoying listening to music because they try and walk to the beat of the music that coincides with previous research by Styns et al. (2007), which found that people walk faster with music compared with metronome stimuli and that people synchronize their walking speed with music tempo. Terry, Karageorghis, Saha, and D'Auria (2012) also found that participants were able to synchronize their running to music tempo and they also found music provides a number of psychological benefits including mood responses and feeling states, which reflects findings from this study where many participants suggested that music potentially has emotive benefits. Notably, other features were also of importance to participants in factor 1 including motivational features (e.g. storing data) and feedback features (e.g. for the app to tell them if they are walking fast enough to achieve health benefits).

The participants in the Target Driven group described themselves as lacking in motivation to do physical activity and they wanted a walking app that would help them by enhancing their motivation through various features, particularly goal setting and storing data. Participants in the Target Driven group reported doing little physical activity and their self-reported lack of motivation corresponds to previous research by Wilson, Rodgers, Blachard, and Gessell (2006) who found that those with greater self-determination to do physical activity were more active and had greater levels of physical fitness than those with less self-determination. Interestingly, many of the features that the participants prioritised as important for them have been studied in previous physical activity research and yielded positive results for increasing physical activity levels over short periods of time for example interventions that have utilised goal setting (Shilts et al, 2004) and self-monitoring physical activity (Gleeson-Kreig, 2006) have been found to be effective in increasing physical

activity levels. Mobile app studies have also found positive results for increasing physical activity when self-monitoring behaviour over the short-term (Consolvo et al., 2006; Maitland et al., 2006), however, there is a lack of longitudinal evidence to support increased physical activity behaviour when self-monitoring using a mobile app.

The participants in Factor 3 were particularly focused on an informational walking app that would assist them to monitor their walking performance (e.g. distance, speed) and provide them with information on their surroundings (e.g. map function, local information). Of particular importance, and comparable to the results of Study 1, seemed to be having the ability for the participants to monitor their walking performance. Unlike the Musically Motivated group, music was not a priority for participants in the Well-Informed group, and unlike the Target Driven group, participants did not express an interest in motivational features.

The differences in preferences between the three groups could be attributed to a number of reasons. Baseline physical activity levels could be one potential explanation for these differences; however, due to self-reported physical activity levels and the low sample size it is difficult to accurately determine this theory. Participants in the Target Driven group said they felt they had problems motivating themselves to do physical activity and in general discussed wanting to do more; one of the participants related physical activity to body weight insecurities which could have been an confidence issue for her to do physical activities and the other participant said she did not like to do physical activity with others. In contrast, the participants in the Well-Informed group discussed walking regularly, some as part of a walking group, others were training for a long distance walking event and one participant talked about cycling and swimming regularly. Only one participant in this group classed herself as not very active and lacking motivation to be more active, yet still reported walking to and from work when the weather is nice. Participants in the Musically Motivated

group seemed to be somewhere in the middle in terms of physical activity participation levels between the low active participants in the Target Driven group and the more active participants of the Well-Informed group. There was a mixture of active and less active individuals in the Musically Motivated group, and all of the participants said they would like to do more physical activity. This potentially explains the choice of features for those in the Musically Motivated group, where participants expressed an importance for both motivational features (e.g. music, the ability to store data), feedback features (e.g. fast enough for health benefits, energy expenditure) and other features (e.g. map). This expands on the results from Study 1 that seemed to suggest that the more active participants wanted more informational features from a walking app compared with the less active individuals who saw potential value to motivational features as well as informational features.

The results of this study highlight the differences in preferences from a mobile walking app that different groups of users have. Three groups of users were identified, suggesting that a mobile walking app that would fit the preferences of all three groups would ideally allow the user to self-select the features they require and be able to adapt how the feature operated (e.g. providing feedback during, or at the end, of a walk). There seemed to be a distinction in terms of people wanting features which would encourage users to walk more and features which would encourage users to walk more effectively. This ability to self-select features may be particularly important to encourage continued use of a mobile walking app over time as users may initially use the app to motivate them to walk more then continue using the app to improve their walking and help them walk faster or for a longer distance.

Reflection on the Use of Q-Methodology

The use of Q-methodology in this study was found to be particularly useful as an exploratory tool to investigate the features users would prefer for a mobile walking app. Initially, our interest in using Q-methodology stemmed from us wanting participants to prioritise the importance of a range of different features, rather than having participants rate all the features similarly. This allowed us to expand on the participants' Q-sorts of features during a follow up interview, allowing us to go into depth on the features they rated as greatest and lowest importance to them. We used the online Q-methodology program Q-Assessor (www.q-assessor.com) to analyse the Q-study in advance of the individual interviews and this guided the preparation of interview schedules. This allowed us to identify the three groups that emerged from the data and use this information as a focus of the individual interviews. The use of Q-methodology identified three classifications of mobile app users and has highlighted a very interesting avenue for future user centred design and research. Many of the participants noted the difficultly in completing the sorting task because they could see the value in features they themselves would not use or need. This stresses the value of using Q-methodology compared with the Likert rating scale used in Study 1 because participants were forced to order the features based on their own preferences; rather than how important they perceived the features to be for others.

Recommendations

This study does not claim to be representative of the needs of all the potential users of a mobile walking app however it does explore the preferences of a selection of low active adults who would consider the use of a mobile app to assist them to become more physically active. Within this sample, three categories of respondents emerged to identify the different

ways participants would like a mobile app to help them. These preferences can be separated into features which encourage users to walk more and features which encourage users to walk more effectively. Considering these groups of features separately may focus and improve app design. These preferences seem to be based on the participants own current physical activity behaviour and psychological preferences and highlights interesting considerations for physical activity mobile app designers. Further research is needed to investigate these three categories of mobile walking app users; in particular there is a need to better understand how individuals differ in their needs between the three groups. Future research could also explore the role of music in a mobile walking app as a tool to encourage users to walk to a predetermined beat, as many participants highlighted the potential for music to encourage them to walk faster through this mechanism. Although further research is necessary, the findings of this study have shown that different people have different preferences from a mobile walking app, and developers can use these findings to inform future design of mobile walking apps aimed at low active or sedentary individuals.

Limitations

Although the findings can be expected to be reasonably informative, this study is not without limitations. The small sample number in the online Q-sort limits the generalizability of the results and the findings can only be extrapolated to the individuals in this study.

Overall Discussion

The two studies presented in this dissertation have employed user-centred design to explore the preferences users have for a mobile walking app. Study 1 used a combination of quantitative and qualitative methods, including an online survey to gather opinion from a broad range of respondents and individual interviews to follow up on the survey data from a selection of the online survey respondents in more depth. Study 2 was Q-methodological in approach and expanded on the results of Study 1 in more detail.

There were several consistencies between Study 1 and Study 2. Ease of use and simplicity were considered important throughout. Participants noted the convenience of having an app that was loaded onto the user's phone without the need for any additional equipment when shown the prototype walking app during Study 1. This was highlighted as a limitation to several other physical activity apps in which participants complained about bulky equipment (e.g. Consolvo et al., 2006; Lin et al., 2006) and the burden of manually having to upload their data (e.g. Lin et al., 2006). Participants wanted the app to be clear and understandable which was also reinforced when participants were shown the prototype walking app in Study 1, and several participants highlighted the need to improve the clarity of the meaning of the points system. In Study 2, the concept of usability was stressed by some participants who explained it can be frustrating when technologies do not work properly.

Total distance was also mentioned consistently throughout Study 1 and Study 2, and participants noted in both studies a preference for miles and kilometres over total number of steps. Participants explained that miles and kilometres would be a more meaningful measure of distance to them than steps. This could be because participants are

unfamiliar with step guidelines for walking and/or because miles and kilometres are more interpretable as a measurement for other activities (e.g. driving). This is an important consideration because many walking interventions utilise steps as the metric (For example: Baker et al., 2008; Tudor-Locke et al., 2002) and provide recommendations in number of steps. Miles and kilometres seem to be a more meaningful measure for participants therefore those who are designing walking interventions in the future should consider this.

There were mixed responses in both studies with regards to sharing physical activity data. Four participants in Study 1 saw a potential value to sharing data however five participants did not want to share physical activity data and two of these participants felt that physical activity information is too personal to share publicly; in Study 2 participants consistently reported sharing features as less important to them. This contradicts findings from some physical activity app user studies that received positive reactions from participants on social features and sharing physical activity data (e.g. Consolvo et al., 2006; Maitland et al., 2006). This could potentially be because participants in this study may have imagined sharing data to be with people they did not know and sharing data with friends or family in a supportive way might have been more appealing to them.

Whilst there were a number of similarities in users' preferences for features of a mobile walking app, the results of both studies highlight clear differences in preferences between different people. These differences in preferences seem to be related to how people view physical activity in general, their own physical activity and their psychological preferences. The results of Study 1 and Study 2 suggest preferences for features are related to physical activity levels. This was particularly evident in Study 1 whereby most participants were highly active and only a few were low active. The highly active participants discussed features which would allow them to monitor their own performance and the low active participants discussed features which would help encourage them to walk

more or serve to distract them from the physical effort of walking. Many of the highly active participants in Study 1 related potential features to activities such as running, therefore, may be unlikely to utilise a mobile walking app.

Study 2 overcame this limitation by selecting only sedentary or low active participants. The participants in Study 2 wanted a range of features but the more active participants, who were already regularly walking and spoke confidently about their walking, wanted features that would help them walk more effectively (e.g. faster/longer), and they seemed motivated by this prospect. These participants spoke much more positively about physical activity than some of the less active participants in Study 2, who said they found it difficult to motivate themselves to be physically active and their preferences for features for a mobile walking app reflected this. The lower active participants, who were mainly in the Goal-setters group, explained how physical activity was linked to insecurities about their body weight and they said that they did not like doing physical activity with others. This was very different from participants in the Target Driven group who expressed more confidence for walking, with many regularly walking in groups. Participants in the Musically Motivated group were mixed in their physical activity levels however they were all primarily motivated by having music as a main feature of a mobile walking app. Again, for many of the lower active participants in the Musically Motivated group, this was due to the motivational benefits associated with listening to music whilst exercising. For the higher active participants in the Musically Motivated group, participants attributed music to helping them to improve their performance, showing a clear difference between those who were low active and those who were highly active. This also reinforces a continued theme throughout the dissertation that there is a difference in mobile walking app preferences between those who wanted the app to help them walk more and those who wanted the app to help them walk more effectively.

The use of Q-methodology in Study 2 expanded on the results of Study 1 by providing a targeted exploration of the preferences people have from a mobile walking app. Through only considering low active and sedentary individuals who said they would consider the use of a mobile app to assist them to become more physically active, the preferences of people who would actually make use of such an application were explored. The results of Study 1 and Study 2 highlight the differences in preferences different people have for a mobile walking app and suggest that different people are motivated by different aspects, as demonstrated by the three groups that emerged from Study 2. Q-methodology was also demonstrated as a potential method of carrying out early stage user-centred design; allowing the separation of various statements or focus points which can be later expanded on during individual interviews. Q-methodology could be a useful user-centred design tool for other technologies which are aimed at best fitting the needs of the user.

Strengths and limitations

The findings from this dissertation can only be extrapolated to the individuals involved in these studies however they can be expected to inform the preferences of other adults for a mobile walking app. The overarching theme throughout suggesting that different people are motivated by different aspects of a mobile walking app is important, and the findings reinforce the concept that user-centred design is an important tool for designing physical activity technologies based on what users actually want rather than what designers think that they want.

Summary of results

Based on the findings of Study 1 and Study 2, the following suggestions for a mobile walking app were created:

1. Distinguish between features aimed at instigating walking behaviour "walk more" and features aimed at improving walking performance "walk more effectively": The results of this dissertation have suggested a difference in requirements from participants who were inactive or low active and who wanted a mobile app to encourage them to walk or to walk more and participants who were already walking and wanted an app to help them improve their walking. Separating these concepts may promote better app design by targeting features specific to the needs of the user.

2. Flexibility of a mobile walking app: As noted above, different people have different preferences for features of a mobile walking app which should be considered by developers. A flexible walking app may suit the needs of a larger number of people by allowing the user to change their use of the app over time to accommodate their change in needs.

3. Music: There was considerable support for music suggested as part of a walking app. Music could encourage users to "walk more", for example, through distracting them from the physical effort of walking; and it can also serve to encourage users to "walk more effectively", for example, by encouraging users to walk to a beat which represents a predetermined walking cadence. Additionally; music was suggested as having emotive benefits, making walking more enjoyable, and being relaxing. There are, therefore, a number of different avenues developers could take when integrating music into a mobile walking app.

4. Local information: Some participants expressed an interest in having local information as part of a walking app to support walking, for example through providing weather and transport information; and to make walking more enjoyable, for example through highlighting nearby cafes or places of interest. This is worthy of further exploration and may be a useful feature to encourage users' continued interaction of a mobile walking app.

5. Provide real distance: An interesting finding was that people consistently reported a preference for miles and kilometres rather than total step counts. This may also be of interest to physical activity researchers who use self-monitoring of total steps to encourage physical activity behaviour change. Although self-monitoring of step counts has been effective at changing behaviour in previous studies, it could be interesting to see if additional benefits are accrued if participants have a better understanding of the distance and the metrics they are accumulating.

6. Social networking features: Features which utilise social networking should be used with caution. Participants consistently reported negatively on posting walking data to social media and they highlighted that physical information is personal. Social networking features, if integrated in physical activity apps, should maintain as much privacy as the user requires.

Conclusion

This dissertation has employed both quantitative and qualitative techniques to investigate the preferences users have for potential features of a mobile walking app, with a view to informing the development of a prototype walking app designed by researchers at the University of Strathclyde. We have found that different people have different preferences for a mobile walking app, highlighted from the results of both studies. Study 2, which was Q-methodological in approach, specifically identified three distinct groups of mobile app users: The Musically Motivated; The Goal-Setters; and the Target Driven. We have argued that these differences in preferences seem to be linked to how the participants view physical activity, their own physical activity levels and their psychological preferences.

Several key messages have been identified from the findings which future physical activity app developers should consider. The differences in preferences participants expressed can be separated into two broad categories: features which motivate users to walk more; and features which motivate users to walk more effectively. By considering these categories separately, designers could be better placed to design more effective walking apps. Considerable support for integrating music as part of a walking app was highlighted by participants. This could take various forms, relating to both "walk more" and "walk more effectively" features. Additionally, local information as part of a walking app may support walking and encourage continued interest in both the app and walking. Providing real distance (miles/kilometres) was more meaningful to the users than step counts, and social networking should be used with caution in mobile walking apps. These key points should be considered by those designing physical activity apps in the future, and by those involved in designing physical activity interventions, as they highlight that different people are

motivated by different things with regards to physical activity adoption and this should be addressed when trying to encourage people to be more physically active.

This dissertation has also presented an informative and useful way of carrying out early stage user-centred design through the use of Q-methodology. In Study 2, Q-methodology was particularly useful for identifying the features which were most and least important to the participants by forcing the distribution of 23 statements of potential features of a mobile walking app. This prevented features being consistently rated the same and it allowed the researcher to identify the different groups of respondents in the Q-sort analysis and investigate potential reasons for these different groups during the individual interviews.

Possible areas for future research could explore the groups of mobile walking app users in more detail and explore how individuals differ within the categories. The findings of these studies are intended to inform the development of the University of Strathclyde's current prototype walking app and subsequent investigations could involve user studies with the developed app, with a focus on separately investigating features which encourage users to "walk more" and to "walk more effectively"

References

Abel, M., Hannon, J., Mullineaux, D., & Beighle, A. (2011). Determination of step rate thresholds corresponding to physical activity classifications in adults. *Journal of Physical Activity and Health, 8*, 45-51.

Ajzen, I. (1985). From intentions to actions: A theory of planned behaviour. In J. Kuhl & J. Beckmmann (Eds.), *Action-control: From cognition to behaviour* (pp. 11-39). Heidelberg, Germany: Springer.

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes, 50*, 179-211.

Allender, S., Foster, C., Scarborough, P., & Rayner, M. (2007). The burden of physical activity-related ill health in the UK. *Journal of Epidemiology and Community Health, 61*, 344-348.

Anderson, I., & Muller, H. (2006). Context awareness via GSM signal strength fluctuation. In: the 4th International Conference on Persuasive Computing, Late breaking results, pp. 27-31. Oesterreichische Computer Gesellschaft, May 2006.

Baillie, L., Morton, L., MacLellan, G., & Ryde, G. (2009). Designing a mobile application to capture everyday activity. Mobile HCI, Bonn Germany.

Graham, B., Stuart, G., Annemarie, W., Myra, N., Ruth, L., & Nanette, M. The effect of a pedometer-based community walking intervention "Walking for Wellbeing in the West" on physical activity levels and health outcomes: a 12-week randomized controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*, *5*.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York: W.H. Freeman.

Baum, A., Newman, S., Weinman, J., West, R., & McManus, C. (1997). *Cambridge handbook of psychology, health and medicine*. New York, NY: Cambridge University Press.

Becker, M. H. (1974). The Health Belief Model and personal health behaviour. *Health Education Monographs*, *2*, 326-473.

Beets, M. W., Agiovlasitis, S., Fahs, C. A., Ranadive, S. M., & Fernhall, B. (2011). Adjusting step count recommendations for anthropometric variations in leg length. *Journal of Science and Medicine in Sport, 13*, 509-512.

Biddle, S. J. H., Whitehead, S. H., O'Donovan, T. M., & Nevill, M. E. (2005). Correlates of participation in physical activity for adolescent girls: A systematic review of recent literature. *Journal of Physical Activity and Health, 2*, 423-434.

Biddle, S. J. H., & Mutrie, N. (2008). *Psychology of physical activity: Determinants, well-being and interventions.* Oxen, England: Routledge.

Blair, S. N. (1988). Exercise within a healthy lifestyle. In R. K. Dishman (ed.), *Exercise adherence: Its impact on public health.* (pp. 75-89). Champaign, IL: Human Kinetics.

Bort-Roig, J. Gilson, N. D., Puig-Ribera, A., Contreras, R. S. & Trost, S. G. (2014). Measuring and influencing physical activity with smartphone technology: A systematic review. *Sports Medicine*, 1-16.

Brooks, C. (1988). Adult physical activity behaviour: A trend analysis. *Journal of Clinical Epidemiology, 41*(4), 385-392.

Brown, S. R. (1993). A primer on Q-methodology. *Operant subjectivity, 16*(3/4), 91-138.

Buur, J., & Bagger, K. (1999). Replacing usability testing with user dialogue. *Communications of the ACM***,** *42*(5), 63-66.

Caspersen, C. J. (1989). Physical activity epidemiology: concepts, methods, and applications to exercise science. *Exercise and Sport Sciences Reviews, 17*, 423-473.

Castelli, D. M., Hillman, C. H., Buck, S. M.,& Erwin, H. E. (2007). Physical fitness and academic achievement in third- and fifth-grade students. *Journal of Sport and Exercise Psychology, 29*, 239-252.

Chang, Y. K., & Etnier, J. L. (2009). Exploring the dose-response relationship between resistance exercise intensity and cognitive function. *Journal of Sport and Exercise Psychology, 31*(5), 640-656.

Chen Y. J., Huang Y. H., Lu F. H., Wu, J. S., Lin, L. L., & Chang, C. J., & Yang, Y. C. (2011). The correlates of leisure time physical activity among an adults population from Southern Taiwan. *BMC Public Health*, 11: 427.

Ciccolo, J., Keeling, D., Jerome, G., Richardson, C. R., Buis, L. R., Janney, A. W., . . . Piette, J. D. (2010). An online community improves adherence in an internet-mediated walking program. Part 1: Results of a randomized controlled trial. *Journal of Medical Internet Research, 12*(4),71.

Clark, D. O. (1999). Identifying psychological, physiological, and environmental barriers and facilitators to exercise among older low income adults. *Journal of Clinical Geopsychology*, *5*(1), 51-62.

Cocker, K. D., Cardon, G., & De Bourdeaudhuij, I. (2006). Validity of the inexpensive stepping meter in counting steps in free living conditions: a pilot study. *British Journal of Sports Medicine,* (40), 714-716.

Cole-Lewis, & H. Kershaw, T. (2010). Text Messaging as a Tool for Behavior Change in Disease Prevention and Management. *Epidemiologic Reviews,* (1), 56-69.

Collins, P., Maguire, M., & O'Dell, L. (2002). Smokers' representations of their own smoking: A Q-methodological study. *Journal of Health Psychology*, *7*(6), 641-652.

Consolvo, S., Everitt, K., Smith, I., & Landay, J. A. (2006). Design requirements for technologies that encourage physical activity. Designing for Tangible Interactions.

Craig R, Hirani V (eds) (2010) *Health Survey for England 2009.* http://www.ic.nhs.uk/pubs/hse09report London: The Information Centre.

Davis, F. D. (1985). *A technology acceptance model for empirically testing new end-user information systems: theory and results.* PhD thesis, Massachusetts Institute of Technology, MA.

Doll, W. J., & Torkzadeh, G. (1988). The measurement of end-user computing satisfaction. *Management Information Systems Quarterly, 12*(2), 259-274.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behaviour: An introduction to theory and research.*

Fogg, B. J. (2003). *Persuasive technology: Using technology to change what we think and do.* San Francisco, CA: Morgan Kaufmann Publishers.

Fox, K. R. (1999). The influence of physical activity on mental well-being. *Public Health Nutrition. 2*(3a), 411-418.

Fukuoka, Y., Kamitani, E., Dracup, K., & Jong, S.S. (2011). New insights into compliance with a mobile phone diary and pedometer use in sedentary women. *Journal of Physical Activity and Health, 8*, 398-403.

Gleeson-Kreig, J. M. (2006). Self-monitoring of physical activity: effects on self-efficacy and behaviour in people with type II diabetes. *Diabetes Education, 32*(1), 69-77.

Greaves, C. J., Sheppard, K. E., Abraham, C., Hardeman, W., Roden, M., Evans, P. H., & Schwarz, P. (2011). Systematic review of reviews of intervention components associated with increased effectiveness in dietary and physical activity interventions. *BMC Public Health, 11*, 119.

Griffin-Blake, C. S., & DeJoy, D. M. (2006). Evaluation of social-cognitive versus stage-matched, self-help physical activity interventions at the workplace. *American Journal of Health Promotion, 20*(3), 200-209.

Gualtieri, M. (2009). Best practices in user experience (UX) design. Design compelling user experiences to wow your customers. Retrieved September 26, 2012, from Forrester Research Inc. website: http://wwwimages.adobe.com/www.adobe.com/content/dam/Adobe/en/industryinsights/solutions/pdfs/Forrester_Best_Prac_In_User_Exp.pdf

Gunther, R., Janis, J., & Butler, S. (2001). The UCD decision matrix: How, when, and where to sell user-centred design into the development cycle. Retrieved September 26, 2012 from: *http://www.ovostudios.com/upa2001/*

Harrison, J. A., Mullen, P. D., & Green, L. W. (1992). A meta-analysis of studies of the health belief model with adults. *Health Education Research, 7*(1), 107-116.

Hatano Y. (1993). Use of the pedometer for promoting daily walking exercise. *International Council for Health, Physical Education, Recreation, Sport, and Dance,* 29, 4-8.

Hendelman, D., Miller, K., Baggett, C., Debold, E., & Freedson, P. (2000). Validity of accelerometry for the assessment of moderate intensity physical activity in the field. *Medicine and Science in Sports and Exercise, 32*(9), 442-449.

Hillsdon, M., Foster, C., Naidoo, B., & Crombie, H. (2004). The effectiveness of public health interventions for increasing physical activity among adults: a review of reviews.

Jakicic, J. M., Marcus, M., Gallagher, K. I., Randall, C., Thomas, E., Goss, F. L., & Robertson, R. J. (2004). Evaluation of the SenseWear Pro Armband to assess energy expenditure during exercise. *Medicine and Science in Sports and Exercise, 36*(5), 897-904.

Janz N. K., & Becker, M. H. (1984). The health belief model: A decade later. *Health Education and Behaviour, 11*(1), 1-47.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. Educational researcher, *33*(7), 14-26.

Kahn, E. B., Ramsey, L. T., Brownson, R. C., Heath, G. W., Howze, E. H., Powell, K. E., . . . Corso, P. (2002). The effectiveness of interventions to increase physical activity. A systematic review. *American Journal of Preventative Medicine*, *22*(4S), 73-107.

Kang, M., Marshall, S. J., Barreira, T. V., & Lee, J. O. (2009). Effect of a pedometer-based physical activity interventions: A meta-analysis. *Research Quarterly for Exercise and Sport, 80*(3), 648-655.

King, A. C., Rejeski, J., & Buchner, D. M. (1998). Physical activity interventions targeting older adults: A critical review and recommendations. *American Journal of Preventative Medicine, 15*(4), 316-333.

Kjeldskov, J., & Graham, C. (2003). A review of mobile HCI research methods. In *Human-computer interaction with mobile devices and services* (pp. 317-335). Springer Berlin Heidelberg.

Kjeldskov, J., & Paay, J. (2012). A longitudinal review of mobile HCI research methods. In *Proceedings of the 14th international conference on Human-computer interaction with mobile devices and servic*es (pp. 69-78). ACM.

Kohl, H. W., Craig, C. L., Lambert, E. V., Inoue, S., Alkandari, J. R., Leetongin, G., & Kahlmeier, S. (2012). The pandemic of physical inactivity: global action for public health. *The Lancet*.

Lamont, S. (2003). Case study: Successful adoption of a user-centred design approach during the development of an interactive television application. *In proceedings of the 1st European conference on interactive television: from viewers to actors?*

Lee, J., Popovic, V., Blackler, T., & Lee, P. (2009). User-designer collaboration during the early stage of the design process. In *IASDR 2009 Proceedings*, Korean Society of Design Science , COEX, Seoul, pp. 1-12.

Legris, P., Ingham, J., & Collerette, P. (2003). Why do people use information technology? A critical review of the technology acceptance model. *Information and Management, 40*, 191-204.

Lin, J. L., Mamykina, L., Lindtner, S., Delajoux, G., & Strub, H. B. (2006). Fish'n'Steps: Encouraging physical activity with an interactive computer game (pp. 261-278). *Proceedings of the 8th International Conference on Ubiquitous Computing: Pittsburgh, PA*.

Maehr, M. L., & Braskamp, L. A. (1986). The motivation factor: A theory of personal investment.

Maitland, J., Sherwood, S., Barkhuus, L., Anderson, I., Hall, M., Brown, B., . . . Muller, H. (2006). Increasing the awareness of daily activity levels with persuasive computing. *Proceedings of the 1st International Conference on Persuasive Computing Technologies for Healthcare: Venice, Italy.*

Malina, R. M., Bouchard, C., & Bar-Or, O. (2004). *Growth, maturation, and physical activity.* (2nd ed.) Champaign, IL: Human Kinetics.

Marcus, B. H., & Simkin, L. R. (1994). The transtheoretical model: Applications to exercise behaviour. *Medicine and Science in Sports and Exercise, 26*, 1400-1404.

Marcus, B. H., Owen, N., Forsyth, L. H., Cavill, N. A., & Fridinger, F. (1998). Physical activity interventions using mass media, print media, and information technology. *American Journal of Preventative Medicine, 15*(4), 362-378.

Marcus, B. H., Napolitano, M. A., King, A. C., Lewis, B. A., Whiteley, J. A., Albrecht, A., . . . Papandonatos, G. D. (2007). Telephone versus print delivery of an individualized motivationally tailored physical activity intervention: Project STRIDE. *Health Psychology, 26*(4), 401-409.

Marshall, S.J., & Biddle, S. J. (2001). The Transtheoretical model of behaviour change: a meta-analysis of applications to physical activity and exercise. *Annals of Behavioural Medicine*, *23*(4), 229-246.

Marshall, S. J., Levy, S. S., Tudor-Locke, C. E., Kolkhorst, F. W., Wooten, K. M., Ji, M., . . . Ainsworth, B. E. (2009). Translating physical activity recommendations into a pedometer-based step goal: 3000 steps in 30 minutes. *American Journal of Preventative Medicine, 36*(5), 410-415.

Mattila, E., Pärkkä, J., Hermersdorf, M., Kaasinen, J., Vainio, J., Samposalo, K., . . . Korhonen, I. (2008). Mobile diary for wellness management- Results on usage and usability in two user studies. *IEEE Transactions on Information Technology in Biomedicine, 12*(4), 501-512.

Miller T., & Monaghan C. (2012, March 5). Apple's App Store Downloads Top 25 Billion. *Apple.* Retrieved September 24, 2012, from www.apple.com.

Morris, J. N., & Hardman, A. E. (1997). Walking to health. *Sports Medicine, 23*(5), 305-333.

Müller-Riemenschneider, F., Reinhold, T., Nocon, M., & Willich, S. N. (2008). Long-term effectiveness of interventions promoting physical activity: A systematic review. *Preventive Medicine, 47*,354-368.

Mutrie, N., Carney, C., Blamey, A., Crawford, F., Aitchison, T., & Whitelaw, A. (2002). "Walk in to Work Out": a randomised controlled trial of a self-help intervention to promote active commuting. *Journal of Epidemiology and Community Health, 56*, 407-412.

Norman, D. A. (2005). Human-centred design considered harmful. *Interactions, 12*, 14-19.

Ogilvie, D., Foster, C. E., Rothnie, H., Cavill, N., Hamilton, V., & Fitzsimons, C. F., & Mutrie, N. (2007). *BMJ.*

Owen, N., Humpel, N., Leslie, E., Bauman, A., & Sallis, J. F. (2004). Understanding environmental influences on walking. Review and research agenda. *American Journal of Preventative Medicine, 27*(1), 67-76.

Paluska, S. A., & Schwenk, T. L. (2000). Physical activity and mental health: Current concepts. *Sports Medicine,* 29(3), 167-180.

Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: A review of mental and physical health benefits associated with physical activity. Current Opinion in Psychiatry, *18*(2), 189-193.

Petrovitch, H., & White, L. (2005). Exercise and cognitive function. *Lancet Neurology, 4*, 690-691.

Pidgeon, N., & Henwood, K. (1996). Grounded theory: practical implementation. In J.T.E. Richardson (ed.) *Handbook of Qualitative Research Methods for Psychology and the Social Sciences*. Leicester: BPS Books, pp. 86-101.

Plasqui, G., & Westerterp, K. R. (2007). Physical activity assessment with accelerometers: An evaluation against doubly labelled water. *Obesity, 15*, 2371-2379.

Potteiger, J. A. , Schroder, J. M. & Goff, K. L. (2000). Influence of music on ratings of perceived exertion during 20 minutes of moderate intensity exercise. *Perceptual and Motor Skills*,*91*(3), 848-854.

Preece, J., Rogers, Y., & Sharp, H. (2002). *Interaction Design, beyond human-computer interaction*. New York, NY: John Wiley and Sons Inc.

Prochaska, J. O., & DiClemente, C. C. (1982). The transtheoretical model: Application to exercise. In R. K. Dishman (ed.), *Advances in Exercise Adherence* (pp. 161-180). Champaign, IL: Human Kinetics.

Rosenstock, I. (1974). Historical origins of the health belief model. *Health Education Monographs, 2*,32835.

Rowe, D. A., Welk, G. J., Heil, D. P., Mahar, M. T., Kemble, C. D., & Calabro, M. A., & Camenisch, K. (2011). Stride rate recommendations for moderate-intensity walking. *Medicine and Science in Sports and Exercise, 43*(2), 312-318.

Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. *Medicine and Science in Sports and Exercise, 32*(5), 963-975.

Sheridan & Radmacher, 1992, p. 156 in B&M, 2008

Schneider, PL., Crouter, S. E., Lukajic, O., & Bassett, D. R. (2003). Accuracy and reliability of 10 pedometers for measuring steps over a 400-m walk. *Medicine and Science in Sports and Exercise, 35*(10), 1779-1784.

Shilts, M. K., Horowtiz, M., & Townsend, M. (2004). Goal setting as a strategy for dietary and physical activity behaviour change: A review. *American Journal of Health Promotion, 19*, 81-93.

Spencer, L., Pagell, F., Hallion, L. E., & Adams, T. B. (2002). Applying the Transtheoretical Model to tobacco cessation and prevention: A review of the literature. *American Journal of Health Promotion, 17*(1), 7-71.

Stenner, P. H. D., Dancey, C. P., & Watts, S. (2000). The understanding of their illness amongst people with irritable bowel syndrome: a Q methodological study. *Social Science and Medicine*, *51*, 439-452.

Stowell-Smith, M., & McKeown, M. (1999). Locating mental health in black and white men. A Q-methodological study. *Journal of Health Psychology, 4*(2), 209-222.

Stroebe, W., & Stroebe, M. S. (1995). *Social psychology and health*. Buckingham, England: Open University Press.

Stroebe, W., & Hewstone, M. (2007). The scope of social psychology: theory and applications. Oxford, England: Psychology Press.

Styns, F., van Noorden, L., Moelants, D., & Leman, M. (2007). Walking on music. *Human Movement Science, 26*(5), 769-785.

Terry, P. C., Karageorghis, C. I., Saha, A. M., & D'Auria, S. (2012). Effects of synchronous music on treadmill running among elite triathletes. *Journal of Science and Medicine in Sport, 15*, 52-57.

The Scottish Government. *The Scottish Health Survey.* Edinburgh, Scotland: APA Scotland Group, 2009. http://www.scotland.gov.uk/Resource/Doc/325403/0104975.pdf

Thompson, W. R., Gordon, N. F., & Pescatello, L. S. (2009). ACSM's Guidelines for Exercise Testing and Prescription (8th Ed). Philadelphia, PA: Lippincott Williams and Wilkins.

Trost, S. G., Owen, N., Bauman, A. E., Sallis, J. F., & Brown, W. (2002). Correlates of adults' participation in physical activity: review and update. *Medicine and Science in Sports and Exercise, 34*(12), 1996-2001.

Tudor-Locke, C. E., Myers, A. M., Bell, R. C., Harris, S. B., & Wilson Rodger, N. (2002). Preliminary outcome evaluation of the First Step Program: a daily physical activity intervention for individuals with type 2 diabetes. Patient education and counseling, 47(1), 23-28.

Tudor-Locke, C., Williams, J. E., Reis, J. P., & Pluto, D. (2002). Utility of pedometers for assessing physical activity. Convergent validity. *Sports Medicine, 32*(12), 795-808.

Tudor-Locke, C., & Bassett, D. R. (2004). How many steps/day are enough? Preliminary pedometer indices for public health. *Sports Medicine, 34*(1) 1-8.

Tudor-Locke, C., Sisson, S. B., Collova, T., Lee, S. M. , & Swan, P. D. (2005). Pedometer-determined step count guidelines for classifying walking intensity in a young ostensibly healthy population. *Canadian Journal of Applied Physiology, 30*, 666-676.

Tudor-Locke, C., & Lutes, L. (2009). Why do pedometers work? A reflection upon the factors related to successfully increasing physical activity. *Sports Medicine, 39*(12), 981-993.

Tudor-Locke, C., Craig, C. L., Beets, M. W., Belton, S., Cardon, G. M., Duncan, S., . . . Blair, S. N. (2011a). How many steps/day are enough. For children. *International Journal of Behavioural Nutrition and Physical Activity, 8*, 79.

Tudor-Locke, C., Craig, C. L., Brown, W. J., Clemes, S. A., De Cocker ,K., Giles-Corti ,B., . . . Blair, S. N. (2011b). How many steps/day are enough? For adults. *International Journal of Behavioural Nutrition and Physical Activity, 8*, 79.

Tudor-Locke, C., Craig, C. L., Aoyagi, Y., Bell, R. C., Croteau, K. A., Bourdeaudhuij, I. D., . . . Blaire, S. N. (2011c). How many steps/day are enough? For older adults and special populations. *International Journal of Behavioural Nutrition and Physical Activity*, *8*, 80.

Unger, R., & Chandler, C. (2009). *A project guide to UX design for user experience designers in the field or in the making.* Berkeley: New riders.

Van Der Horst, K., Chin, A. M. J., Paw, J., Twisk, W. R., & Van Mechelen, W. (2007). A brief review on correlates of physical activity and sedentariness in youth. *Medicine and Science in Sports and Exercise, 39*(8), 1241-1250.

Vandelanotte, C., Spathonis, K. M., Eakin, E. G., & Owen, N. (2007). Website-delivered physical activity interventions. A review of the literature. *American Journal of Preventative Medicine, 33*(1), 54-64.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *Management Information Systems Quarterly, 27*(3), 425-478.

Vredenburg, K., Mao, J. K., Smith, P. W., & Carey, T. (2002). A survey of user-centred design practice. *Design Methods, 4*(1), 471-478.

White, M., & Dorman, S. M. (2001). Receiving social support online: Implications for health education. *Health Education Research, 16*(6), 693-707.

WHO. World Health Organization Global Strategy on Diet, Physical Activity and Health. (2004). Geneva, Switzerland: World Health Organization.

WHO. World Health Organization Global Recommendations on Physical Activity for Health. (2010). Geneva, Switzerland: World Health Organization.

Wilson, P. M., Rodgers, W. M., Blachard, C. M., & Gessell, J. (2006). The relationship between psychological needs, self-determined motivation, exercise attitudes, and physical fitness. *Journal of Social Psychology, 33*(11), 2373-2392.

Woods, C., Mutrie, N., & Scott, M. (2002). Physical activity intervention: a Transtheoretical Model-based intervention designed to help sedentary young adults become active. *Health Education Research Theory and Practice, 17*(4), 451-460.

Yaffe, K., Barnes, D., Nevitt, M., Lui, L. Y., & Covinsky, K. (2001). A prospective study of physical activity and cognitive decline in elderly women. *Archives of Internal Medicine, 161*, 1703-1708.

Zunft, H. J. F., Friebe, D., Seppelt, B., Widhalm, K., Remaut de Winter, A. M., & Vaz de Almeida, M. D. (1999). Perceived benefits and barriers to physical activity in a nationally representative sample in the European Union. *Public Health Nutrition, 2*(1a), 153-160.

Appendices

Appendix A- Study 1 Online Survey

Note to reviewer: this survey was made and distributed on-line, using Qualtrics survey software.

Please read the following information.

Mobile phone devices and their technologies offer great opportunities for accessible lifestyle management, information and support. Mobile phone technology could be used as a potential mechanism for improving health related quality of life and can help encourage people to be more physically active.

A research team at the University of Strathclyde has developed a mobile phone application which records and monitors walking as a form of physical activity and is hoped to help motivate people to improve their physical activity levels. Your responses will help us determine what features are most important for users.

Why have you been invited to take part?

The National Strategy for Physical Activity in Scotland 'Let's Make Scotland More Active' has set a target for 50% of adults to meet the physical activity recommendations by the year 2022. Currently, the Scottish adult population is not meeting that with only 33% women and 45% of males achieving the target. We are investigating whether mobile phone technology could improve participation in physical activity.

You are under no obligation to take part in this survey and your participation is voluntary. If at any time you do not want to continue with this investigation then you are free to withdraw with no negative consequences.

We will use the information gathered from you to make improvements to an application we have in development. All information will be kept confidential.

We will follow University guidelines in terms of data protection and disposal of data. University assignments are kept in a locked archive for 5 years and then destroyed.

If you are willing to complete this survey, please click 'Yes' and then the forward button (>>) below.

Yes

No

Q.1.What age (in years) are you?

Q.2.Gender

Male

Female

Q.3. Please choose which accurately describes your current physical activity levels*

**Being physically active includes activities such as brisk walking, gardening, dancing, or housework which accumulates to at least 30 minutes a day.*

I am not physically active and I don't plan to start in the near future.

I am not physically active but I've been thinking about starting.

I am physically active, but I participate less than five days per week.

I am physically active on 5 days or more per week, and have been for less than six months.

I am physically active on 5 days or more per week, and have been for more than six months.

Q.4. Do you currently use a mobile phone?

Yes

No

Q.5. If yes, please state which make/model, if known:

Q.6. Please describe the number of mobile phone applications (apps) you have downloaded to your phone

0 apps

1-5 apps

5-10 apps

10+ apps

Q.7.How often do you use these downloaded applications?

Daily

Sometimes

Rarely

Never

Q.8.How often do you use a mobile application (such as Nike+ or Endomondo) during physical activity?

Frequently

Sometimes

Rarely

Never

Q.9. Would you consider yourself happy with your current physical activity level?

Yes

No

Q.10. Would you consider the use of a mobile phone application to help you maintain or become more physically active?

Yes

No

Q.11. The following section provides a list of common features which may be included in a walking app. Please consider the feedback you would like to receive from a mobile walking app, and rate the importance of the following features:

During Walk Features

The following features are related to the 'during walk' experience. You have decided to go for a walk and turned the app on and put your phone in your pocket.

What do you want when your phone is in your pocket?

Feature	Highly important	Important	Of little importance	Not important
Tell me how far I have walked				
Tell me if I am walking too slowly to gain maximum health benefit from walking.				
Encourage me to keep walking.				

Q.12 After Walk/Feedback Features

The following features are related to the 'after walk' experience. You have finished your walk.

What do you want the app to do? Please tick the importance of what you would like the app to do?

Feature	Highly important	Important	Of little importance	Not important
Tell me how many calories I burned				
Tell me how many steps I took				
Tell me how fast I walked				
Tell me how far I walked				
Provide me with a map of my route				
Tell me my progress towards meeting physical activity guidelines				
Let me share my walking data and interact with other users online				

Q. 13. Thanks for taking the time to complete this survey. The Physical Activity for Health research group would be very interested in following-up some of your responses through a short face-to-face interview. This would take place at a time and place convenient to you.

If you are interested in taking part, please press 'yes' below.

Yes

No

Q. 14. In order for us to contact you, please state your email and which city you live in.

Appendix B- Interview Schedule Study 1

This study is essentially trying to figure out what features people want from a mobile phone application for walking.

I will ask you about your own physical activity habits and experiences, as well as discussing some of the answers you gave to the on-line survey. In addition, I will show you the application the research team at the University of Strathclyde have in development. There are no right to wrong answers; I am simply interested to find out what you think. All of responses will be kept confidential.

Moderate physical activity can take many forms from housework to gardening to brisk walking.

The physical activity recommendations are:

"…at least 150 minutes of moderate-intensity aerobic physical activity per week"

This study is looking at how potentially mobile phone applications could be used to encourage people to become active or maintain their levels of activity.

<u>Icebreaker</u>

Q1. Are you familiar with apps?

(If not familiar with apps: Apps are like mini computer software packages that run on mobile phones or mobile devices).

Can you describe your use of apps, what apps you have?

What do you like about the apps you already have?

<u>Icebreaker</u>

Q2. You said in your interview that you were … (their response to the physical activity question). What sort of physical activities do you like to do?

When and where do you do physical activity? How long for?

Who do you participate with? (I.e. do you participate in physical activity socially)

If don't participate, why not? Barriers to participation?

Walking Habits

Q3. How often do you walk?

As part of daily routine?

Do they deliberately walk as a physical activity?

Mobile Phone Use

Q4. You mentioned that you would/wouldn't consider the use of a mobile phone application to either help you become or maintain your physical activity. Can you maybe explain why it could/couldn't help you?

Features – During the walk

Q5. If you were to use an app for walking, what features would you like?

Imagine you have gone for a walk, what would you like to hear during the walk?

You have stated X as an important/unimportant feature for you. Can you explain why this is important/unimportant to you?

Features – After the walk

Q6. If you were to use an app for walking, what features would you like?

Imagine you have gone for a walk, what information would you like to know about your walk?

You have stated X as an important/unimportant feature for you. Can you explain why this is important/not important to you?

The Stepper App

Q7. Tutorial/demonstration/introduction to the app

- What it is
- What it does
- Ask participants to hold the app and walk
- Any features on here/not on here you would/would not like to see

Additional Features

Q.7. Are there any features not mentioned in the survey you would like to see in a mobile application or anything else you would like to add?

- Music?
- Is it important for you to be able to use the app whilst listening to your own music or having music as a feature as part of the app?
- Why is/isn't this important to you?

Thank you for taking the time to be interviewed.

Appendix C- Study 1 Interview Transcripts

Interviewer: This study is essentially trying to figure out em what features people want from a mobile phone application for walking.

I will ask you about your own physical activity habits and experiences, as well as discussing some of the answers you gave in the recent on-line survey you filled out. In addition, I will show you this application, mobile phone application the research team at the University of Strathclyde has in development. There are no right or wrong answers to this I'm just simply interested in trying to find out what you think. And of course all of responses will be kept confidential.

So, moderate physical activity can take many forms from housework to gardening to brisk walking.

The physical activity recommendations are 150 minutes of this moderate-intensity physical activity per week for adults'

This study is looking at how potentially mobile phone apps could be used to encourage people to either become or maintain their physical activity.

Interviewer: So are you familiar with applications, you know what they are?

PAR01: Yes

Interviewer: Ok good. Em can you describe your use of applications, what apps you may have or what they like, what you like about current apps that you have

PAR01: I don't have that many cos most of them are just useless. I generally just have apps that are, I find useful, that have something, there's a reason for having them not just cos my 12 year old sister said it was cool. But em things, I don't even know what I've got on it, twitter, Facebook, eBay, YouTube, Quinko, snow forecast that's important for skiing, news, stuff like that.

Interviewer: So practical things?

PAR01: Practical stuff yeah.

Interviewer: Ok, so you said in your online survey you were physically active but you participate less than five days a week. Em… what sort of physical activities do you like to do?

PAR01: Hockey, skiing and if I have to walking.

Interviewer: So where and when do you these physical activities?

PAR01: Skiing usually given the choice in France but if not up north or Xscape or on the dry slope and hockey here sort of twice a week. Walking I generally do quite a lot to and from I mean it's just 15 mins each way each day for the train so I try I try and make sure to walk a bit faster so I'm actually getting something useful out of the walk.

Interviewer: So do you this every day?

PAR01: Yeah, mostly every day.

Interviewer: So do you this kinda as part of a daily routine?

PAR01: I try to 'cos I rePAR01ze I'm not doing much. I used to do quite a lot at the gym and swimming but I don't have the time anymore with a wee boy.

Interviewer: Ok….em…you mentioned that you would consider the use of a mobile phone application to help you maintain or become more physically active. Can you explain em maybe why em you think you would?

PAR01: Well…when I'm doing the walking to and from the train station em you're never quite sure how fast you're going or what kinda level you should be walking at to make it useful in terms of cardio fitness so it would be useful for that to know and it's also a good challenge to try and improve your speed.

Interviewer: Ok dokey. So if you were to use an application for walking what features do you think you would like on this application?

PAR01: Em…. How far you've gone, how fast you're walking em… time taken, calories burned.

Interviewer: Ok dokey so imagine you've gone for a walk, em… imagine you've gone for a walk we're looking at the features em kinda during the walk what you'd like to know. You said that em an encouragement from the application would be an important feature for you. Can you explain why?

PAR01: Em…. I suppose just to stop me being lazy. It's quite useful, I wouldn't necessarily use that on a short bit of exercise but if I was doing it for a longer period or if I was trying to do kinda a run, particularly for running, cos I don't run its quite embarrassing to see me run em but some kind of em…something to keep you going or something that just sort of checks in at a regular point to sort of em I dunno…I dunno how it would actually work but something that would periodically encourage you to do more if you're not quite as, you're slowing down or something like that to sort of like keep you at that speed.

PAR01: Ok. You said it was highly important for the feature to tell you if you're walking too slowly to gain maximum health benefits. Em… how would you kinda like it to do that, like would you like a kinda prompt or an audio cue or maybe even a word or what kinda feature would….

PAR01: "Move faster"! (Laughs) I dunno…probably some kinda audio cue em… cos it's very easy especially if you're walking with music on to just sort of forget and slow down so it would be useful to just have something that em just kept reminding you yeah I suppose an audio cue.

Interviewer: Em…so imagine you've gone for a walk. You're back home, em what information would you like to know about your walk?

PAR01: Em…really just how far I've gone, average speed, what I've burnt. I'm not really that bothered about where, I know some people would like to see where they've gone on a map but I wouldn't that fussed about that, really just the overall performance I suppose.

Interviewer: Ok dokey one of the features that you mentioned that wasn't important was the ability to share walking data and interact with other users online. Can you maybe explain like why this wouldn't be an important feature for you?

PAR01: Acht, I just don't see the point, I'm just not that interested in sharing em that kind of stuff. Eh…I suppose it's my use of social networks as well I get really irritated by pointless posts and I guess that's why but then you know some people do like it so it would be a useful feature I think probably to have that you could select if you wanted it cos I know that some people enjoy it I'm just not that bothered about sharing that kind of info.

Interviewer: So I'm now just gonna show you this application that we've got in development as you can see it's very basic (uh huh). So if you were to go for a walk you'd press start, take the mobile device as you were walking press stop, press yes, save the activity and basically what you would get is a points system for how many steps you took. So we're kind of, em, what we've got just now is a kinda points system as a kind of feedback. So hopefully by the end of the week em how many points that you would have would be equivalent to em the national kind of guidelines for physical activity.

Participant: Uh huh

Interviewer: So if you take a wee look at it. I'm just kinda interested in what's the first kinda thing that comes into your head, what's your opinions about how it is just now bearing in mind it is very basic.

PAR01: No that's fine. It's really just what does the points mean in terms of you know if I have 10 points what does that mean. Does it tell me that?

Interviewer: Well not at the moment cos it's sort of still in development. So the points system is em like a feedback system at the moment but I mean would that work for you considering all the kinda features that we've got? What would you need on there for that to be a better application for you?

PAR01: Just I mean in terms of the information about em, the calories burnt and then the time and the amount, yeah the distance cos I think when I'm trying, I think when you get into a routine and you know you're kind of at a certain fitness that you can do certain distances in a certain time and its useful to know that you've done that and em then obviously then try and improve on that. That I think would, I mean it's useful to have how many steps you've taken but I don't really, I can't visuPAR01ze what that mean in terms of distance of what I've gone. So even if it was just a kinda rough translation, a guestimate as to what steps equals into distance if its didn't actually measure full distance, that would be useful.

Interviewer: Ok and one final em question for you. Is there any features not mentioned in the survey that you would like to see in a mobile application or anything else that you would like to add?

PAR01: No.

Interviewer: One thing em that has em been brought to my attention is music. So em is it important to be able to use the app while listening to your own music or maybe as a feature as part of the app so you could play your own music while…walking…

PAR01: Yeah I would be, I think id quite like to use music particularly when you get, there's a few tracks you find that are at the right speed for you and that em it would be useful to be able to listen to them at the same time as that being on so that they weren't conflicting.

Interviewer: Ok so, why would music be important to you? Just kinda…

PAR01: To keep the pace.

Interviewer: To keep your pace and maybe to just kinda…

PAR01: So I don't slow down!

Interviewer: Ok that's us. Thanks very much for taking the time to be interviewed.

Interviewer: Ok so this is study is essentially trying to figure out em what features people want from a mobile phone application for walking.

I will ask you about own physical activity habits and experiences, as well as discussing some of the answers you gave in that on-line survey you filled out. In addition, I will show you this application, mobile phone application the research team at the University of Strathclyde has in development. Now there are no right or wrong answers to this I'm just simply interested to find out what you think. And of course all of responses will be kept confidential.

So, just starting off talking about physical activity, moderate physical activity can take many forms from housework to gardening to brisk walking.

The physical activity recommendations for adults are at least 150 minutes of moderate-intensity physical activity per week'

This study is looking at how potentially mobile phone applications could be used to encourage people to either to become or maintain their levels of activity.

Interviewer: So are you familiar with apps, mobile phone applications?

PAR02: Yes I am, yes.

Interviewer: You know how they run, how they operate that kind of thing?

PAR02: Yes

Interviewer: So can you just describe your use of apps, maybe what apps you have?

PAR02: I kind of apps I have, I've got an IPhone. The apps I use are the Tour Caddy Pro for when I'm playing golf. My mail, my messaging and that's about it. My kids tend to play with games parts of the phone. But for me just that it's really just for texting, for emailing and iTunes for the music as well.

Interviewer: Ok. So in your survey you said that you were physically active on five days or more per week, and you have been for more than six months. What sort of physical activities do you do and what do like to do?

PAR02: Well I like to run, do a lot of running. I play a lot of golf. I do a lot of things in the garden as well that's my remit at home. I have two kids and two dogs so we walk everyday as well. Then we've a pond down the bottom of the house that we kind of walk round, like a boating pond, so we do that regularly.

Interviewer: That's great. So just talking about some of your walking habits, you mentioned that you walk and is this part of a kinda daily routine?

PAR02: Yeah I mean its 7 days a week really. It's more cos we've got the dogs to exercise the dogs we take them out obviously for their health and wellbeing which in the essence is addressing our own as well so I mean it's about maybe anything from 20-40 minutes a day kind of thing.

Interviewer: Ok. You mentioned in the on-line survey that you would consider the use of a mobile phone or a mobile phone application to help you maintain in your case your levels of physical activity. Can you maybe explain why you think it would help or could help you?

PAR02: I don't know if it would help necessarily in terms of my current levels it's just I would always run with my IPhone for example I would play music. I've used the Nike+ app on the IPhone as well and I found that to be useful in the sense that its good motivation I think with the music there and you know it's quite a good app in terms of keeping you going when you get those tired legs so often so I use it more for running but I don't use it when I'm walking or playing golf or whatever just when I run.

Interviewer: Ok. So we're just gonna speak about the features that were on the on-line survey so if you were to use an application for walking what kind of features would you like on the mobile phone?

PAR02: I mean I quite like the features where you can measure for example how far you've ran or if you've set yourself out a route maybe connected to Google maps or whatever else is available so they can track your route and give you a time of how well you've done it because in some ways its quite a nice measure of recognizing your own performance and that kind of appeals to me cos I'm always quite motivated to try and improve on my performance not that I necessarily always achieve that but I think having that part of the app to say your ran this far in this amount of time I think is a quite useful application kind of to have for me certainly.

Interviewer: Ok. In the survey you stated that for the app to have a kind of encouragement feature would be highly important to you. Can you maybe explain why it would be important?

PAR02: Yeah again I think it probably ties in with my previous answer a little bit I think when you can maybe track your history of how well you've done with your regular run or regular route I think that motivation kind of keeps you trying to achieve that same level. I mean there are times when you go running and you don't quite feel as motivated that day so you don't feel you're really getting the benefit out of it that you're hoping for whereas if the app was able to kind of say "you're a bit slower than you were last time speed yourself up!" or words to that effect I think it would kind of help just keep your levels up to a satisfactory level for your own performance really.

Interviewer: Ok so imagine that you've gone for a walk, you're back home you've taken your phone out your pocket. What information would you like to know about your walk that you've just been on?

PAR02: Again I would just want to know about the distance and know about the time that it took and I think that's all I would be looking for. I don't think I would need anything else in particular. Things like stride pattern, walk cadence, how many steps you took that might appeal to some but doesn't appeal to me. I just want to know distance and time.

Interviewer: Ok. In the online survey you stated that for the app to tell you how fast you walked that would be of little importance to you. Can you explain maybe…?

PAR02: I mean how fast I go in terms of walking and things like that I'm not really interested in again I'm looking more at the overall package of when did I start, what time was it when I finished and to be encouraged along that route if you like but I'm not really fussed in terms of that aspect of it.

Interviewer: Ok you stated that the app to have a map of your route would be highly important. Why is this an important issue for you?

PAR02: I think because I think it's probably more to do with the logistics of where I stay and that there are circuit routes that I take when I go for a run for example or walking the dogs wed go to the same place and so because of the standardization of you doing the same routes you're able to monitor your performance better if that routes actually able to be locked into your phone. I suppose any kind of distance. If I'm running for example and I take one circuit and it's fairly hilly vs. another circuit that's fairly flat and I'm trying to compare the times if they are both the same distance but different terrains I'd want to know what kind of impact that's having.

Interviewer: Ok, one final feature that we're going to discuss. You stated the ability for the application to share our walking data and interact with other users online; you said this wouldn't be important for you. I was just wondering why you felt this way?

PAR02: Well I don't think my fitness patterns and physical activity levels the same as everyone else so I mean giving them that information I don't see what value it would be to anybody knowing how far I'm walking or how well I'm doing. I don't see any value to that to me or anyone else.

Interviewer: Ok I'm now just gonna show you this application that we've got in development. It's called the Stepper App. What I'm just gonna ask you to do is just hold iTouch and if you could just walk to that door and back. Just getting you to do it you know it's a better kind of demonstration. Ok yes stop, save the activity ok so basically the Stepper App records the number of steps you took and kind of gives you a score in terms of points for what you would get for that walk. I mean you only walked to the door so it wasn't very far at all but an example here is 2 points for 115 steps so basically the points system what they're trying to do is they're trying to encourage people to walk more obviously using the application and then by the end of the week hopefully the points would be sort of equivalent to what the national guidelines are for physical activity.

Interviewer: So it's very basic at the moment still kind of in development so it simply only tells you the steps, the time, when you did it and how many points you got for walk. So I'm just kind of interested in what you maybe think about it just now?

PAR02: I mean in terms of the app again I can see its value for a lot of people. For me personally I mean as I said before the number of steps I've taken is, it doesn't interest me whatsoever it more the time I've taken from a performance point of view cos I think I'm quite in control of my physical activity. But for those who aren't I could see the benefit of this because it gives me an incentive to try and achieve a certain target of points each week or each day even and I think that would be quite motivating for people but I think it could also be demotivating for people in the sense that if they don't achieve the points by the end of the week that they're looking for yet they've feel like they've made an effort that could make them get a bit fed up with it and stop using the app so for me it's good for some but not for all.

Interviewer: Ok just a final question, is there any features not mentioned in the on-survey that you would like to see in this mobile application or anything else that you would like to add?

PAR02: I'm not sure in some ways what would be really cool and I don't know what the computer, technological bits are of it but things like a heart rate monitor along with it would be really useful and I don't know how easy that is to do or not do but I think certain people whose levels of physical activity and their looking at it from a performance points of view and they wanna work within a certain fitness threshold I think their heart rate gives them a better indication of where they're at rather than the number of steps they've taken so that would be a nice addition I think in some ways.

Interviewer: Ok…one common kind of feature that has been mentioned as an additional feature to the application is music. Now would it be important for you to be able to use the app whilst listening to your own music or having music as a kind of feature as part of the app?

PAR02: I think I'd want to be listening to my own music. I think music is very emotive and I think people judge things on how they hear sounds, how they hear music. There's certain music that I can't stand that would drive me crazy. There's other music that actually makes me enjoy the run and almost zone out just run really. So I think the feature for me would be my own music to be playing at the same time as the app itself.

Interviewer: Ok and why is listening to your own music important to you?

PAR02: Cos it's what I connect with. I guess it's what I emotionally connect with. I don't want to listen to music that someone else likes that I don't particularly enjoy. I'd find that frustrating.

Interviewer: And what is your reason for listening to music when you run?

PAR02: I think by in large because the beat, the rhythm, the cadence of the music kind of encourages you to go along with that/ I think it's a very sub-conscious auditory process when you listen to music and it does evoke certain emotional responses. And so for me it's quite nice I don't have to worry about the stresses of study or work or family life when I'm out for a run and I'm listening to my music that's all I'm kinda thinking about and I kinda of zone out in that respect so it's much a relaxation to do exercise as well a motivation to do a level of activity you want.

Interviewer: Ok well that's all my questions so thanks for taking the time to be interviewed.

Interviewer: This study is essentially trying to figure out what features people want from a mobile phone application for walking. In this quick interview I will ask you about your own physical activity habits and experiences as well as discussing some of the answers you gave in the online survey you filled out. In addition I will show you the application we have in development. Em…there are no right or wrong answers I'm just simply interested in kinda getting your opinion and finding out what you think and all of your answers will be kept confidential.

Ok so let's start off by talking about physical activity. Moderate physical activity can take many forms from kinda walking to housework to even gardening. The recommendations are '150 minutes of moderate intensity physical activity per week for adults'

Now this study is essentially looking at how mobile phone applications can be used to encourage people to be either become more active or maintain their current levels of physical activity.

So, are you familiar with applications?

PAR03: I am yes.

Interviewer: Ok can you describe your kinda use of apps, what apps you have currently that you use?

PAR03: I've probably got the smallest amount of apps on an IPhone in recorded history. So I don't, I've got, eh I don't have very many. I don't use my phone for much other than texting and phoning. So I don't have any social network stuff. I have one or two games that my friends have told me to buy, and they tend to be boring games like word association puzzles that I can sit on, when the train is late. And then I have things that are useful so I've got the stuff from like British Rail that tells you when your train is, where your train is. I've stuff for CalMac ferries so I have that kind of stuff, stuff that's gonna tell me things.

Interviewer: Practical kinda things?

PAR03: Practical stuff. So I have very little me entertainment, if you want to call it that.

Interviewer: Ok that's great.

Interviewer: So, in your on-line survey you said you were physically active but you participate less than 5 days per week,

PAR03: Yeah

Interviewer: So I was just interested, what sort of physical activities do you like to do?

PAR03: Eh, I don't like exercise for exercise's sake. I find it hugely boring and I'll have spurts of doing things like running and then I'll stop. I don't even bother joining a gym because I know that that is not gonna work. So I've now got a Zumba class, which I love, I love it. I'm rubbish at it but I love it.

Interviewer: I'm glad you've found something that works for you.

PAR03: …cos It's just a laugh. Em, so the teacher is very nice she is gonna start another class so I'm gonna be doing that twice a week. But I would be, I am much more inclined to be not formally exercising so walking I quite like, I don't mind walking. I could probably do more of that. But running, gym, I can't ride a bike; I can't ride a bike so I can't cycle so yeah, a bit useless really.

Interviewer: Ok, so who do you participate with when you do your classes, is it kinda a social activity?

PAR03: Yeah, so we, actually it's amazing it's the only physical activity that I've ever done that I go on my own when my mates can't go but there's quite a group of us that sort of meet there. It's near where we live; well it's near where I live so it's very convenient. And it's just; we're all a bit useless but its fun.

Interviewer: Well, that's half the battle! So, we're just going to talk about your walking habits now. Do you walk as part of a daily routine, I know you said you got the train but do you do any kind of deliberate walking?

PAR03: Em…I try to go for a walk at the weekend. Em, I live in Milngavie, Bearsden so I walk round the Loch at Milngavie.

Interviewer: Oh right yeah.

PAR03: I don't get that done every weekend but I try to get that if I can. And I try to get out at lunchtime every day and make sure I walk somewhere. So I, even if it's just down to Marks and Spencer which is ten minutes away to pick up lunch so I try to get out my office at lunchtime. And the walk to the station is about 15 minutes, about 20 minute back cos it's uphill on the way back so I do that every day. (Great) You know not marathon walking.

Interviewer: So you mentioned that you don't currently use a mobile application during physical activity but you mentioned that you would consider it to maybe help you maintain your activity or even become more physically active. Can you explain maybe like the reasons why you think you would or why you think it would be useful?

PAR03: Em…I'm not quite sure how to answer that. I don't…em….I tried music right, I know lots of people use music , you get these fancy dPAR02 things that play music to make you run faster right, read about that, but I just don't, I don't like music when I'm running. So when I used to run I just don't like it. It gives me headache. Em, so I don't know maybe that's wrong maybe I wouldn't use it. It would have to be a strange mobile app to get me, I'd be much more inclined for example to be listening to a book (laughs) I would be much more inclined to do that I think if I was, em….

Interviewer: But I mean the thought of having an app you think would help you?

PAR03: Em d'you know I don't know if that was a correct answer or not. (laughs) I think my honest answer to that would be, I would try it and see if it did…

Interviewer: Test it out?

PAR03: Yeah.

Interviewer: Ok dokey. So we're gonna imagine that you have started using an application, for walking. So during the walk kind of em imagine you've gone for a walk and you're in the middle of the walk and you've put your phone in your pocket, what do you think you like to hear kind of …

PAR03: If I'm walking?

Interviewer: Mm Hmm.

PAR03: D'you know, I think, oh god I bet I'm the only one that says this cos I'm so old. I do quite like audiobooks, so I think an audiobook, now I'm sitting here thinking about it instead of clicking buttons on a computer would be better for me than music but it would be more likely for me to, particularly if I was very disciplined and would only allow myself to listen to the book when I was walking.

Interviewer: So almost like a kind of distractor almost? Or something to kinda take, you know keep your mind busy when you're walking?

PAR03: Yeah, uh huh, yeah.

Interviewer: Ok brilliant, that's great.

PAR03: Cos otherwise I do walking and thinking of work and that's rubbish (laughs)

Interviewer: Ok so in your survey you said that em, eh, how far you've walked would be quite important and you would like the app to tell you if you are walking too slowly to gain health benefits. So can you maybe explain that a wee bit further?

PAR03: Em well I think it would be quite nice to know how far you've walked just cos I kind of I would like to know that cos I think that's quite important in terms of… how far and how long you've been walking as well cos I wouldn't remember to clock the time when I started, I know I wouldn't. So I think that would be quite good. What was your other question? It was…

Interviewer: About encouragement as well would a kind of prompt…

PAR03: Yes it would be quite good if it interrupted whatever it was playing me to tell me to shoogle along a bit faster (laughs)

Interviewer: Yeah so maybe like a kinda prompt or audio cue or…

PAR03: Yeah. Or just a little voice that went 'PAR03, you're going too slow, speed up' (laughs) I don't mind being told what to do!

Interviewer: Ok so the next question is about after the walk so, we've been on our walk; you've had kind of feedback as you're going along, em what em feedback would you like to receive when you've finished your walk?

PAR03: Em…

Interviewer: Just off the top of your head…

PAR03: Yeah em, Id kind of like to know, I think it would be good if it could tell you how you were progressing, so I'd quite like it if had some feature were it was comparing what you did last time you walked or if it just did that say once a week and it compared how you did over the week with the previous week, that kind of, something that would mark your progress if you were trying to do, that's assuming you were trying to do more, but even if you are already doing the same so long as that's enough ..

Interviewer: To track it?

PAR03: Uh huh.

Interviewer: Ok, in the online survey you said that a map em of your route that you just em walked isn't really important to you. Can you maybe explain that a little bit further?

PAR03: Yeah I wasn't sure quite what I would do with that.

Interviewer: You don't see it as an important feature, just to track where you've been, just as an additional feature, it's not really important to you?

PAR03: No, I don't think so, I don't think I would ever refer back to it or be worried about that. And I just I thought to myself I know where I've been cos I've just been there. And even with my rubbish memory you'd think id remember where I'd been.

Interviewer: Ok and the other one that you mentioned that wasn't important was em sharing your walking data and interacting with others online.

PAR03: Yeah

Interviewer: Do you not see that as a tool you would use?

PAR03: No. I don't do any. I'm not on Facebook, I'm not on is it messenger or whatever it is. I don't do any of that sort of stuff. So I don't, I know most of the rest of the world does but I…

Interviewer: You don't think it would be beneficial to you, you just don't see it as…

PAR03: I just don't think I would do it. Even if it was a feature on the thing I wouldn't use it.

Interviewer: Ok…that's great. Ok so now I'm just going to show you this app that we've got in development just now. Em…is very basic at the moment. It's called the Stepper App. You press the start button. What I'm going to ask you to do is just to walk to your desk hold it and walk back just so you can kind of see it in development so if you start and just walk to your desk and back.

PAR03: It's so clever isn't it! How can you do this on a phone?

Interviewer: I know. This just kinda gives you a better demonstration that me kinda showing you it. So you would just stop it. Save the data. So what happens is it records the number of steps you've taken and you only walked to your desk so it's not that far but what it does do is basically the number of steps you take is equivalent to a kinda points system. So that is kind of your feedback system. Hopefully at the end of the week the amount of points you have will be equivalent to the national kinda physical activity guidelines.

Just looking at this app it is very basic at the moment so can you tell me kinda thoughts on it.

PAR03: Yeah I like that you see I'm a simple person so I don't have to do anything. I just have to click it and start it and stop it.

Interviewer: Yup

PAR03: So it's like a posh pedometer really isn't it

Interviewer: Yes

PAR03: And it tracks, so it's got the feature of tracking , of giving you a summary of what you've done, so you can track, you've got a history of what you've done which is kinda nice.

Interviewer: So you like the history part?

PAR03: Yeah. And is it gonna tell me at the end of, will it tell me how many points I need to get…

Interviewer: Well it is just in development, this could be an option for it to tell you that. So that is something that you would like?

PAR03: Yeah. I tell another thing right which is not any, the only reason that I'm looking at points right and I'm doing Weightwatchers at the moment, most of the world is doing weight watchers.

Interviewer: Apparently it's the most successful way to do it!

PAR03: And of course they run a points system so if you could, em they have a system, whereby they've , em everything is, I mean its counting calories right, but you don't count the calories it just tells you how many points you're allowed a day and what food and what points … but exercise has points as well. So I think if you were trying to sell this, a marketing tool would be that if it would convert whatever these points are into whatever system weight, you'd be able to figure it out, weightwatchers has so if you run for an hour at a particular speed it would tell you how many points that gives you and you can either save those points or you could eat more. If you're sensible you don't eat more. You know you accrue benefits. That was just a thought, you know cos I'm in that zone when I see points that what I think, I'm thinking of that. Em and of course people that are interested in being

physically active would probably also be interested. No I think that is quite good. I think that's sort of nice.

Interviewer: So the simple kind…

PAR03: I think it's nice but tis not much different to a pedometer that's the only thing I would say.

Interviewer: Mm hmmm, well that what's were trying to find, to figure out if there would be any other, because it isn't a pedometer we're trying to you know make it a wee bit more information than a pedometer.

Interviewer: So just you like the simplicity, you like the points system. Is there anything else on there that it doesn't have that you would like to see? Think of all the features we've kinda spoken about so maybe it say, currently it says your steps but doesn't say about calories or pace or well…

PAR03: I think pace would be more, pace and calories are the two, I think pace, I think I'd want to know about pace because I think pace is important in terms of CV health. So I think something that could indicate that you'd gone fast enough for it to be beneficial. And if you haven't gone fast enough, how fast do you have to be? So you know if you're currently doing 20 steps a minute, you need to increase that by 5 steps and you'll be alright. That kind of information would be quite good. What do I have to do in order to do what I'm trying to aim for.

Interviewer: Uh huh. Ok. That's brilliant. So my final question we've already kinda touched on it was music and the question is would it be important for you to use the app while listening to your own music or actually having the ability to listen to music through this app. Now you did say it wasn't important but I just want you to maybe…

PAR03: I would want my own music.

Interviewer: Your own music?

PAR03: Yeah because I can't believe it would offer me that I'd want to listen to.

Interviewer: Ok. And why would that kinda be important to you?

PAR03: Em… this is making me feel so old. It's because I can't bear a lot of the modern music. I think it's pish. So I just think…it's just so (not your cup of tea?) so commercial. So I would very much want to, it to interface with whatever I've got on my phone, which isn't a lot.

Interviewer: So almost as if like you turn the app on and it could have access to maybe your iTunes or music you have on your phone or the audiobooks you mentioned? I know you said you weren't a big fan of listening to music when you exercise.

PAR03: And then it could tell me, you see I don't know what information is on the audio books so I don't know whether it would know the beginning and end of a chapter but stuff like it would be great to know you would need to watch two chapters with (laughs) or for this particular book only one chapter. That would work.

Interviewer: Ok well that's fantastic, that's us. Thank you very much for taking the time to be interviewed.

Interviewer: This study is essentially trying to figure out what people want from a mobile phone application for walking. So all I'm going to do is ask you about your own physical activity habits and experiences as well as discussing some of the answers you gave in the online survey you filled out. In addition I will show you this application we have in development at the University of Strathclyde. Em…there are no right or wrong answers I'm just em interested in finding out what you think about it. Em…all of your responses will be kept confidential.

Interviewer: Em…so you've signed the consent form…em ok happy to go.

Interviewer: Eh…this study is going to look at potentially how applications can be used to encourage people to be more physically active or maintain their current levels of activity. Are you familiar with apps? On mobile phones?

PAR04: Yes, but I don't have an IPhone I have a blackberry so I'm not a massive app fan…

Interviewer: No but you understand what they are and how they kind of run and stuff like that?

PAR04: Yeah

Interviewer: Ok Great. So Physical Activity can take many forms from housework to gardening to brisk walking. The Recommendations are: "150 minutes of moderate intensity physical activity per week for adults"

PAR04: Mm hmmm.

Interviewer: So, you mentioned in your survey that you are physically active 5 days per week, and have been for more than six months.

PAR04: Yeah

Interviewer: What sort of physical activities do you like to do?

PAR04: Em, running, cycling, walking, em don't really do a lot of housework haha…but it is mainly running, cycling and walking

Interviewer: Ok Great. And when and where do you do this physical activity?

PAR04: I run along the canal where I live (Oh Brilliant) but my cycling is mainly to work, to and from work or I'll walk to work which takes about an hour.

Interviewer: So an active commute?

PAR04: Yeah so commuting or the gym.

Interviewer: And who do you participate in these activities with? Is it a social thing?

PAR04: It's just to get to work so it's not really social (laughs)

Interviewer: What about the running is that a social activity?

PAR04: Em…only events but generally I run on my own, when I'm training.

Interviewer: Ok, em, so you mentioned you walked to work and how often do you do this? Is it kind of part of a routine or…

PAR04: It's probably like three days a week cos I don't have like a travel plan everyday em I'll just get up and see how I feel but generally it's probably walking three, three times a week to work.

Interviewer: Ok, great. Em, you mentioned that you would consider using a mobile phone application to help you maintain the physical activity levels that you do have. Can you explain maybe like why feel like it would help or how you think it could help you, specific to you?

PAR04: I guess create goals maybe, although I'm quite good at doing that myself anyway and I think physically active people are em good at doing that (yeah) but for me yeah I'd still use it because you know it's good to have the information there, on hand.

Interviewer: So how far are you walking every day?

PAR04: It's about an hour, so yeah it's about an hour.

Interviewer: Yeah that's really good.

Interviewer: Ok so in the survey, em, I don't know if you remember but there was a list of kind of features. I'm just going to talk about, kind of dive into some of your answers a little bit more.

Interviewer: Em so, during the walk, em, imagine you have gone for a walk, what information would you like to know so, what would you like to know if you've left your house and you've put your phone in your pocket, what do you think you would need to know like along the way?

PAR04: Em…where I am is like a big thing because I've only been in Scotland for like 12 weeks now starting my PhD and like I use my GPS quite a lot. So I guess where I am and how far I've gone.

Interviewer: Ok so you don't get lost?

PAR04: (Laughs) Yeah.

Interviewer: Ok, em… just looking back again to the survey you said em encouragement, some sort of prompt would be of little importance to you. Just kind of interested to see why you put, like, it's not an important feature for you.

PAR04: A prompt to do physical activity?

Interviewer: So to encourage you to keep walking when you've got the phone, the app in your pocket.

PAR04: Because I don't need it.

Interviewer: No?

PAR04: I guess I'll walk to work and when I get there I'm not gonna walk any further. And to be honest I don't need a prompt I know that I have to do a certain amount of activity a day and the more is the better in my head so a prompt wouldn't be very useful for me.

Interviewer: Ok. Next question we've got is about after the walk, kind of just getting feedback from your application. (Yeah). So you've finished your walk, what would you like to know?

PAR04: Em… distance, perhaps where I am and also like things along the way like features because I heard about this website like called, I don't know if you've heard of it, tapwater.org, and like all of the cafes have like, they're all linked to giving you free water if your physically active.

Interviewer: In Glasgow?

PAR04: In everywhere. It's like a national website, so these places like give you free water if you're a cyclist, if you're a walker. So it's quite useful to know these things as well so maybe linking it with organisations and like telling me where cafes are, where I can get some stuff or products that I'd usually buy.

Interviewer: Ok, you stated em…how far you walked and how many calories you burned as highly important. Why specifically these two cos…

PAR04: Well that's, I guess calories are quite important to me (laughs)…probably because I'm a woman!

Interviewer: Yeah…know that feeling.

PAR04: And you know it's like you surround you calories and things like that

Interviewer: And with the map you said that was highly important, is that for kinda practical point of view for you, how you're new to the area?

PAR04: I think so yeah, because I guess local people have other landmarks that are more kind of eh like buildings and things whereas I don't know the area in that way I just know it you know this street, this street and you know they don't really have a meaning to me, the places.

Interviewer: So, yeah, it's an added tool? It would be an added tool for you.

PAR04: Yeah…yeah.

Interviewer: Em…just the last two features that we spoke about em on the survey. Em you stated that em if the app was to tell you your progress towards meeting physical activity guidelines this would be like not a kinda high priority for you…

PAR04: No… cos I kind of know the guidelines like you know I guess when you work in the area you know, whereas people don't really know how much they should or shouldn't do. So, it's not really helpful.

Interviewer: No…em. And finally, em, you mentioned that it was important to you to be able to share your walking data and interact with other users online. Can you maybe tell me a bit more about that?

PAR04: Em, well I use oh I don't know the exact website but its similar for running, so like you can upload, how far you've ran, where you've ran and so on and I think it's useful because I'm quite supportive of getting more people walking and cycling so sharing routes, sharing em where you go, shortcuts because not everyone knows like little things like shortcuts because everyone knows the road if they are travelling by car so I think it's important to share data like that.

Interviewer: Mm hm. Ok dokey. Right I'm just going to show this app that we have got in development. It's called the Stepper App. Basically, what the app does; this is it just here, so you would click start. Go for a walk, so as you step…press stop. Press yes you would like to stop the physical activity, save. And basically what it is, it records the amount of steps

you've done and gives you points so that is kind of your feedback system. So the points would be how much activity you've done and at the end of the week hopefully the amount of points you have would be equivalent to the kind of national guidelines.

Interviewer: Now, as you can see it is very basic, in development. Is there any features on here that you think would improve, kike I know we've spoken about a lot of features already but what do you think?

PAR04: Em, well I don't know about improvements but I think for someone who would be interested in this, it needs to be quite simple cos sometimes I'll like get feedback from something and you get too many kind of, what do you call them, criteria. (Uh huh) So I think it's presented quite simply because it wouldn't put people off.

Interviewer: What about the points system? Would you feel that would work for you or would you just need to see the basic information?

PAR04: Um…the points systems quite useful I mean I'd like to know how you worked it out so I'd like to know em how you got that and how you've converted it into physical activity guidelines because I'm genuinely interested in that stuff but I don't know if everyone would wanna know how their points as long as they were achieving them.

Interviewer: Uh huh so for you that wouldn't be really useful as a feedback system, with the points?

PAR04: Em…I don't know. It would be useful; yeah it would be useful in a way.

Interviewer: Ok…so just a final question we've spoken a lot about features for this mobile phone application, em is there anything else not mentioned in the survey em that you would like to see that you can think of? One thing that isn't on here, which I thought, might be a good idea is music. How would you feel about having music as part of this app?

PAR04: Mm…yeah but then again I have my own music. I don't know if that's just me personally but like I don't, I'd listen to that on my phone and I'd do it anyway while I was walking.

Interviewer: Uh huh so you would want to sort of play the music alongside the it…so…

PAR04: Yeah I definitely use it when I'm walking but I don't know if the app would do that for me when I do it anyway.

Interviewer: Ok dokey…

PAR04: Em…um and what else was I going to say to you… I think that was it.

Interviewer: Ok dokey well that's us. Thank you very much for taking the time to be interviewed.

Interviewer: This study is essentially trying to figure out em what features people want from a mobile phone application for walking.

I will ask you about some of your own physical activity habits and experiences, as well as discussing some of the answers you gave in that on-line survey you filled out. In addition, I will show you this application, mobile phone application the research team at the University of Strathclyde has in development. There are no right or wrong answers to this I'm just simply interested to find out what you think. And of course all of responses will be kept confidential.

So, moderate physical activity can take many forms from housework to gardening to brisk walking.

The physical activity recommendations are at least 150 minutes of moderate-intensity aerobic physical activity a week'

So this study is looking at how potentially mobile phone apps could be used to encourage people to either become or maintain their levels of activity.

Interviewer: So are you familiar with applications, mobile phone applications?

PAR05: Em…I am to a certain degree. I don't have many and I don't use many.

Interviewer: So you have, you understand what they are?

PAR05: Yeah.

Interviewer: Ok. So can you just describe your use of apps, maybe what applications you use?

PAR05: Em…at the moment I use a few simple apps, probably two sports apps so Sky Sports and ESPN to check results of sports games. Em…and I use a messaging service to keep in touch with friends who are abroad. And that's, that's pretty much all I use at the moment.

Interviewer: Ok brilliant. So in your survey you said you were you were physically active on five days of the week or more per week and have been for more than six months. Can you tell me about some of the PA that you like to do?

PAR05: Yeah em I would usually do weight training for four to five times a week for about 60mins each time and then I'll do some sort of cardio work probably everyday again for about 60 minutes and that quite often comes in the form of em a fast quick paced walk again for about 60 mins.

Interviewer: And do you do that in the gym?

PAR05: Eh…sometimes I do it on the treadmill depending on weather and where I am but quite often I'll try to go outside as much as possible before that part.

Interviewer: Ok so how often are you walking?

PAR05: Em…out of about 7 sessions a week I'd probably say I'd do a walk four to five or them.

Interviewer: Ok and do you do this walking as part of a daily routine? Do you walk to work? I mean outside of the gym?

PAR05: No it's really just for exercise or leisure purposes it's not for, it's not to get anywhere, it's not for commuting purposes, it's really just for kinda for PA, recreation that kind of purpose.

Interviewer: Ok that's brilliant. Ok so you mentioned in your survey that you would consider he use of a mobile phone application to either help become, but in your case maintain your physical activity? Em can you maybe explain em why you feel like a mobile application could help you?

PAR05: Em… it would just be something that I could use to track em what it is I've been doing em… I usually do the same route all the time for the purpose of that I know how long it takes me and roughly the distance I'm walking but if I was to know what distance I was walking I would be able to go on other routes and be able to track that little bit better. Em…I would also, it would also be really good to know that I was walking quickly enough so I try and maintain a good pace em… and that I can kind of gauge that up between how long I take to get to certain points on the route but if I had something that was quickly able to tell me how fast I was going then I would be able to keep up with a certain rhythm that would be good.

Interviewer: Ok dokey. So if you were to use an application for walking what features would you think you'd like to know simply during the walk only so as you were participating?

PAR05: During the walk would be the kind of pace that I was walking if that could be indicated by a buzzer or a voice or something that I could check…

Interviewer: To tell you what…

PAR05: Having access to the time and current distance walked that would be good.

Interviewer: Ok so you stated em in your online survey that em an encouragement tool, an encouragement feature in the app would be of little importance to you. I'm just interested to know why you feel you wouldn't need that.

PAR05: Em…it probably just because I've got, I'm already pretty internally motivated I would think to continue a walk. I'm never, I never kind of lack motivation to actually go out or to keep going during the walk em so the app for me would really be about tracking, making sure I'm doing it at the right intensity em rather than for kinda motivational purposes I think.

Interviewer: Ok dokey so now we're just gonna move on to talk about em after the walk. So imagine you've gone for a walk, when you come back em and you've stopped em walking what information would you like to know about the walk that you've just gone on?

PAR05: Em probably average pace that I've been walking at em. Overall distance perhaps distance for specific sections so distance by time periods also how these compare to previous walks I had done in the past.

Interviewer: Ok…. Em you said in your survey that a map of your route would be an important feature for you (Yip). What, why is this?

PAR05: Em just cos I'm not, a lot of the times where I walk I'm not too familiar with the area, or where I can actually go (uh huh) So that's why I just keep to the one kinda straight route there and back all the time so if I had a map that was able to tell me how long it would be to a specific point or em showing a map, showing exactly where I had gone and thinking about alternative ways I could then go off that route em just to kind of feedback what I'd been doing.

Interviewer: Ok… and em finally just another feature. Em… one of the options was the ability to share walking data and interact with other users online. You stated this wasn't important and I just wanted to find out maybe why this is not an issue for you.

PAR05: Yeah just for me it's completely a personal thing. I do it for health and fitness it's not something for em kind of competitive purposes so I don't really have any need I don't think to kinda compare what others are doing. I know the time period that I'm doing is sufficient for health which is the main reason I'm doing it so as long as I achieve that for myself it's not, I don't feel I need any more motivation to…by what others are doing.

Interviewer: So I'm now just gonna show you this app that we've got in development. It's called the Stepper App basically its tracks the number of steps you take. So what I'm gonna ask you to do is just press start and walk just to the desk and back. Hold it and just walk to the desk.

Just if I get you to do a quick demonstration then it's easier for you to kinda see. So you would just stop it, save em, sorry, you want to stop the activity, you'd like to save it and basically what we've got here is a points system, for the number of steps you've taken. So hopefully by the end of the week the number of steps you've taken is equivalent to what the em national guidelines are for physical activity and the points would be a kind of demonstration equivalent of that. So currently the application tells you the steps, the day, the time, and how many points you've got for that walk. I mean obviously you just walked to the desk so it's was very slow I mean there is an example. So… it's very basic just now, it's still in development. So I'm just kind of intrigued to see what your thoughts are (yeah) of it just now.

PAR05: I'd be interested to know what the points system was and how that related to other things em… and also how that would relate to distance, I think if those things were apparent quite quickly as part of the display or as some sort of starting screen telling you how, what the points me.

Interviewer: So are there any features on there just now em that you feel, sorry is there any features you feel that are not on there just now that you feel that you would or want so just some of the things we've spoken about.

PAR05: Yeah, yeah em… so distance would be, would be interesting to know as you were going along and yeah just something, something about the kinda points and steps relationship so you would know if you were achieving, if achieving it how many you would need to go for and something about pace if it was possible to do that.

Interviewer: Ok just a final question, is there any features not mentioned in the survey that you would like to see in a mobile application or anything else that you would like to add?

PAR05: Em…can I see the ones from the online survey (Yeah - this is during and that's the after). Yeah I think the only thing missing I would say from the after features is comparison of previous walks (ok) so being able to save it and store it and then comparing it to previous data on the previous week and seeing how you'd be able to kind of track your own progression rather than just simply in comparison with others.

Interviewer: Ok…em…finally just one other feature that is mentioned quite a lot is music. So would it be important for you to be able to use the app whilst listening to your own music or having music as a feature as part of the app?

PAR05: I always listen to music so it would be really important I'd say for me and I would much rather the music that I chose depending on mood or preference at that time rather than something inbuilt.

Interviewer: So…if there was a kind of feature on here that linked to your music you have on your iPhone that would be good for you?

PAR05: Yeah.

Interviewer: And why is using music em important?

PAR05: Em for me to it helps as kind of motivation em… and distraction as well cos I can get really, really bored quite quickly so after about 15-20 minutes I kind of just stop so the days with my IPod battery runs down or I forget to take it's a lot more difficult. I sort of struggle to go out so just having music just to kinda keep me going so I'd say it's essential for me to have it on. I mean I would use the app without it. Uh huh I would use the app just secondary but if there's a way they could be linked in I think that would be good.

Interviewer: Ok that's great. Well that's all my question so thanks for taking the time to be interviewed.

Interviewer: Ok so this study is essentially trying to figure out what features people would want em from a mobile phone application for walking.

Em…we're just gonna speak about em walking as a physical activity as well as talking about some of your experiences and current kinda levels of activity.

Em… all of responses will be kept confidential and there's no right or wrong answers to this I'm just kinda interested in what you have to say.

So physical activity can take many forms from gardening to housework brisk walking and the recommendations for physical activity are 150 minutes of moderate-intensity physical activity per week

Ok so as I said this we're looking at seeing if this study, if this mobile phone application that the University of Strathclyde Research Team has in development would it help people.

Interviewer: Ok so are you familiar with mobile phone applications, do you know what they are?

PAR06: Yes I am familiar with them from my husband's iPhone. I do not have applications on my phone however I have applications on my iPad. So yeah

Interviewer: So you understand what they are?

PAR06: Yeah.

Interviewer: Ok no problem. Ok so you said in your survey that you were physically active five days of the week or more and you've been participating in physical activity for more than six months.

PAR06: Yeah.

Interviewer: So I'm just kind of interested in what kind of physical activities you do? So can you maybe tell me about that?

PAR06: Uh huh. Well my main sport is tennis. Em but we've laid off tennis with the bad weather over the winter but normally with I mean fair weather I would be playing tennis at least twice a week which is doubles tennis so it's not obviously as physically intense as the singles but you know we're still out playing tennis for an hour, an hour and half a couple of times a week. Em, in addition to that I have been doing one hour of Zumba a week and that's been going on now for about 18 months and em I have dipped in and out of things like spinning class which is very intensive, a one hour spinning class and em pilates when I have the time so. But my main sport as I say is tennis a couple, say two times a week approximately. Zumba, I've been, that's once a week for one hour and whenever I can, on days when I don't have either tennis or Zumba I would try and walk for at least 30 minutes so em yeah, I mean we can get out to the reservoirs here and I know that it's a 30 minute, 30 minutes is the recommended minimum for moderate exercise per day for five days so I mean I try, try to do that. Em and I found it its easy enough for me to do it cos I can just leave the house and walk and I'm in nice surroundings at the reservoirs. I don't need to get in the car to drive somewhere to walk so I can do it as and when I want to. You know it's easy for me to walk.

Interviewer: So em you would deliberately use walking as a physical activity?

PAR06: Definitely yes.

Interviewer: It's not a case of getting from A to B or anything like that?

PAR06: No, I use it as a sort of, well many things. I use it to de-stress, to get out in the fresh air and cos I feel good when I come back. You know I feel the better for having done it.

Interviewer: Brilliant, so…

PAR06: I think it makes me sleep better as well.

Interviewer: So when you walk do you do this as part of a like a social activity or do you just kind of do this yourself or….?

PAR06: Not necessarily no. It's mainly, it would be most of the time I would just be walking on my own.

Interviewer: Ok dokey. In the online you that filled out you stated that you would not consider the use of a mobile phone application to either help you become or maintain you PA levels. I'm just kinda interested in finding out why, why you feel this way? And why you feel it wouldn't help you?

PAR06: Well I mean I would use walking as means to sort of escape and you know the I don't take the mobile phone with me and neither do I take an iPad, you know an IPod with me. You know I have one for listening to music but I just find that I want to just be out and I can listen to the countryside and the peace and quiet and that's why I'm looking for. So I'm not looking for any gadgetry or anything like that I just want like a break from everything.

Interviewer: Ok. So if you were, and this is a big if cos I know you said you wouldn't, if you were to use an application what kinda features do you think you would, you would like to know as you were going for a walk? So imagine em you've left the house and you're going to walk around the reservoir and you've put a phone in your pocket would you, em what kind of features do you think you'd like to know along the way just if you were to use one?

PAR06: Well I suppose it would be interesting, almost like a stopwatch kinda thing to know how long I had, exactly how long I had been walking for. The em, the pace of the walking that I was doing em you know that's sometimes something I consider you know what is intensive fast walking (ok), what is medium walking and I'm not very sure about that so possibly that would be something that I would be quite interested in. Em because obviously the faster that you walk, the more benefit you're getting from it em you know I suppose from a stamina point of view so maybe if it was able to tell me that. You know I'm not really interested in music or anything you know as I said before GPS I mean I know you can track where you're walking em I'm highly unlikely to want to use anything. So really it's just a case of how long I've been walking for and what speed I've been walking at and possibly how many calories I'm burning as well.

Interviewer: Would you like to know that as you were walking?

PAR06: Yes, em yeah that would be quite interesting to see what was happening, yup.

Interviewer: Ok dokey. Em we're still on this imaginary stage so you've come home from your walk and you've pulled out the mobile phone from your pocket. What would you like to know about your walk? Like what em kind of information or even a feedback would you like to know?

PAR06: Well em I'd just like to know you know how far I've walked in the time that I walked. If it was 2 miles and I did it in 40minutes that's the kind of information that I would be looking for. I can't really think that I would want anything else from it.

Interviewer: Ok that's great. Now I'm just gonna show you em this application that the research team has in development. Em it's very basic, it's basically em what I'll ask you to do is … I'll get you to have a wee play about with it cos then you'll have a better understanding. If you just hold it and if you walk to just that chair and back.

Ok dokey. Thanks very much. Ok so what you would do is you would stop the activity, save it and basically what it would tell you, it would tell you how many steps you've taken and it gives you a certain number of points. Now that's only 0 cos you've just walked to the chair, you've not walked far at all but basically with the points system what they're trying to do is by the end of the week how much you've walked em will kinda give you a grand total of points and hopefully that will be equivalent to the kinda national physical activity guidelines for health.

PAR06: Yup.

Interviewer: So the points is basically just kinda a feedback system. So just looking at the application it's very basic at the moment em it's still in development. So you just maybe tell me your thoughts. I know you said you wouldn't use one but just if you were to.

PAR06: So this is a kinda different way instead of saying 30 minutes a day this is taking it as if there was a sort of a national average of steps is that what it would be.

Interviewer: Well basically the points system is to kinda let you know how well you're doing so the idea is at the end of the week you would have a grand total of points and that

points would be equivalent to what you should be doing anyway (Sure) It's just a way to kinda display what you've done.

PAR06: I think that is very interesting. It's not something I would have ever thought of but yeah I think, I think it's really, I think that's really interesting and I would certainly em be keen to kind of look at that, yup. I mean I had no idea what you were gonna say. This is quite simple (yeah). But yes because you can match up and you can say well I've done 300 points so far this week and I need to do another 100 for my optimum level of walking per week and em I know now I've got to do another 100. Em so I think that's really good.

Interviewer: Ok so do you like the simplicity?

PAR06: Yeah it's simple, and it's quite straightforward and I think a lot of people you know I think they would buy into that and it's easy to understand so there's nothing complicated about that.

Interviewer: Ok and what about the kinda things that you mentioned like the pace and distance would you want that on there as well?

PAR06: Well I, I'd definitely think that if I em, if it could tell me whether I was walking at a light moderate or intense pace (uh huh) em that … it's probably just because I've been studying this over the last few weeks that I know that em you know if you're going at a faster pace you might not have to walk for so long than if you were going at a medium pace but I don't you know, I don't know that much about it but that it would interest me to know whether I was going at a light, medium or intense pace. Now I know that they say exercise weigh moderate, 30 minutes of moderate exercise per day over five days of the week is what were supposed to be aiming at but em I'd like to know if we were to up that to 5 days of intensive exercise if that gonna make things, is that gonna give us even more health benefits from that.

Interviewer: Ok. So that's a feature….

PAR06: Yeah I'd be interested in that yup.

Interviewer: Ok great. Well em just a final question is there anything else you feel that that would be important to you em on an application? Now one common thing that is on, quite a lot of people have spoken to me about is music.

PAR06: Uh huh.

Interviewer: …as part of the app or a feature of the app. So you could either have the option to play it alongside the application or have music running as part of the app, application.

PAR06: Uh huh.

Interviewer: Would this be important to you or not really important? If you were to use an application. Now remember there is no right or wrong answers. If it isn't important I'm just trying to find out why it wouldn't be important.

PAR06: I, do you know, sometimes I find the whole palaver of walking and you've got this thing around your neck and your trying to fit you know the earphones are falling out and you're sticking them back in, in your jeans and your music and you know I just find it all intrudes into the sort of, I'm trying to use walking as a tranquil relaxing exercise.

Interviewer: As a means to escape?

PAR06: Yeah exactly. So it's really not important to me at all so I wouldn't be worried at all about having music on it (ok). But I do like what you are suggesting em and I think that it would appeal to a lot of, it would appeal to a lot of women em who are you know who are interested in keeping fit em… and if it's easy as that to use and its simply an app on your phone and it's not an additional thing that you have to wear on your leg or something. I mean would you just carry it with you in your pocket?

Interviewer: Or put it in your pocket yeah. You don't really need to carry it.

PAR06: You wouldn't have to carry it uh huh. And I mean would there be any method of it accumulating the data?

Interviewer: No it'd just be in your pocket or in your hand or however you want. The phone kinda does it all for you.

PAR06: Would you see it actually, would you be able to go in and say right well here's the last week on Monday, Tuesday, Wednesday, Thursday, and Friday I walked these, this is what I walked. Would it be able to record the data?

Interviewer: Yeah. Well the application is still in development but at the moment it tells you em per walk em how many steps you took and how many points you got so these are all the kinda demonstration ones I've got here so as you can see 2, 2 points for 115 steps and you did that on that day at that time.

PAR06: Yeah

Interviewer: So that's the kinda information that's on there just now but you would see, so that's your week.

PAR06: Yeah. Would the app actually have a description within in that would say to you that for ladies this is what we would recommend…

Interviewer: Well this is what we're trying to figure out what people would actually want so...

PAR06: Right yeah. There would have to a kind of guideline at the beginning that would give you the information. Em yeah I think that would be you know there would have to be something like that on it.

Interviewer: Yeah, no, it's, it is very basic so it's still kinda in development. Well that's all my questions so thanks very much…

PAR06: And even a recommendation within the app at the beginning when you turn it on that this is what the current Government health guidelines are that you walk so many and this, what we would and then we would transfer that to fifty points.

Interviewer: Uh huh yeah.

PAR06: So you're looking at 50 points a day. Uh huh. I mean it's different a pedometer is the old thing isn't it that they wore. Em but that's, that's good. I mean I was very sceptical when you first got in contact with me and I thought there's you know what's all this but now that you show it to me I am quite interested in it.

Interviewer: Good. Well that's what we're trying to do. Well that's all my questions so thank you very much for taking the time to be interviewed.

Interviewer: This study is essentially trying to figure out em what features people want from a mobile phone application for walking.

I will ask you about some of your own physical activity habits and experiences, as well as discussing some of the answers you gave to on-line survey. In addition, I will show you this application, mobile phone application the research team at the University of Strathclyde has in development. There are no right or wrong answers to this I'm simply interested to find out what you think. And of course all of responses will be kept confidential.

So, moderate physical activity can take many forms from housework to gardening to brisk walking.

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This study is looking at how potentially mobile phone applications could be used to encourage people to become active or maintain their levels of activity.

Interviewer: So are you familiar with apps?

PAR07: Yes.

Interviewer: You know how they run, how they work?

PAR07: Yip.

Interviewer: Can you describe your use of apps, maybe what apps you have and how many?

PAR07: I have about 30 apps, and I sort them into folders regarding lifestyle, work, social media etc.

Interviewer: Ok and how often do you use these apps?

PAR07: Every day.

Interviewer: So big part of your life?

PAR07: Yip.

Interviewer: Ok so in your online survey you said you were physically active but that you participate less than five days a week. Can you tell me about some of these physical activities or what kind of physical activities or what physical activities you like to do?

PAR07: I walk to uni and…yeah. (laughs)

Interviewer: So how often do you walk on I mean like a daily basis?

PAR07: Well I'll always walk to the tube station and then walk from the tube station to uni so I'd say a mile or so a day, two miles maybe.

Interviewer: Ok and you try and incorporate this into your daily routine?

PAR07: Oh everyday yeah.

Interviewer: Ok dokey. Em in the survey you mentioned that you would consider the use of a mobile phone application to either help you become or maintain your physical activity. Can you maybe explain why you think it could help you?

PAR07: Em…hopefully it would keep me motivated.

Interviewer: Ok.

PAR07: And… it would give me an example of what actually, an output of what I'm actually putting in.

Interviewer: Ok. So if you were to use an application for walking what features do you think you'd like. So imagine you've gone for a walk what would you like to hear during your walk? Like what information do you think you would need to know?

PAR07: I'd like to know when I hit certain milestones like distance travelled or miles achieved. I wouldn't like it to be overly interrupting my walk. Maybe just as an aid.

Interviewer: Ok. So in your online survey you said that it was important for the app to tell you if you were walking too slowly to gain maximum health benefit from walking. Why do you think that's important for you to know?

PAR07: Because I'd like to be able to pick up the pace if I could and I'd like the app to push me so that like a gentle push so that it wasn't just, so I was actually achieving something, maybe set out a few goals.

Interviewer: Ok you also said it was highly important for the app to encourage you to keep walking.

PAR07: Yip.

Interviewer: What kind of things do you like, or do you think you would like to help encourage you so like a prompt or a …

PAR07: Well I'd like to maybe input my goal and for the app to be able to recognize when sub categories of that goal was achieved. So like, say for example I had to walk ten miles in a week I'd like it to tell me when I'd walked a quarter of that.

Interviewer: Ok now we're going to talk about some of the kinda feedback features, what features you would like to know once you've finished your walk. So you've come back to the house after your walk, what kind of information would you like to know about the walk that you've just been on?

PAR07: How far, what pace I was doing it at. I'd probably like to know, not so much how many calories but what benefit it's had to my overall fitness. I'm not interested in how many calories I've burnt.

Interviewer: Ok you said the number of steps you've taken isn't important to you. Why is this feature not of importance to you?

PAR07: Because a numerical value of individual steps doesn't appeal to me. I'm more appealed in larger measures of output like how many miles I've walked or how beneficial this has been for my health etc.

Interviewer: So how far you walked is highly important to you?

PAR07: Yes.

Interviewer: Ok you also said it was important for you, for the app to provide you with a map of your route. Why…I'm just interested?

PAR07: Because if I was to take up walking as a method of exercise I'd like to be able to alter the route.

Interviewer: Ok. You also said for the app to tell you of your progress towards meeting PA guidelines was important. Can you maybe develop this a little bit further?

PAR07: Because I'd like to be able to have a record of what I've achieved in say a week or a month. That's why it's important.

Interviewer: Ok and just the final feature we're going to discuss is the ability for the application to share your walking data and for you to interact with other users online. Now you stated this is of little importance to you. Can you explain why that's not an important feature?

PAR07: Its cos to be honest I wouldn't really affect me what other people are doing but I do think that in a way it would be beneficial cos it probably keeps you motivated in a sense of the word.

Interviewer: Ok now I'm just gonna show you the app that we've got in development just now. It's called the Stepper App basically it records the number of steps you've taken and translates that into a points system. So what I'd like you to do is maybe walk to the front door holding the app and just walk back. All you need to do is hold it. Ok so what you would do is just press stop, stop the activity, save the activity and ok. So, it comes up with a points system, so it's like a feedback system for the number of steps you've taken. So hopefully by the end of the week how many steps you've taken will give you a point score, which would be equivalent to what the national guidelines would be for physical activity.

Interviewer: So… it's very basic at the moment. I'm just kinda interested in seeing your thoughts, what you think about the application, what works for you what doesn't.

PAR07: I like the points system because then it's give it a kinda competitive edge so like every week you would probably want to be like ok so I'm gonna beat last weeks points but I find it irrelevant to know how many steps I've taken.

Interviewer: Ok so what features would you need if you were to use this to increase your PA? What would you need to know bearing in mind all the things we've discussed about…what would be the most important features we could add onto that for you.

PAR07: The distance is a big one for me, and the route.

Interviewer: Ok so final question. Are there any features not mentioned in the survey you would like to see in a mobile application specific to your needs or anything else that you would like to add?

PAR07: I would like it to link to my iTunes library.

Interviewer: Yup that's what I was going to follow on to, music. So it would be important for you to be able to use the app while listening to your own music.

PAR07: Yeah of course and I would like it to say if I was listening to a song if say I hit that ten mile mark it would say well done and it would just voice over the song and then go back to playing so it would almost like it would be running in the background so it didn't actually feel like I was using an exercise app.

Interviewer: And why is using music important to you?

PAR07: Because it keeps the brain active and gives, whilst you're walking and keeps me motivated.

Interviewer: So sort of an encouragement, motivation…

PAR07: Yeah it's an encourager, it's a motivational tool.

Interviewer: Ok well that's all my questions so thanks for taking the time to be interviewed.

Interviewer: This study is essentially trying to figure out what features people want from a mobile phone application for walking.

So I will ask you about your own physical activity habits and experiences, as well as discussing some of the answers you gave on the on-line survey you filled out. In addition, I will show you this application we've got in development. There are no right or wrong answers to this I'm just simply interested in trying to find out what you think. And of course all of responses will be kept confidential.

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Interviewer: So are you familiar with mobile phone applications?

PAR08: Yes

Interviewer: You know what they are?

PAR08: Yes

Interviewer: Ok, em, so can you describe your use of apps, like what apps you have?

PAR08: Em, I use things like MapMyRun, and I use things like … and like Outermills, which is like a shopping one. Yeah just things like that really, I don't use them a lot. I've got a couple of games. But yeah I'd say the map my run one I use fairly regularly because I don't have an IPhone (laughs).

Interviewer: And what is it you like about this map my run? Does it create runs for you or…

PAR08: Its, no, it works on the GPS system. So you just sort of set it to play, run, how far you've gone, it tells you how far you've run, how long it's taken you, and you can download it onto eh, the map my run website. And you can do it with cycle rides, and things like that as well.

Interviewer: Brilliant. Ok.

PAR08: So you can map it and share it on Facebook as well if you want. And I've got a friend that lives in Ipswich so she'll share … we share our runs with. Good or bad (laughs)

Interviewer: Oh that's great.

Interviewer: Ok dokey so you said in your online survey that you were physically active on em, 5 days or more per week and have been for more six months.

PAR08: Yeah.

Interviewer: I'm just kind of interested, what kind, what sort of physical activities you like to do?

PAR08: Em… it's running, cycling, walking. I'm gonna be getting into swimming soon cos I'm starting triathlons.

Interviewer: Aw are you? That's brilliant.

PAR08: I hate swimming but you know we'll get there (laughs). But yeah running, swimming, eh cycling, walking.

Interviewer: So how long do you kinda do these … like what's your kinda normal week like?

PAR08: Em…. weather dependant I'll cycle into work, two or three times a week which is an eighteen mile round trip. So I do that two or three times a week. I run three times a week, which totals about 25 miles normally, it's not masses but yeah. And eh I walk into town I never get the bus into town from where I live, it takes about half an hour each way, so I'll walk into town a couple, two or three times a week. So a fair bit.

Interviewer: So who do you do participate in these activities with, is it a social thing or is it all kinda by yourself?

PAR08: No I mean the running I always do with friends. I mean coming to the Nike one, or I've got another running group I go to on Tuesdays. And there are two friends; we all started running at the same time. We couldn't run a mile and now we run marathons so yeah. (That's fantastic) Occasionally I'll go out on my own but it's not quite as much fun (laughs) … nobody to moan to! (Laughs)

Interviewer: You spoke about walking so how often do you do walk? Is this part of your daily routine if you're not cycling?

PAR08: Em…I'd say it's not really a daily routine, it's just to get from A to B. I wouldn't, I don't do it as a form of exercise as such.

Interviewer: So not a deliberate form of physical activity?

PAR08: No but I prefer to walk in than get a bus or something. I hardly ever get buses.

Interviewer: That's good. Em… So you mentioned that you would consider the use of a mobile phone application to help you maintain your physical activity. So can you explain maybe the reasons why you would consider using a mobile phone, how you feel it could help you?

PAR08: Well you've always got your mobile phone on you for a start, which you know they used to have pedometers and stuff like that and you'd always got to have them to cling on to your belt whereas you've always got your phone on you. Em … and until recently I mean one of my friends has got like a sports watch that tells you about all the calories you've burnt and how far you've done and I quite like that cos I never know how much I've done. I just sort of go out and hope for the best or wait till I'm tired and go back again you know. I've ran for three quarters of an hour, I've walked for half an hour so yeah it'd just be more interesting to see, yeah to see the stats so to speak cos I quite like things like that.

Interviewer: Ok so we're just going to imagine that you've gone for a walk. What kind of features, if you were to use the application would you like to hear, what would you like to know? So you've put the phone in your pocket, and as you were walking…

PAR08: Well I'd like to know the distance, every sort of mile or something cos it's funny em last Saturday I walked into town with a couple of friends and he's got eh, what was I going to say, the wrist watch, the Nike sports band, and we were just pottering about town and he said do you know we've walked five miles today. You are joking just middling about town so it's quite interesting to see how far you can walk when you don't even realize it.

Interviewer: Uh huh.

PAR08: So yeah, if it tells you how far you've gone. I'm not sure if I want it to tell me how many calories I've burned whilst I'm walking, maybe when I've finished. Definitely how far I've gone.

Interviewer: Ok, em, you said in the survey it was important for the app to encourage you keep walking. Now what are some things you think would encourage you like a prompt or a cue or applause or… (laughs)

PAR08: Yeah I suppose if you're trying to maintain a particular speed you'd probably want it to tell you if you're slowing down or something like that I mean I dunno whether you'd have it shouting at you 'speed up!" But I dunno, I don't know how that would be but maybe just a noise or something just to prompt you that you're going slowly, anticipating thinking right I'm gonna do four miles in an hour and you're only doing three.

Interviewer: So an encouragement tool would be useful for you?

PAR08: Yeah, I think so.

Interviewer: Ok so now we're going to move on to after your walk. You've finished this imaginary walk. Em, what would you like the app to tell you at the end?

PAR08: Em yeah how far I've gone, how many calories I've burned, em, if it was GPS system being able to see the route would be quite interesting so then if you went out again without your phone you would know that particular route is X amount of miles or something like that. Em… yeah.

Interviewer: In your on-line survey you said that the ability to share the walking data and interact with other users online would be quite important for you. (Yeah) Can you explain that a wee bit further?

PAR08: Well, as you can tell I'm not Scottish and I do have friends that live all over the UK and there's a couple of friends who, that started getting into things like running, walking and whatever as a consequence of me starting and so, we sort of, eh encourage each other quite regularly and post things and it's nice to share and say 'oh you did well today' or somebody

shares it and says ‘oh I only did four miles today it was really hard’ you think but yeah at least you got out there, you’re doing it. So it’s nice, encourage people’s persistence (?)

Interviewer: So it’s like a kinda extra motivation?

PAR08: Yeah, it definitely is. Definitely.

Interviewer: Ok so now I’m just gonna show you this app that we’ve currently got in development. It’s called the Stepper App. Now it’s very basic em so what I’m actually gonna ask you to do is if you can hold this, press the start button and just walk over to the end and walk back.

PAR08: Ok.

Interviewer: There we go. Just to kinda, doing this demonstration just kinda gives you a better idea of how it works.

PAR08: Ok.

Interviewer: So then you would press stop, are you sure you want to stop the activity? Yes. Save the activity. So basically what this app does, it counts the number of steps you've taken and then the number of points you receive is kinda like a feedback system.

PAR08: Right.

Interviewer: So hopefully if you walked every day of the week by the end of the week it will kinda be equivalent to what the national kinda guidelines are for physical activity.

PAR08: Do like 10,000 steps a day or something daft?

Interviewer: Well that's the recommendation but for our, for this, for the purpose of this app we've kinda created a kinda points system as kinda a feedback, kinda evaluation tool. So as you can see it is very basic and basically just tells you how many steps you've taken, the time and the number of points you've received. And so just kinda interested to see what you think about it just now, like your thoughts and opinions on it?

PAR08: Yeah I mean it's quite simple but yeah it's fine yeah. (Laughs)

Interviewer: So do you like the simplicity or would it need more kinda features for you?

PAR08: Em… I'm trying to think. Would I need more… I mean if I was just trying to keep up the steps then that's fine isn't it I guess. Yeah.

Interviewer: Think of some of the things we've spoken about so the distance and the pace and the calories and all that? Do you feel that you would need that or do you like the simplicity of it?

PAR08: I think I would if there was like you go to another screen where it sort of had that as well maybe be quite nice you know like as you sort of start, when you got the app you put in like your height, your weight and what not and it could work out roughly how many calories you've done. But I mean I'm not obsessed by calories but I know some people who are, they calorie count you know the exercise goes towards like any extra food they can eat so eh. I personally wouldn't be that worried but I know other people would be. It would be nice to know how the distance though as well the steps.

Interviewer: Ok so just final question. Are there any features not mentioned in the survey that you would like to see in an application or anything else you'd like to add? One of the features I thought might be important is music. How would you feel about the app either as a feature or the ability to play your own music?

PAR08: Em… could you not do that with most apps anyway I thought rather than using with your music…

Interviewer: Yeah but just because this app is so basic just now we're basically trying to find out what people would want so is maybe a music feature would that be important to you?

PAR08: Yeah I mean if I'm on my own I definitely listen to music or the radio when I'm out doing exercise sort of helps me keep at it. If I'm with friends then I'm not worried about that.

Interviewer: Ok so if you're, when you're with…

PAR08: I put my MapMyRun on when I'm with friends but (yeah) but I won't listen to music, if I'm on my own I will.

Interviewer: So when you're on your own why is listening to music important for you?

PAR08: I dunno, it keeps your motivated and it stops you thinking 'oh god I've got another 5 miles to walk' or something (laughs) Just sort of yeah you're signing along and you forget what you're doing to a degree so yeah.

Interviewer: Ok dokey that's great. Well that's us. So thank you very much for taking the time to be interviewed.

Interviewer: This study is essentially trying to figure out what features people want from a mobile phone application for walking.

I will ask you about some of your own physical activity habits and experiences, as well as discussing some of the answers you gave in that on-line survey you filled out. In addition, I will show you the application, mobile phone application the research team at the University of Strathclyde has in development. There are no right or wrong answers to this I am simply interested to find out what you think. All of responses will of course be kept confidential.

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So this study is looking at how potentially mobile phone apps could be used to encourage people to either become or maintain their levels of activity.

Interviewer: So are you familiar with applications, mobile phone applications?

PAR09: Yes

Interviewer: You know what they are?

PAR09: I do.

Interviewer: Ok so can you please describe your use of apps maybe what you have, how many you have?

PAR09: Mostly the apps are either recreational apps tending to be games apps and other forms of recreational apps. I use one or two apps for information and for music purposes. I don't use any apps for physical exercises purposes whatsoever.

Interviewer: Ok so you said in your survey that you were physically active but you participate less than 5 days per week so what sort of physical activities do you do and what sort of activities do you like to do?

PAR09: I walk and I always walk and I always if I've got a meeting anywhere I always take the stairs, I always do anything that involves taking the physical way of doing it and lately I've been running twice, three times a week.

Interviewer: Ok so just talking about your walking habits, how often do you walk? Is this kinda part of a daily routine?

PAR09: Yes.

Interviewer: So how long would you say you walked for per day?

PAR09: Approximately 40 minutes per day.

Interviewer: Ok. You mentioned in the on-line survey that you would consider the use of a mobile phone or a mobile phone application to help you become or maintain your levels of physical activity. Can you maybe explain why you think it could help you?

PAR09: I find running very monotonous and I think that a mobile app like even just a music app or an app that measures activity might give you a way of measuring the extent what you've actually done. Or relieve the boredom whilst you're actually doing it.

Interviewer: Ok so if you were to use an application for walking what features would you like? So imagine you've gone for a walk, you've put the device in your pocket what would you like to hear during the walk like as you're walking?

PAR09: I'd like something that measures my distance and my pace so that you could…and perhaps you could relate that to calories burned or physical work in kilojoules or whatever the dimension of work is.

Interviewer: Ok so you've stated in your survey that an encouragement to keep you walking would be an important feature for you. Can you explain maybe why this is and how you'd maybe like this encouragement so maybe a prompt or an audio cue or an applause or what would you like and why is it important to you?

PAR09: What I would like is something that would remind me perhaps that I still had to complete my exercises for the day or that I was below specific targets that I had set myself or something that relived the boredom of the exercise whilst I was doing the exercise.

Interviewer: Ok. So you've gone for a walk, and you've come back home. What information would you like to know about your walk?

PAR09: Distance travelled, calories burned, how fast, how long the walk took me. That's it.

Interviewer: Ok. So in the survey you said you'd like the app to provide you with a map of your route. You stated that would be an important feature for you why would that be important?

PAR09: The map of the route would be important in advance of the walk so that you could plan different walks to keep the exercise routine interesting.

Interviewer: But when you come back you said you'd like to be able to see your route of where you've gone.

PAR09: Yeah…purely to measure, to get an idea of how far that route actually is so you can judge not just in number scale but you can actually see a route on a map telling you how far you've actually walked cos I think you tend to overestimate how far you've walked. You've not really walked as far as you think.

Interviewer: Ok you said that you'd like the app to tell you of your progress towards meeting the physical activity recommendations or guidelines. Why is that important?

PAR09: Because it's a measurement of…it's an objective measurement of your progress rather than leaving it a subjective i.e. to how you feel or what you think. It would be an objective measurement that you could physically measure.

Interviewer: Ok one final feature you said it would be important for you to be able to share your walking data and interact with other users online. Why would that be useful for you?

PAR09: Because exercise tends to be easier when you are doing it in a group or with someone else and if someone was as fat as you were then you could see who was getting the slimmest the quickest (laughs). So in other words to encourage an element of competition.

Interviewer: Ok so now I'm just gonna show you this application that we have in development at the University of Strathclyde. It's called the Stepper App. What I would like you to do, if you could just walk to that door and back just holding the app.

Interviewer: Ok so you'd stop, save the activity. So basically what this app is, it gives you a number of points for how many step you've taken. Now you only just walked to the door so you wouldn't have got any points because it's so short but basically what the app tells you just now is the number of points you got for how many steps you took so that one we can take as an example so they got 2 points for walking that much. So the app just now just tells you points, steps, your weekly total and when you did it. So I'm just interested to see just your initial reaction, your observations about the app? How you feel?

PAR09: Obviously steps equals points and more steps you take the more points you get. If I step slowly would I get the same number of points if I take the steps quicker, would I get a higher number of points. So in other words if I took 100 steps in 1 minute would I get more points than if it took me 4 minutes to take the 100 steps. I'd like to see that. That would be perhaps the same for calories and that information is available on running machines so it shouldn't be a difficult thing to do.

Interviewer: Is there any features that was mentioned today that you feel that you would want on there that is currently not on there?

PAR09: Distance, time and METs or calories.

Interviewer: Ok just a final question, are there any features not mentioned in the survey or that we've discussed today you would like to see in a mobile application or anything else that you would like to add? One feature that is continuously coming up is music. So would it be important for you to be able to use the app whilst listening to your own music or having music as a kind of feature as part of the app?

PAR09: Both yeah.

Interviewer: Both?

PAR09: Yeah both, definitely both.

Interviewer: So the ability to play your own music through the application or having them running simultaneously… either or?

PAR09: Yeah.

Interviewer: Ok and why is this important to you, why is listening to music when you're being active your being active important?

PAR09: Because it alleviates the boredom of the repetition of being active because boredom is one of the key enemies of exercise because you have to keep exercising on a regular basis it becomes boring therefore anything that relives the boredom is going to be an encouragement to exercise.

Interviewer: Ok well that's all my questions so thanks for taking the time to be interviewed.

Interviewer: So this study is essentially trying to figure out what features people would want from a mobile phone application for walking.

I will ask you about some of your own physical activity habits and experiences, as well as discussing some of the answers you gave to on-line survey you filled out. In addition, I will show you this application, mobile phone application that the research team at the University of Strathclyde has in development. There are no right or wrong answers to this I'm simply interested to find out what you think. And of course all of responses will be kept confidential.

So, moderate physical activity can take many forms from like housework to gardening to brisk walking. And the physical activity recommendations for adults are at least 150 minutes of moderate-intensity physical activity per week'

Now this study is looking at how potentially mobile phone applications could be used to encourage people to become active or maintain their levels of activity.

Interviewer: So are you familiar with applications, do you kinda know what they are?

PAR10: Yes but I'm not a great user of them but yeah I am familiar with them.

Interviewer: Do so can you describe your kinda use of apps maybe like what apps you have, if any?

PAR10: Yeah, more educational related so like the Guardian, the Economist, a few kind of trains related but not any sports apps I'm pretty sure I don't have any,

Interviewer: Ok, you said in your on-line survey that you were physically active on five days or more per week, and you have been for more than six months. Can you tell me just some of the activities that you participate in?

PAR10: Yeah I tend to train, I'm slightly injured just now but I'd tend to train six days a week, on a Monday Wednesday, Saturday that would be more speed work so high running intensity and then the other three days a week it would either be stamina, longer runs or you know kinda volume runs or a little bit of tempo running but because I'm injured just now then I do more cross training so I'm still training six days a week but supplementing that with more swimming or going to the gym.

Interviewer: Ok and who do you participate in these activities with? Is it a social activity?

PAR10: I'm part of a training group so there's probably about 20 of us train on average together and then some nights the three nights when I'm not doing the high intensity work sometimes it's on my own but usually with at least one other person.

Interviewer: How often do you walk say as past of a daily routine or…?

PAR10: How often? I mean I'll walk kind of lot in a working day you kind of have to walk a lot between departments so but more really at the weekends or you know like if I can't walk to the gym or I can't use public transport and walk around for example the west end if I'm kind of… so goodness so how is it minutes or is it in time?

Interviewer: Just trying to gather a kinda rough idea of your kind of walking habits? I mean if you don't walk then that's fine.

PAR10: I would go for a run rather than go for a walk if that makes sense so but …

Interviewer: So you wouldn't deliberately do it for physical activity?

PAR10: Not for physical activity no.

Interviewer: Ok no problem. You mentioned that you would not consider the use of a mobile phone or a mobile phone application to help you maintain in your case your physical activity. Can you maybe explain why it couldn't help you?

PAR10: One of the things I guess that if I think about the motivations to why I do sport there's the, you know yes it's to get faster or cos you know I train to get faster but I also like the kind of social side and I don't really like being, you know I'll wear like a Garmin for example which will record my time and that's fine and it took me a while to actually get everybody else to Garmin before I did so I'm probably a late kind of start when it comes to things like applications, maybe not so much technology but when it comes to sport the kind of freedom you get from doing a physical exercise tends to be kind of away from you know I guess technology you know so you're doing it because it's kind of almost like back to basics so you're out you know kind of running in the middle of nowhere and I wouldn't wear for example you get a lot of people wearing IPods and you know they'll run with headphones and you know I like kind of seeing my surrounds or speaking to the people I'm with or you know so I tend I'm not even for running I wouldn't really use an iPod so I don't think that well I know for a fact I wouldn't run with a mobile phone, you know or even walk. If I was doing for example a hill walk which I occasionally do, more kind of hill running now rather than a hill walk but if I was going into the hills say I was injured and I couldn't run I wouldn't yeah I would tend not to carry gadgets with me. I kind of like that sort of being one with nature and almost back to basics and maybe that kind of the motivation is slightly different. It's about maybe getting away from the technology and I think when your

kind of when a large part of your day you're staring at computer screens or you know maybe doing a lot of searches on the internet so you're kind of its quite nice getting away from all of that. You feel you know a sense of freedom or something if that makes sense.

Interviewer: Yeah. Ok so if, and this is a big if (laughs) you were to use an application for walking…imagine you had gone for a walk and as you're walking along can u think of anything at all that you would like to know as part of you walk? We're thinking about this from a going out and walking as a deliberate form of physical activity.

PAR10: Well I would say I'd equate it to how I'd use my Garmin for running so I would you know for me I like to record the number of miles that I've done. I'm not at all bothered about calories but I like to know mileage because I want to know ultimately what speed I'm running at so I can improve that speed so I can get faster in a race so distance and time to give you speed essentially. But you obviously you could do that with a simple stopwatch. But the Garmin tends to do that and if I feel I really, if I say for example if like in Portugal if I wanted to see the runs that I've done then obviously I can look at Google Earth through Garmin so the Garmin device kind of gives me the you know where I've been if I want to see the specific route. It gives me distance. It gives me the time. If I want I can also wear my heart rate monitor, it gives me my heart rate so I can see I can see whether or how efficiently I'm running. I think actually yeah it does work out calorie for you as well if you wanted that but I don't care really.

Interviewer: Ok so we're still imagining (laughs). So imagine you've gone for a walk again as a deliberate form of physical activity. You've gone for a walk, you're back home what information would you like to know about your walk and again if it's easier could you maybe refer this to what you would when you're running.

PAR10: I think that the same as maybe Vie just said that you know the understanding what speed I'm running, the distance and the time to give me the speed. And then because sometimes I'll run you know a similar type of training run so I want to see whether I've made improvements (yeah) so yeah those types of things 'coos if I guess you're running competitively you want to know that you are getting faster so it's quite good to put little stakes. So those are the main things.

Interviewer: Ok so in your online survey you stated that it wouldn't be important feature for you to share your data and interact with other users online. Can you just explain why you feel that way?

PAR10: Yeah. It's quite interesting because recently I went on to Garmin connect and there you get the option to upload so everyone can view so you can share all of your runs and a lot of people yes do that on the site but I think that for me why would other people need to know that information unless for example I know some people on blog sites will record runs and its maybe more about sharing where they've been. I DON'T feel like a great need. The people I'm closest in running then I would verbally arrange to say well this is a great run lets go and do it and so that they can physically do it with me. It's just so I would share it more in a personal way rather than just sharing it with the World Wide Web and the masses. I mean that's probably just I guess my mentality but I'm much more touchy feeling hands on person rather than just kinda of…it's also I think a lot of people that I've seen kind of posting lots of things online there's a lot of kind of you know it's kind of on show and I'm not a kind of on show person if that makes sense. I mean yeah I'm sure the motivation might not be that in many instances but some people you do see that its posting really fast times and it's just like oh ok but you know maybe it's for different reasons but I just don't feel the kind of need or motivation to show. And maybe there's a little bit of old fashionedness in there as well where you think well do I want lots of people that everyone for example form my running club knowing when I'm running because you don't know who's gonna join the running club and do you really want you know there could be kind of a couple of dodgy people maybe joining. I'm not saying anything, they're lovely people but there's people you maybe know less well do I want them knowing where I am, do I want them knowing that I'm out of the house as well etc. so there's maybe a little bit of old fashioned engrained thoughts there as well that make you think I don't know. I think quite often you know even if you take kind of Facebook, social media kind of how people use technology in general and it's not until things go wrong that you realize oh goodness do I really want to share all of that stuff with people so sometimes we're not aware until something goes wrong what the downside would be so yeah. I don't feel there would be a huge personal benefit to releasing all of my data and what speeds I'm running. I'd rather just go out and perform well in a race and that's a way of showing people I guess what you've doing and how fit you are, if that makes sense.

Interviewer: I'm just gonna show you this application we've got in development just now. It's called the Stepper App and basically what I'm gonna ask you to do is hold the app and just walk round the table for just holding the app.

Ok so we'll just press stop, stop the activity yes, save the activity. Ok so basically what the app would show you is how many steps you've taken and you would get a points for how many steps you took. Now you only did walk around the table so I mean it says there its only 10 steps. But basically the point of this is to kind of encourage people so hopefully by the end of the week the number of points you would have would be equivalent to what the kind of national physical activity guidelines. The points is almost like a kinda feedback evaluation system. So what the app will tell you will be all your walks, the time taken, points you received for that walk, how many steps you took and what time you did the activity at.

So I'm just kinda interested to see like what you think about it just as it is I mean it's very basic just now it's still kind of in development. So…

PAR10: Can I ask a question what are the points for?

Interviewer: Well that's what we're; basically it's a kind of feedback system for how many steps you took. So…

PAR10: So it's like a reward almost?

Interviewer: Uh huh yeah so like if you can see in this one here, the person got 2 points for walking 115 steps. Now this is just kind of you know being used as a kind of testing tool at the moment, an example to show people. So obviously it's still in development so the number of steps is equivalent to a certain amount of points so basically that's like a feedback system to kind if let people like know how they're doing in terms of an overall physical activity. So it is very basic and simple just now but just trying to find out if people like that if there's things on there that they don't like, things that they would want instead.

PAR10: I think that I mean…

Interviewer: I mean put yourself in the position of a person that is doing walking as a deliberate form of physical activity…

PAR10: Or maybe wanting to get into walking and needing an incentive.

Interviewer: Uh huh.

PAR10: You see I can see why someone might want to know if… cos I'm guessing the type of people that are using walking as exercise they probably aren't able to … a lot of people maybe aren't able to run so maybe it's a mean to an end or they just enjoy walking, walking is kind of their favourite physical activity. Are you getting people I guess that are coming into walking as a way to maybe lose weight or whatever. I think that some people do need an extra thing to incentivize them and you know encouraging them by I guess earning points

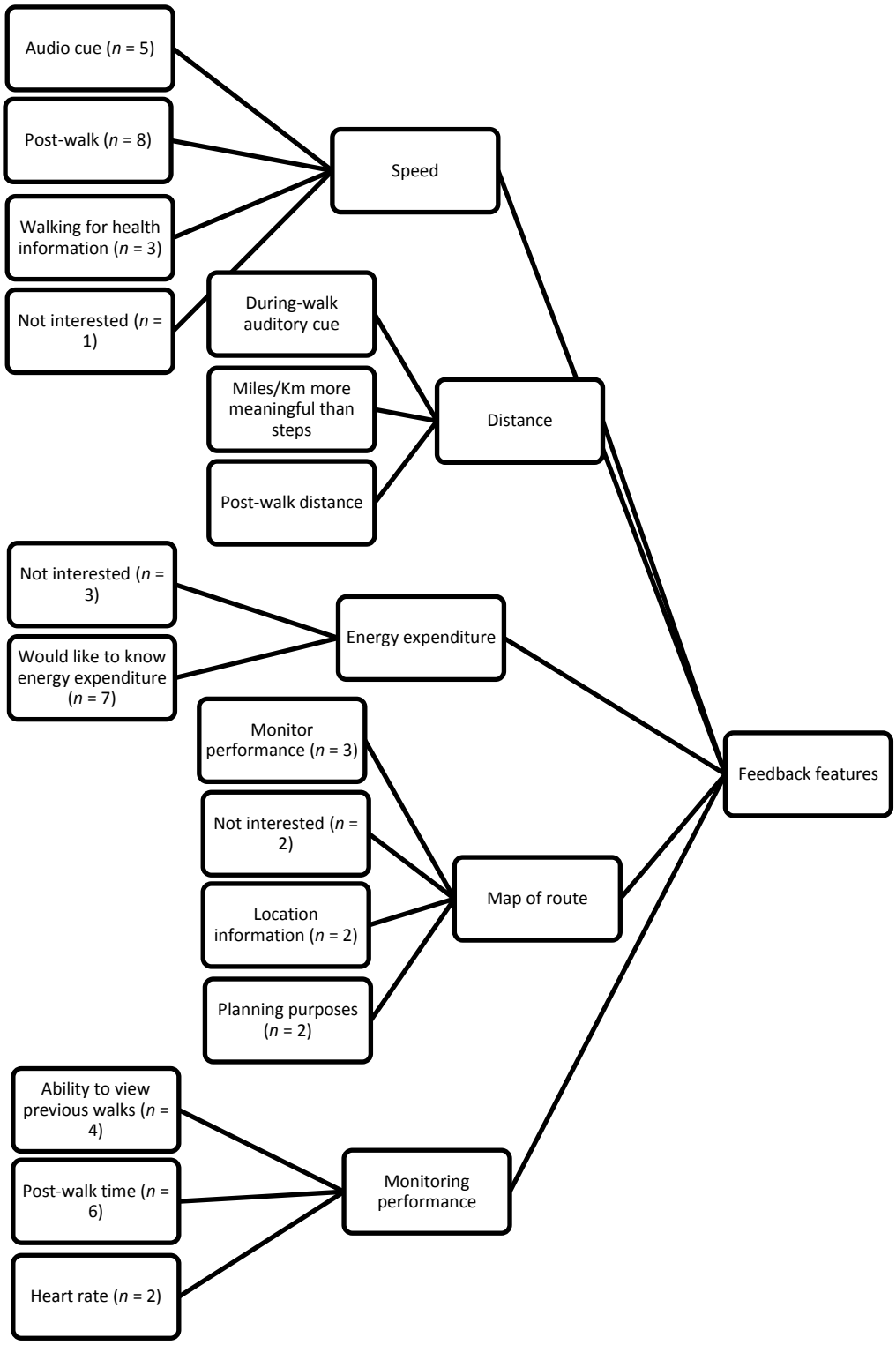
and so many points. It feels to me like it potentially would work best related to calories so you know the points equal you can you know that's equivalent to you burned off x number of calories that feels like something that would be more of interest to, in my head, the type of person it would maybe get enthused by this and I guess I kind of questioned steps are kind of not that relevant maybe in society in general but I guess it make it in Lehmann, it maybe puts it into a nice basic format but most people I guess who measure things in distance and speed and yes you've got time in there but I would have thought distance would have been more meaningful to people because quite often people are maybe using walking so eventually they can maybe walk a certain distance or maybe they want to walk the West Highland Way or they want to or you even just do a 10 mile sponsored walk or whatever and in real terms they need to know that they are capable of walking a mile then build up to two miles then and steps really because of gradient etc. steps are maybe not the best indicator so I think probably distance would be more relevant than steps if that makes sense.

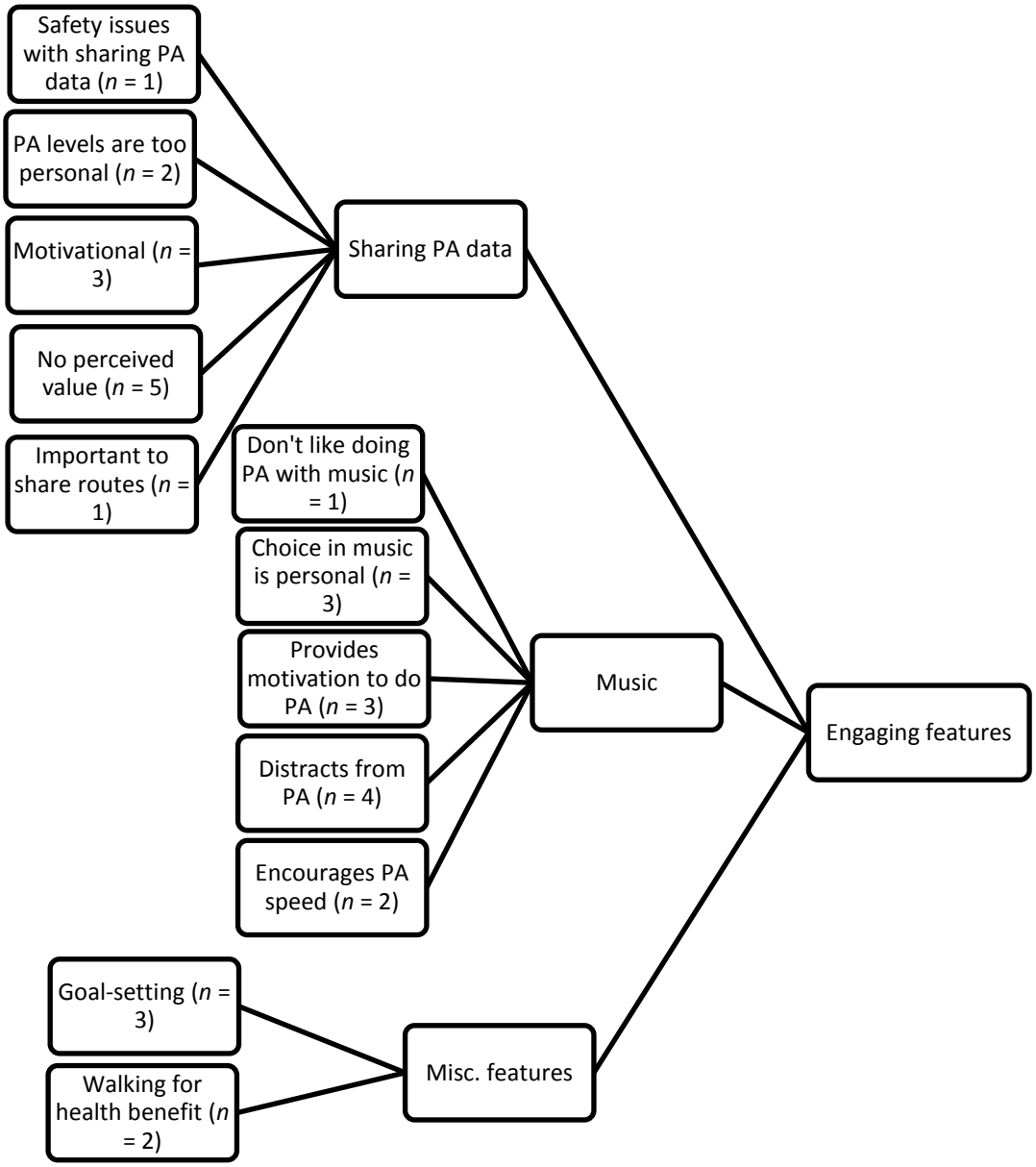
Interviewer: Ok so final question. Is there any features not mentioned in the survey you would like to see in a mobile application or anything else that you would like to add? Now one common kind of suggestion for this application is music. So would it be important for you to be able to use the app whilst listening to your own music or having music as a feature as part of the application?

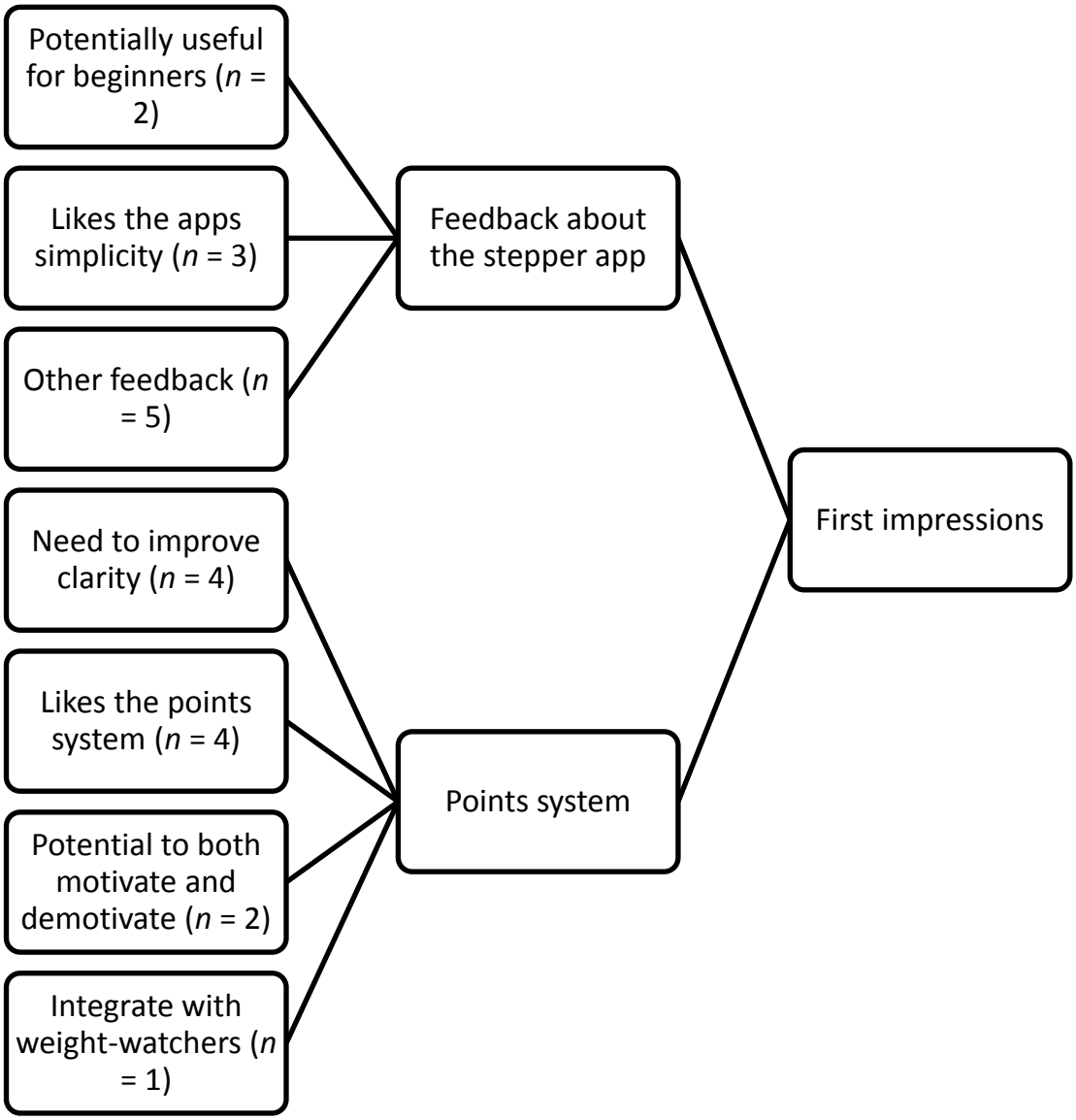
PAR10: Not for me personally because as I was saying I wouldn't tend to do exercise, any type of exercise with headphones in unless I was sitting on a stationary bike in the gym cos it's so boring (laughs) so I would tend not to for walking about and also I think for my health and safety yet you know that if you are standing and you go to cross the road and you look you can't see you might not hear a cyclist for example approaching you or shouting at you or so I think that yes I wouldn't use the kind of the music aspect but I know a lot of people who do who are maybe trying to get fit again, they've maybe had a kid or had a couple , a family they're trying to get fit again and they can't actually go for a jog or go a walk without having headphones in so I think for most, I'm not the majority but I know that obviously what you need is both ends of the scale you know to balance out the survey but as I say I'm not the norm cos I do know lots of people that just can't bear doing exercise without music so music does sound, from my awareness of others, as something that probably would make sense but I definitely think distance as I say and I would have thought that people would request calorific information as well on there cos understanding how the points would be used better cos it's not really that clear and I think being able to see where they've been, the way the Garmin does so essentially kind of you know the sort of almost like a Garmin equivalent app which I'm sure they're probably is out there already, well I'm not 100% sure but I can see why you know people especially I think at a kind of an entry level where they maybe aren't able to walk a mile just now, to get I think that it feels like the sort of thing that would encourage people at a very basic entry level to get into walking and that's got to be a good thing, that can't be a bad thing.

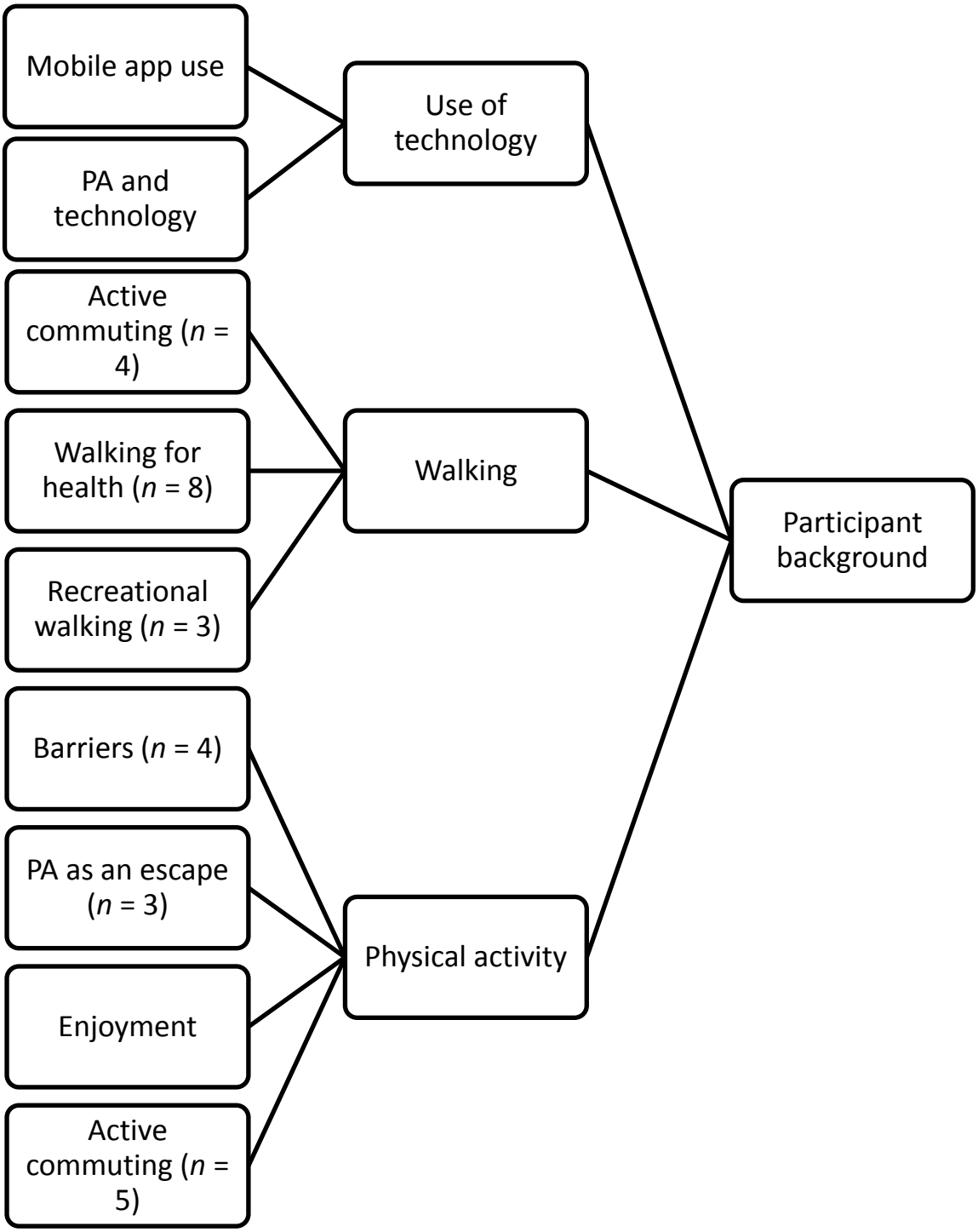
Interviewer: Ok well that's all my questions so thanks for taking the time to be interviewed.

Appendix D- Thematic Framework Study 1

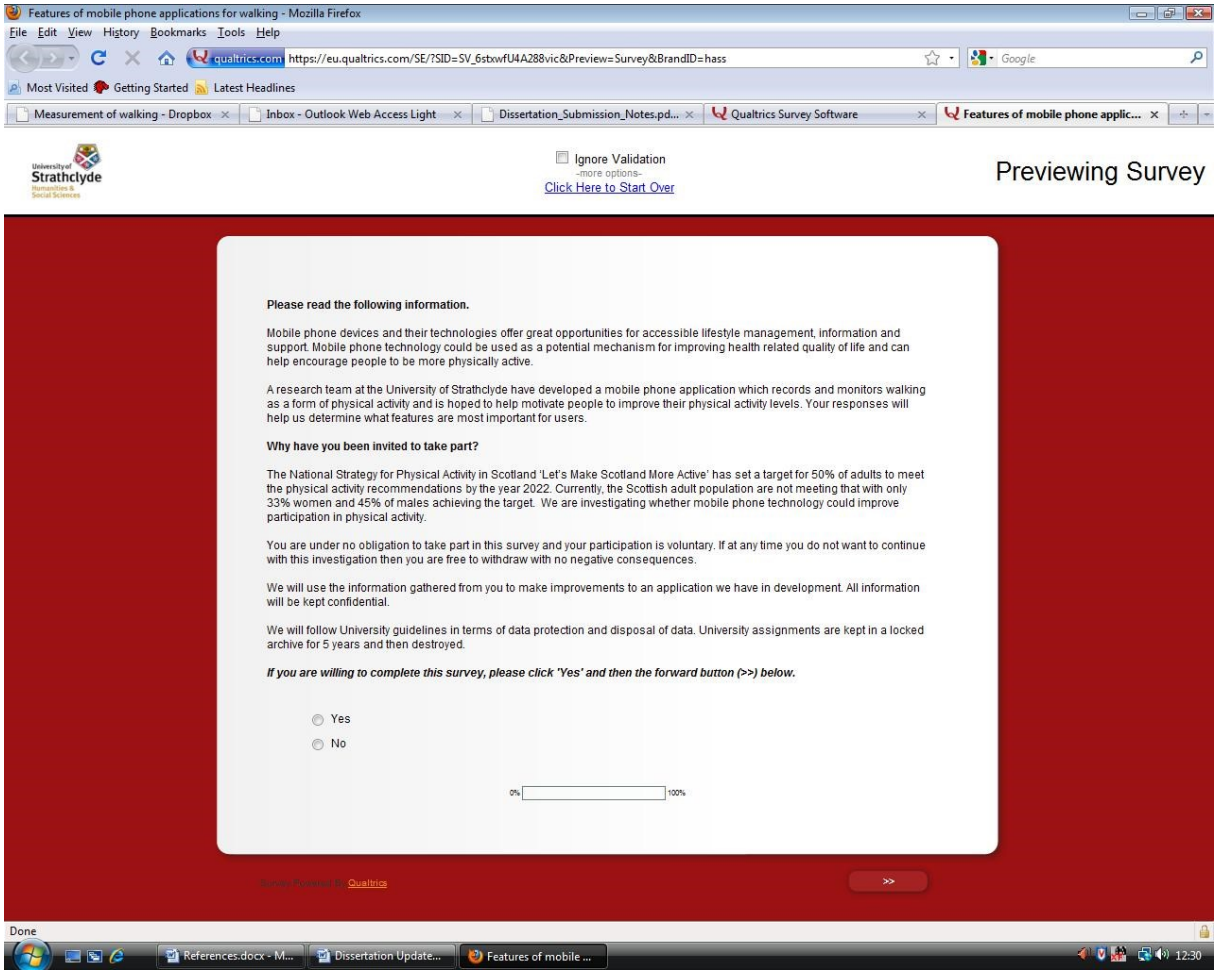



Safety issues with sharing PA data (n = 1)
PA levels are too personal (n = 2)
Motivational (n = 3)
No perceived value (n = 5)
Important to share routes (n = 1)
Sharing PA data
Don't like doing PA with music (n = 1)
Choice in music is personal (n = 3)
Provides motivation to do PA (n = 3)
Distracts from PA (n = 4)
Encourages PA speed (n = 2)
Music
Goal-setting (n = 3)
Walking for health benefit (n = 2)
Misc. features
Engaging features


Potentially useful for beginners (n = 2)
Likes the apps simplicity (n = 3)
Other feedback (n = 5)
Need to improve clarity (n = 4)
Likes the points system (n = 4)
Potential to both motivate and demotivate (n = 2)
Integrate with weight-watchers (n = 1)
Feedback about the stepper app
Points system
First impressions


Mobile app use
PA and technology
Use of technology
Active commuting (n = 4)
Walking for health (n = 8)
Recreational walking (n = 3)
Walking
Participant background
Barriers (n = 4)
PA as an escape (n = 3)
Enjoyment
Active commuting (n = 5)
Physical activity

Appendix E- Online Survey Consent Form



Appendix F- Information Sheet Study 1

Research Volunteer

Information Form

PLEASE READ THE FOLLOWING CAREFULLY

Title of study: What features people want from a mobile phone application for walking.

Introduction

Mobile phone devices offer great opportunities for accessible lifestyle management, information and support. Mobile phones could be used as a potential mechanism for improving health related quality of life and can help encourage people to be more physically active.

A research team at the University of Strathclyde have developed a mobile phone application which records and monitors walking as a form of physical activity and is hoped to help motivate people to improve their physical activity levels. You are being asked to discuss in an interview what features you would like to see in a mobile application. Your opinions will help us determine what features are most important for users.

What is the purpose of this investigation?

The purpose of this investigation is to find out what people want from a walking application. By finding out what features of an application users would like, we can modify our existing mobile application to help give users what they want in the hope that they use the application and will regularly enjoy using it.

Do you have to take part?

You are under no obligation to take part your participation is voluntary. If at any time you do not want to continue with this investigation then you are free to withdraw with no negative consequences.

What will you do in the project?

The project will involve a short discussion of approximately 30 minutes regarding mobile phone applications for the use when walking. You will be asked to discuss what features you think you would want both during and after a walk.

Why have you been invited to take part?

The National Strategy for Physical Activity in Scotland 'Let's Make Scotland more active' has set a target for 50% of adults to meet the physical activity recommendations by the year 2022. Currently, the Scottish adult population are not meeting that with only 33% women and 45% of males achieving the target. We are investigating whether mobile phone technology could improve participation in physical activity.

What are the potential risks to you in taking part?

We do not foresee any risks of you taking part in this study. You will not be asked to do anything that you feel uncomfortable with.

What happens to the information in the project?

We will use the information gathered from you to write a dissertation and to make improvements to an application we have in development. All information will be kept confidential.

We will follow University guidelines in terms of data protection and disposal of data. University assignments are kept in a locked archive for 5 years and then destroyed.

The University of Strathclyde is registered with the Information Commissioner's Office who implements the Data Protection Act 1998. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998.

Thank you for reading this information – please ask any questions if you are unsure about what is written here.

What happens next?

If you are happy to be involved in the study, please sign the consent form that the student will provide to confirm this. If you do not want to be involved in the project then thank you for reading the information. You do not need to do anything else.

This investigation was granted ethical approval by the ethics committee of the School of Psychological Sciences and Health, University of Strathclyde.

If you have any questions/concerns, during or after the investigation, or wish to contact an independent person to whom any questions may be directed or further information may be sought from, please contact:

Dr Susan Rasmussen

CPsychol, Health Psychologist

Lecturer
School of Psychological Sciences and Health
University of Strathclyde

Graham Hills Building

40 George Street

Glasgow G1 1QE

Email: s.a.rasmussen@strath.ac.uk

Phone: 0141 548 2575

Chief Investigator Details:

Dr David Rowe, is supervising this investigation and if you have any questions or concerns about the student or the investigation the please contact him.

David Rowe, Reader in Exercise Science in the School of Psychological Sciences and Health

Strathclyde University, 76 Southbrae Drive, Glasgow G13 1PP

Tel: 0141 950 3712 david.rowe@strath.ac.uk

Appendix G- Informed Consent Form for Individual Interviews Study 1

Consent Form

I confirm that I have read and understood the information sheet for the above study and the researcher has answered any queries to my satisfaction.

I understand that my participation is voluntary and that I am free to withdraw from the study at any time, without having to give a reason and without any consequences.

I understand that any information recorded in this study will remain confidential and no information that identifies me will be made publicly available.

I consent to being audio recorded YES/NO (please circle)

I consent to taking part in this study

I (PRINT NAME)	Hereby agree to take part in this study
Signature of Participant:	Date

Appendix H- List of Statements

The app allows me to set goals for myself

The app provides an audio cue to tell me to walk faster

The app lets me know, during the walk, how far I have walked

The app has a points/rewards system based on my walking

The app provides audio encouragement (for example, clapping) while I walk

At the end of the walk, the app tells me how fast I walked

At the end of the walk, the app tells me my overall distance for the walk

The app provides distance information in miles/kilometres

At the end of the walk, the app tells me how many calories I burned

At the end of the walk, the app tells me my average heart rate

At the end of the walk, the app tells me the total time I spent walking

At the end of the walk, the app tells me my distance in number of steps taken

The app stores data (distance, time, calories burned) from previous walks

The app has a map function which allows me to store and look back at previous route maps

The app allows me to post walking data on social media websites (e.g. Facebook)

The app allows me to listen to music whilst walking

The app tells me if I am walking fast enough to achieve health benefits

The app provides me with a map of my route while walking

The app provides local information (drinking water, toilets) while walking

The app provides usage instructions to maximise the health benefits of walking

The app allows me to store walking data on a desktop or laptop computer

The app allows me to share my route with a trusted individual while walking, for safety reasons

The app allows me to connect to an online walking community and arrange/view organised group walks with other members in my local area

Appendix I- Study 2 Interview Schedule

Firstly I would like to thank you for completing the online part of my study and thanks for meeting me for an interview today. I am researching the potential for a mobile walking app to help people become more physically active as part of my MPhil in Physical Activity and Health at the University of Strathclyde. The focus of this interview is to expand on some of the answers you gave in the online sorting task. It should take around 20 minutes to complete.

Everything you say will be treated confidentially so only my supervisors and I will know who said what, and we will not put any names on any published material.

Can you tell me a bit about your current physical activity patterns and the types of physical activity you like to do in your spare time?

Types of PA, how often, with whom, would you like to do more PA, barriers, walking habits?

Part 1: Group responses

Remind participant about the online Q-sort task; discuss how they rated the features and what grouping category they fit into.

Do you agree with where you currently fit into the grouping category?

Can you explain why you fit into this grouping?

Why are these features important to you?

Part 2: Individual responses

You rated …"feature X…" as one of the top two most important features for you in the online Q-sort. Can you explain why you consider it to be one of the most important features?

How will it help you to maintain/increase your walking levels?

Can you tell me how you would like this feature to be integrated into the app?

What will it look/sound like?

When will it be used?

In the Q-sort, you scored …"feature Y.." as being least important for you. Can you explain why?

How can this be made more important or beneficial for you?

Individual responses to groupings of features if not already mentioned, e.g. social features (Facebook/online walking community), music, or other.

Can you describe how you imagine this feature would work based on the wording of the statement?

Can you tell me any way that this feature might work better or well for you?

Part 3: Rank order statements

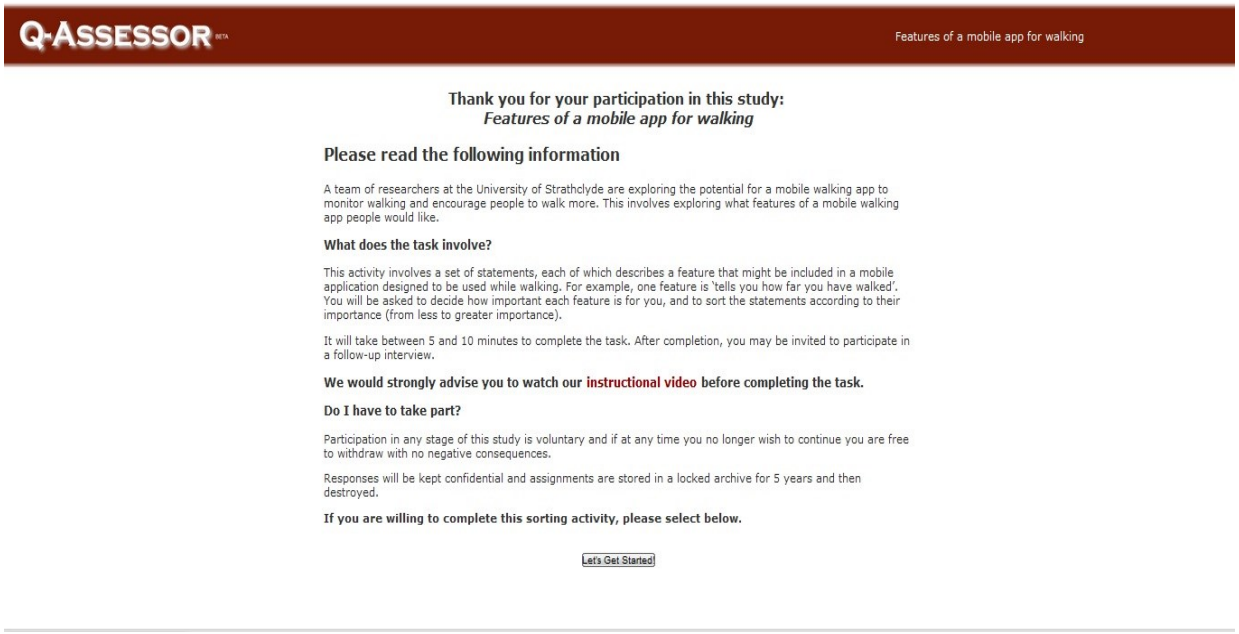
Show the participant the list of statements according to rank, describe how the participants ranked the statements overall.

Features which ranked high or low overall that were maybe previously not mentioned in the interview? (e.g. social features)

Is there anything else you would like to discuss or anything else you would like to add?

Thank you

Appendix J- Q-Assessor introductory paragraph



Appendix K- Information sheet study 2

INFORMATION SHEET

School of Psychological Sciences and Health

Title of Study: An exploration into the potential features of a mobile app for walking

My name is Yvonne Laird and I am a postgraduate student at the University of Strathclyde undertaking this research project as part of my MPhil.

What is the purpose of this study?

This study aims to explore the potential for a mobile walking app to monitor walking and encourage people to walk more. This involves investigating what features of a mobile walking app people would like and why.

What will you have to do?

You will be asked a number of questions relating to the online sorting task you previously completed.

Who can take part in this study?

We are looking for males and females aged between 18 and 65 years who have completed the online sorting task and who would consider the use of a mobile walking app to help them increase or maintain their physical activity levels.

Do you have to take part?

Your participation in this study is completely voluntary and you can withdraw at any time without any negative consequences. If you agree to take part your responses will be kept anonymous.

What happens to the information you provide in the interview?

An electronic form of the data will be stored for 5 years on a password protected computer. The paper format of the data will be held in locked conditions for 5 years then destroyed through the safe mechanisms provided by the University of Strathclyde. All names of participants will be removed and replaced with identifying codes, e.g. PART001.

The University of Strathclyde is registered with the Information Commissioner's Office who implements the Data Protection Act 1998. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998.

What do I do if I want more information?

If you wish more information please contact me (Yvonne Laird) at:
Yvonne.laird@strath.ac.uk or one of my project supervisors (details below)

Dr David Rowe (Project Supervisor)
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Dr Allan Hewitt (Project Supervisor)
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This study has received ethical approval from the department of Psychological Sciences and Health. If you have any questions or concerns during or after the investigation please contact:

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Appendix L- Consent form Study 2

Consent Form

Name of department: Physical Activity for Health
Title of the study: An exploration into the potential features of a mobile app for walking

I confirm that I have read and understood the information sheet for the above project and the researcher has answered any queries to my satisfaction.

I understand that my participation is voluntary and that I am free to withdraw from the project at any time, without having to give a reason and without any consequences.

I understand that I can withdraw my data from the study at any time.

I understand that any information recorded in the investigation will remain confidential and no information that identifies me will be made publicly available.

I consent to being a participant in the project

I consent to being audio recorded as part of the project Yes/ No

(PRINT NAME)	Hereby agree to take part in the above project
Signature of Participant:	Date

Appendix M- Study 2 Interview Transcripts

Researcher: Ok firstly I'd like to thank you for completing the online part of my study and thanks for meeting me for an interview today. I am researching the potential for a mobile walking app to help people become more physically active as part of my MPhil. The focus of this interview is to expand on some of the answers you gave in the online sorting task so it should take around 20 minutes to complete. Everything you say will be treated confidentially so only my supervisors and I will know who said what and we won't put any names on anything that's published. So just to start off, can you tell me a little bit about your current physical activity patterns and what types of physical activity you like to do in your spare time?

PAR001: Well I do some, I cycle about an hour every day um if I don't do that I do about half an hour of swimming.

Researcher: Ok, do you just do these for enjoyment or do you cycle to get somewhere?

PAR001: Well I walk to get places or I drive so I usually cycle for please. I mean for exercise.

Researcher: Ok that's fine. Do you feel like you're happy with the amount of physical activity you do?

PAR001: Well sometimes. It can get very boring sometimes and needs variety. It's good to mix that up a bit (ok) in terms of, yeah.

Researcher: Ok, so how much walking would you say that you do?

PAR001: Up and down the stairs, um, maybe from like my house to the corner shop which is about, not even a kilometre away but some people drive to do that so I guess I'm better off walking.

Researcher: Ok so for of community purposes, walking to get places, like you said? (Yeah) Ok so the next part of the interview is going to be talking about some of the group responses to the online sorting task. Now what we've been able to do is sort peoples responses into

three main groups. You were placed into factor 3 which is this group here and we've called this the well-informed group so what the main kind of things that people were wanting from the features in this group were really well they wanted to know a lot of information from the walking they do from the app. So the main distinguishing features that were different from the other groups were they wanted local information so things like access to (toilets) toilets yes and water and they wanted to know the total time they'd been walking and they also wanted to be able to listen to music whilst they were walking as well and the negative features, the things that they didn't want that were different from other groups, were the ability to store data on a PC, they didn't want an audio cue and they weren't interested in calories so comparing it with the other groups, this group factor 1, the kind of most important feature which was different from all the other groups for them they all wanted music. That was the most important thing for them. In terms of the other features, they were quite similar. The information was what they wanted, like they were saying distance, now that was one of the features that was important for every group but they were also wanting the map of their walk and they also wanted to know if they were walking fast enough for health benefits and calories. Now factor 2, that was a bit different, we called that group the goal-setters because the features that they found most important, yeah like you can see, was the points system and the ability to be able to set goals as part of the app now those were different from the other groups because you can see here that they were listed further down. So let's see, points system was featured negative 2 here and goal setting was a neutral and that's quite similar for factor 1 as well featuring quite low down the rating scale so points system was again minus 2 and goal setting was the same, neutral as well. So can you first tell me, do you agree with the group you've been placed in based on what you've seen in front of you, do you think that's the right fitting in you or do you think there is something else you'd rather be placed in as part of?

PAR001: Well, factor 1 seems very focused on music and the overall distance which is usually what I'm focused on for cycling for example but I don't count calories because I don't see the point in it and for example I pretty much agree I guess cos it's nice to know where you're going and the walking distance um well obviously local information if you're going for a hike or something.

Researching: Just to remind you on the results that you did provide: This is how you fit against your group so you did say that music was one of the most important things for you but I think that the other things that you noted as most important for you best fitted with the factor 3 so em that you've got usage instructions to maximise health benefits, overall distance, miles/km (yeah), total time.

PAR001: Yeah it pretty much overlaps I guess, I'd agree with that.

Researcher: Can you tell me why these features are important to you, so just thinking about the group as a whole, em the well-informed group, why why do you think that's important to you over and above the main features of the other two.

PAR001: Well it's good to know overall distance in terms of, for example you need to know how far you've walked and you need like the local information for example to know like if you're going to pass out in the next 10 minutes and well I the thing is that I guess it depends what you use the app for cos you could use it for example to go to walk so you could walk to work as opposed to taking the bus so I guess you wouldn't need the local information for that.

Researcher: If you are following the same route every day?

PAR001: Yeah. And um yeah I've well music is good because it sort of I dunno it keeps your mind off whether you're tired or not so. (Ok) As for the other ones, I don't know, well I mean you don't I don't know if you'd need online walking community connections but for example you could organise walks with other people which always inspires people to keep walking or running or cycling or whatever, I'm not sure about the other ones. Well I'm not much of a goal setter either.

Researcher: Ok, so would you consider yourself more someone that wants to get information from the app rather than wanting the app to encourage you to walk?

PAR001: Yeah I mean if I'm walking it usually means that I'm wanting to walk, I've already done the encouragement part of it.

Researcher: Ok, so just moving on now to the individual responses that you've gave rather than the group responses. So your top feature or your top two features was music. So can you, I know you've touched on a little bit about why music is important to you but can you just maybe go into a little bit more detail?

PAR001: Well for example you can pick, it's like with the Zumba for example, like you can pick tunes that inspire you to keep a certain pace or to keep a I dunno to keep yourself going I guess and yeah I guess it also means your mind doesn't stray too much from the actual walk. You know you don't think "I'm tired so I'm gonna walk slower" you just kind of bounce along.

Researcher: Do you think maybe music is a bit distracting from what you're actually doing or?

PAR001: Well yeah ok obviously if you're cycling you might get run over but with walking it's a bit safer to listen to music but it can also distract in a bad way.

Researcher: Work both ways? (Yeah) So also making you distract from walking and the exercise, what else it is distracting you from or do you mean as a safety point of view?

PAR001: Yeah, yeah it can distract you from the surroundings or I dunno it can, yeah.

Researcher: Do you find that that can happen with you or?

PAR001: Um, Well I don't really use music to walk although it I find it very appealing to walk with music because it's um like from here to Tesco for example is about a 10 minute walk. Music just kind of, I dunno, it keeps me company (laughs) whereas I dunno on a bike it's a bit more dangerous so I guess it sort of.

Researcher: Yeah ok, so maybe you would listen to music if you were walking but sometimes be careful if you're cycling?

PAR001: Yeah, yeah, you need to keep a certain volumes just to make sure you don't so that you can hear cars, you can hear other people, you can be informed about your surroundings.

Researcher: Ok, and so the other feature was the usage instructions to maximise health benefits. Can you just firstly tell me what you think that is and how that would maybe be displayed?

PAR001: Well because a lot of people use like for example let's say for an iPhone or something or an iPhone walking app they usually use it without actually knowing how to use it so they just sort of fumble around until the know they forget the basic idea of it but um if you have instructions that can actually help you with the like the I dunno how to use an

application or how to I dunno map or how to improve your speed and so on as well as actually I dunno, It could for example give nutrition advice or and so on. I think that would probably help more than actually not knowing how to use something. Well cos very few people actually read a manual for anything so.

Researcher: Yeah ok, so do you think that if you had something that there to tell you "this is what you need to do to get the most benefit from your walk for next time" that that would be something that would be quite good for you?

PAR001: Well or maybe you could have like I dunno not safety tips but health tips like "if you're walking too fast and you get too tired, do this" or.

Researcher: Ok that's fine, just move on now to the features that you have rated as least important for you. So the two features I suppose are quite similar: audio cue and audio encouragement. Can you start by telling me what you'd imagine an audio cue would be like and how you'd imagine that would work as part of the app?

PAR001: Well the thing is I wasn't quite sure what it was, ah, I, I assumed that was probably when you actually like reach a certain distance it would like tell you you've reached you know like 1 kilometre, like a milestone mark or something. (Yes that's exactly what it could be). I think it can sort of, cos if you keep counting it it always feels longer at least from my point of view for example swimming if I count the laps for swimming it takes long longer for me to, it feels a lot longer to let's say 16 laps as opposed to if I count downwards or the other way around or whatever. As for the audio encouragement I just thought it was a bit, I dunno, a bit patronising. "You got here, congratulations, you can walk" (laughs). It's not my style, sounds like a reward system which I guess works if you're, if you're in a competition like for a points system or something but otherwise I don't think it would work for me.

Researcher: Ok, is there any way that you think those features could be integrated into the app in a way that might perhaps work for you?

PAR001: Well maybe you could use an audio cue to tell you if you've been on a route before (yeah) or like you know like part of a route or like point out "you are this much, this far away from like let's say I dunno local information from example, you're this far away from water or this far away from toilets" (ok) I haven't really thought about it that much.

Researcher: Ok, what about for the audio encouragement, do you think that there's anything?

PAR001: I dunno. Well cos if you're listening to music then maybe at the end you could have a summary of it, I dunno, like a "well done" at the end "you did it". Or "bleep". Um, yeah. (Ok) I'm not quite sure.

Researcher: That's fine. So just moving on now as well to em some of the features that were rated quite low as a whole as part of the group as a whole. A lot of the social features kind of seemed to be consistently low em let me just see. So how you've rated the social features, that's neutral there for connecting to an online walking community and another one was the ability to share route for safety reasons and I think there was one more. So those ones were consistently quite low as the group as a whole so I just wanted to talk a little bit about those features and what you think about them so we'll start with what you've already spoken a little bit about connecting to an online walking community. Can you tell me how you'd imagine that would work?

PAR001: Well I guess it would be a sort of kind of forum thing where you say "hey guys, I'm gonna go for a walk today for let's say 2 kilometres or I dunno 15 kilometres or whatever. Does anybody want to join me?" But I think it can also stop you from going on walks cos it's like you'd be waiting for other people to respond. I guess it depends. I mean it's good to like have company and encourage yourself by hanging out with others and having that competition so to speak but em otherwise I think it's sort of well I mean it's also I though originally you meant on Facebook so like you "I did this much on Facebook" which I think it's like useless information for other people to know. Although it does have the aspect, if other people, if you tell for example other people on Facebook that you're going to go on a diet they're going to keep track of this and like tell you "why are you eating this" or like I dunno you have an audience so to speak so they kind of keep track of what you're doing as well.

Researcher: Ok and do you think that's quite a negative thing?

PAR001: Well not quite, I mean sort of, I mean it could be a good thing it could be a bad thing depending on what you do with it. Yeah I think an online walking community would be good for long walks (yeah) but if you depend on it too much then it means that you're going to depend on everybody else to walk with.

Researcher: Yeah I suppose there'd be quite a lot of organisation involved.

PAR001: Yeah, well I guess if it's your neighbour then it's fine you see them every day so you can go walking with them anytime but it's also good to be able to walk by yourself and so, but of course obviously if it's for the share route for safety then it's bad.

Researcher: Yeah, so do you think that an online walking community wouldn't really, I mean I know you've rated it as neutral but is that something that that is something you wouldn't really use in the future or you would maybe use once in a while or?

PAR001: Probably once in a while, but I dunno.

Researcher: So would it be something that you are willing to try?

PAR001: Yeah, I mean, yeah it's good to cycle with other people it's good to walk with other people. Well plus you meet people so obviously if you meet a few creeps it might be a bit of a downer but.

Researcher: Ok, and moving on to sharing route for safety reasons so can you maybe tell me a bit about what you think that is?

PAR001: Well I guess for like let's say if you are walking to a place you've never been before. On the other hand why would you take that route if well I mean it sort of goes hand in hand with the walking community thing? Why would you go somewhere you don't feel safe. Although on the other hand I guess for example if you're walking at night for example you could tell people "I'm gonna walk here so I need someone to accompany me".

Researcher: Preciously. I mean that sort of feature can work in a number of ways em for example you could be you could send a text alert to someone, maybe your flatmate or something, that says "I'm 5 minutes away from home" or something like that so.

PAR001: Yeah, I was thinking of it in a more going out context. Usually if you are out at a bar or something and you have to come back and the only way home is walking. It usually helps if somebody knows where you are.

Researcher: So would that be something that you would maybe use as part of the app?

PAR001: Well maybe. I think it depends cos if you're I guess it also you could also use it for like if you go for a long walk and you get stuck some place or you get injured it's good for people to know where you are.

Researcher: Ok, so depending on the situation? (Yeah). Ok so the other one was, which you have also spoken a bit about as well, was the ability to post data to social media. Which I can't actually see on your thing, but em, can you tell me a bit about what that would be and would you think you would use it?

PAR001: Well maybe. I think that I could say that I've been to some places due to walking but not, maybe I would not post my route to Facebook or something like that, but although it would be good if you were travelling somewhere like a long distance that you've never travelled before and you're travelling with a few other people it might be good for a few other people to know as well in case something happens like in case of emergency.

Researcher: Yeah, So in terms of "I've just been for a walk, this is what I've done"?

PAR001: Yeah, no no not really. I would probably post a status on status as opposed to just posting "I did this" but only if it was something like I dunno for example for the first time when I cycled 18 kilometres for the first time I was over the moon so I just posted that on Facebook but if I if it was just like 2 kilometres or something it wouldn't have been a big thing.

Researcher: Ok so maybe something maybe once every while something that's a bit more of an achievement you would think about? (Yeah). Ok that's fine, let me just see if there's anything else that we haven't spoken about. Em, I don't really think that there is. Is there anything else that you want to discuss or you feel like hasn't really been mentioned.

PAR001: I can't really think of anything.

PAR002 interview

Researcher: SO first off I would like to thank you for your participation in my study and for doing the online sorting task. I am researching the potential for a mobile walking app to help people become more physically active. The focus of this interview is like I said to expand on the responses you gave in the online sorting task and it should take about 20 minutes to complete. Everything that you say will be treated confidentially so only me and my supervisors will know who said what and your name won't be put on anything that's published.

So first off I would like to ask you a little bit about your current physical activity and what you like to do and how often and that sort of thing. Can you tell me a little bit about that?

PAR002: Well I don't know if I am what you are typically looking for just for this app just now just particularly because one of my walking group colleagues and I have just signed up to participate in a health trek activity called the great Pentland push that's in aid of fundraising for St Columbus Hospice and you've got a choice of the distance you cover. We've just gone for the most modest one which is thirteen miles, a thirteen mile hill trek over the Pentlands, so we've started doing a lot more structured training and walking so it's a bit beyond your getting fit, your sort of basic getting fit and being sedentary. So at the moment we've got quick a keen focus at the weekends and trying to do something sort of very active and fairly local if we possibly can but from that perspective as well a walking app is something that is quite useful to us and we found yesterday that walking up the Pentlands that you kind of hit these black spots where GPS didn't actually work so therefore you couldn't actually track your distance so we are kind of doing something exceptional at the moment which means that we are consciously more active and doing a walk more than we would have done say a couple of months ago just because we've signed up to this challenge. But as I say I have got an app on my mobile phone and I use it just to track distance and so on, regardless of what sort of walk it was, and I was a bit disappointed it didn't work where we were so I felt I was missing something not having access to that information just about how much distance we'd covered and how look it took. A basic bit of information about change in terrain and so on. So yes, we're kind of in that stage for the next few weeks where we're trying to do a lot more than we probably would do.

Researcher: So do you purposely go out and train once or twice a week or?

PAR002: Yes, every weekend we're trying to do something, Melinda and myself. Variety, not always hillwalking. It could be on the flat, just to add a bit of variety really. So we are trying to do something pretty much most weekends if that's at all possible.

Researcher: Ok so just to move on now to the group responses. These are what these three tables are and these groups in the sorting chart that you had. This is the three groups of least importance moving to neutral then greatest importance. Now the three groups, the way its sorted is based on how people have responded. Now what we have done is clustered people together based on similar responses. So the most important thing for people in factor 1 was to be able to listen to music. They also wanted some basic information about their walk. Factor 2 wanted the app to encourage them so they wanted to be able to set goals and they liked the idea of the points system and those were the sort of features that were different from everyone else. Factor 3 was the one that you fitted into and we've called that the information group. Everyone wanted quite a lot of information about their walks so things like a map, local information, time, distance, that sort of thing. So these are what your results are and how you fitted into the group as a whole.

So firstly I'd like to just ask, do you agree with how the group that you've been placed in?

PAR002: I would say so, yeah. Yep.

Researcher: Can you explain why you think you think you fit into this group?

PAR002: Well I am more, I'm not really interested in music that doesn't appeal to me that's a distraction as much as anything else and I do feel that you need to keep your wits about you a lot of the time when you are actually out and about so music it puts you into your own little bubble and you're just not conscious of what's going on around you so I would say that that's not a priority for me whatsoever. Em, yeah it's more specific information just as I was saying earlier on about hard facts about the walk you've done and what I've achieved with the kind of core information about distance and time and being the most useful sort of information to me. Yeah, so being able to, the mapping function, and being able to track your distance as you go along again these are all sort of core elements of what I do because I do a lot of exploration. I may be following a route that maybe someone's told me about but quite often I'll kind of modify it to kind of suit myself so having an appreciation of just what distance you've covered is actually quite important but personally like I said like audio encouragement because I feel I'd be using it in a different way than maybe a number of the other people that you interview who sort of need all this.

Researcher: So things like the points system, would that be something that would motivate you?

PAR002: Can you explain a little bit about what you mean, what you understand, by a points system?

Researcher: Um, a points system could be anything. It's quite general. What I think the idea would be is the person that is using the app would get points for the walk that they've done that possibly interlinks with government guidelines or something like that. Or say if they have a goal that they want, a certain number of points that they want to achieve, so sort of meeting targets.

PAR002: Well again to a certain extent, yes that is useful, particularly when you have not got a lot of training experience. To know that you have done a certain amount of miles, therefore by accruing these points as you call them Yvonne, certainly does let you know that you are on track to gain a certain level of fitness or to gain a certain number of miles. So I suppose so to an extent it is yes.

Researcher: But the more informational features are probably what's more important for you personally?

PAR002: Yes, that's right.

Researcher: So I am just going to move on now to your individual responses so I will touch on the features that you rated the most important to you which we have kind of talked about a little as well, so you've talked about overall distance, is that, I mean, why is that important to you?

PAR002: Well my initial interest in overall distance is, as you know, I am one of the walk organisers for a walking socialising group so I try to find new routes that I think would be interesting and appealing to the members and one of the bits of information I have to give them is how far is it, you know, how long is that walk and what are the opportunities for them. You know, if it's a very long walk then it could broken up into segments so that maybe they could take the bus from a halfway point so that someone who is maybe not quite as fit or has maybe suffered an injury and doesn't want to overdo it, they can maybe drop out. So having an accurate appreciation of distance from that perspective is actually quite important but for me I do prefer longer walks rather than doing little short ones so I do like to know if I am actually covering a reasonable amount of ground but my primary interest in the overall distance is I think from the walking groups perspective so that I can reliably say "oh yes it's 8 miles but at the halfway point there is a bus that you can just catch back if you felt it is a bit too much for you" type thing so that's primarily why distance was important.

Researcher: And a secondary reason was for your own personal kind of, reaching targets?

PAR002: Yes, yes, if I've not been somewhere before and I'm exploring the I like to get a feel for how long it's taken and what sort of distance is actually involved in it yeah.

Researcher: And the second most important feature for you was miles and kilometres. Can you tell you why that was more important to you?

PAR002: Well, again, it's an accurate reflection of the amount of time spent and the distance covered so having that information is quite crucial. Um, miles and kilometres is quite useful because your OS maps are mapped out in kilometres but we still think in miles and some people find it difficult to translate between the two so being able to have flexibility to actually have the distances mapped out in both. The girl that I am doing the hill trek with is French so she thinks in kilometres in her head and finds it difficult to relate to miles so being able to have that information in both numeric systems is actually quite useful.

Researcher: And I noticed you rated miles/kilometres and overall distance a lot higher than say for example steps. Do you think that steps is a less meaningful way of measuring for distance for you.

PAR002: To me personally it doesn't really matter but to someone that's maybe less active then just being able to do, for example 500 steps one day then 1000 steps the next day may actually be a real achievement for them, so definitely to know that they can that they are improving, I think that that is quite a more simple more level of achievement there. But then taking you so many steps, these step counters, just tracking your everyday activity, again it's not something that I feel that is necessary for me, but depending on why you are doing it its useful to know that you've becoming less necessary and you are actually making more of an effort. You're using the stairs and you're walking to work and so on and if steps is a more meaningful measure to that individual then that's fine but to me personally no I don't need to know how many steps I took when I did a ten mile walk.

Researcher: Ok, so moving on the ones you said were least important, so the ability to post things to social media and local information. Can you start of by saying what you think local information would be as part of the app, so if you could maybe give me an idea of what you imagine that would be?

PAR002: Well local information. Um... I think supplementary stuff that surrounds the nature of the area or the place where you're walking because as I was saying earlier knowing where if if for any reason it was just becoming too much and you thought "to heck with this!" and you just had to stop and I can't complete what I thought I would want to do today. Being able to know the option of say public transport is there is actually quite useful to get information on what that actually is and where (laughs) you could go to get it is actually quite quite useful so about the locality and sometimes, it kinda goes into your social media side of things as well, so about facilities that are within areas you know cafes, where you can actually take a break if you need to because that's one thing, if I'm walking with the group, they do like to know where there is a good café so they can have a nice coffee (laughs). But, yeah, local information.. it might also be weather. Weather is quite important as well. I find myself looking at the met office forecast for particular areas quite frequently and that will influence my decision as to what I do and whether or not I opt to change my plans. So things like yeah, weather is particularly important I think, because when people are starting to get fit as well being quite sedentary to start to be more active they can quite easily be put off by the fact that it looks as if probably going to rain later and then again not knowing what your options are if you get caught in a thunderstorm, you know, back to the local information you know oh ok I can just cut short and get the bus back. Weather would be the thing that would be most useful, then followed up by the information about local transport then possibly supplementary things to refresh you on the way (laughs).

Researcher: So do you think that, I mean I know that you stated that quite low down the scale, I know you've said it might be something you would use, do you think that is still something that is quite unimportant to you?

PAR002: Well, I do it beforehand. I find out about the all the options and I try to find out about whether or not there's a suitable café and I look at the weather so I've got all that in my head before I set off. Its fortuitous if I discover something along the way but because I don't know of any other way of getting it on route, well I mean there are probably things I could use like foursquare that will tell you about things that are in the vicinity whether or not they are tailored to the out of town more remoter environment. It's all very well saying "you might be interested in this exhibition" or "there's a nice restaurant around the corner with an offer on" that sort of thing but on a rural from a rural perspective, so I tend to do it all in advance and try and find out that informative in advance so from that perspective it's not that important in an app. I think I would probably still do it even if it was on the app but that's just the way I am. I like to be as fully prepared as possible before I set off. I'm sure it would be useful and if it can supply information on the way to sort of supplement what I already know then great.

Researcher: Ok. The other feature was posting to social media. Would that something that would be interesting to you?

PAR002: Well (sighs), I think there's an age thing in this as well because um personally I can't see why people feel the need to communicate the minutiae of everything that they do um to the world. Who cares frankly? Because I mean I've got a Facebook account, I've got a lot of people that I'm friends with and the mundane dribble that a lot of these people just put up there is a complete waste of time and of interest to nobody, other than themselves, I don't know who they think is actually interested in this, but in saying that you know because we've signed, myself and Belinda, have signed up to do this hill trek walking activity, they the group Pentland Push, they have a Facebook page and they they're all just kind of getting started just now so there's not much information on it just now but there is an ability to post up a photograph and to say a little bit about what you've been up to. Um, so, Belinda and I have decided that we'll do this, we'll contribute towards this. So in that respect, what I did yesterday was um I put one picture up of one photograph of the place where we were that we were walking in and just said "this is"... you know you've got to give your team a name and we've just went for something daft like the Pink Ladies um so "the Pink Ladies tackled Turnhouse Hill and Carnethie Hill yesterday" and there was a photograph of the hill so in that respect I have done it, but it's for a specific reason, and I wouldn't do it as a matter of course it's just because we are involved in this particular special activity that we've gone on lots of training walks for and to get things started so that other people will do it as well. So, um, I wouldn't do it in general but em mainly because I couldn't be bothered working out how to do it but then (laughs) when I saw that they had a Facebook page I thought "ok let's, let's try and help them get more people to show what they're doing and put up a picture and a little comment". What they allow you to do is quite restricted em so if they if they let you put more information up then I might be more enthusiastic about it so it's very limiting what you can and can't do. But, but, yes, so if there's a good practical, valuable reason for doing it and it's something special then yes I will engage with social media but not as a rule.

Researcher: Ok, great. Next I would just like to talk about how people overall have kind of arranged features according to importance and quite commonly amongst everyone in the group they rated the more social features quite low down on their range of importance so things like what we were just talking about, like posting to social media, and also the connecting to an online walking community and the sharing route for safety purposes which is quite similar to you its rated quite far down. So I just wanted to talk to you about those sorts of features, what you would imagine they would be and whether you could see yourself using them. Just to give me your general opinion on the sort of social side to an app.

PAR002: Well again, I don't really see myself that as being something of value and I'm thinking back to the 'Map My Tracks' app that I've got which is on my iPhone just now and it has the ability to run in an offline mode just turn my phone and the GPS or you can actually run it in the online mode where it talks to the website em over the internet um and

you can have your data stored online and it connects you to the sort of wider community so that other people can see what you've been doing and where you've been going um but from my perspective that's, that's not important to me to be able to connect online and share that information. It's back to what I was saying: Do people really care? Why do these people have enough time to be sitting spending time looking through all this information? But saying that, when I've been trying to find interesting routes occasionally when you do like a Google search it'll pop up something that'll say like "Map My Walk" and it'll show you where someone has cycled or where someone has walked. I might actually spend a bit of time but it is just purely coincidental, I don't actually go looking for it, therefore in general I don't really contribute or feel it's something I would personally want to contribute a lot of information. I prefer to use it in an offline very sort of personal mode just for me, you know, yeah, it's, it's really between me and the app as it were rather than between me and the app and the world.

Researcher: Do you think that if you were kind of given a, some kind of access on your phone, to access different routes in the area maybe ones that you hadn't been to before do you think that would be of interest to you or are there other ways that you would go about doing that?

PAR002: No, it's always interesting because it does take quite a bit of effort to explore. I mean I love maps, I like looking at maps and working out routes and things be it urban, suburban or rural. So I suppose if you, if you're not that way inclined then to have something just popping up saying "you might want to try this. I see that you like walks of about 5 miles of fairly flat terrain. This one might actually be quite good for you or you might actually find this one quite interesting". But, for me personally it might not be as useful but I'm sure for people who, who maybe just don't have that sort of passion for maps and exploring and maps and routes and things it probably would be because it makes it easy for them to do so certainly for if you're trying to encourage people to get fit. To give them as much information and as many options as possible might actually be quite a good thing.

Researcher: Ok, the next bit was sharing a route for safety purposes. Can you talk to be a bit about that and what you imagine that would be like and whether or not you think you would use that?

PAR002: Yeah, again, it kind of comes back to this music thing again and for me it's not really necessary to have that sort of information because I think as long as I've got my wits about me and I've got an appreciation as to what the route is like physically. What the terrain is like, the conditions and so on, it's not really an issue. But that would be something I would establish because I would have spent a lot of time before even setting out. But, eh, yeah, to me it's not something that is in my mind although I do get comments from some of

my walkers in my group to say “and you went out and you checked that all on your own, you walked round that all on your own, oh I wouldn’t do that. Oh you need someone to come with you.” Just as they say for safety sakes, for comfort, somebody that’ll come with you, so they find it a bit, what I do and just take as natural, they, they’re a bit sort of worried and concerned about and probably wouldn’t do it themselves so I tend, maybe I should (laughs) have more concern in that respect but, eh, again it’s it kind of ties into that sort of posting everything to social media and the dribble you have to wade through to find the nuggets of information “oh by the way I walked that route and there’s been a landslip and the path is very unsafe and you’re now diverted through a housing estate which is not terribly safe”. To actually get to those nuggets, there’s so much dribble to wade through, it’s not worth the effort. But maybe I’m just a sort of stronger personality in that I don’t worry about it as much as a lot of other people.

Researcher: Well I think that’s all the things that I wanted to talk to you about. Is there anything else that you feel haven’t been mentioned or anything you want to expand on or anything?

PAR002: No, I think that generally covers it. This definitely is a reasonable reflection. I think you’re absolutely right that the factor 3 side is probably more where I fit in rather than any of the other ones really but I would certainly just be using it as a very sort of practical tool possibly in quite a basic mode, as it were. And I definitely don’t feel the need to have all this additional information. It’s not vital to me, it’s a, it’s purely a tool to me that I use just on particular occasions. I just don’t have time for all the social media and the engaging and the exchanging (laughs) of information.

Researcher: So something quite simple, quite straightforward, just press it and go sort of thing?

PAR002: Pretty much, because even the app I’ve got loaded on my iPhone just now can do a lot more it can link to the online community and upload information online as you are actually walking, it doesn’t really interest me and the way I would prefer to use it. It’s just all about sort of personal information and I don’t feel the need to have to share it with em anybody else.

Researcher: Firstly I’d like to thank you for completing the online part of my study and thanks for meeting me for an interview today. I’m researching the potential for a mobile walking app to help people become more physically active as part of my MPhil in Physical

Activity and Health at the University of Strathclyde. So the focus of this interview today is to expand on some of the answers you gave in the online sorting task and it should take about 20 minutes to complete. Everything you say will be treated confidentially so only me and my supervisors will know who said what and we won't put any names on any published material.

So just to start off, can you tell me a bit about your current physical activity patterns?

PAR003: Em, I'm not a very physical, I'm not very active really. Eh, I walk a bit, I walk to work and from work when the weathers nice.

Researcher: Ok so, do you think that being more physically active, is that something that you are trying to achieve?

PAR003: Yes, it is.

Researcher: So would you say that you're not very happy with your current physical activity levels?

PAR003: No, I want to increase them.

Researcher: So what is stopping you from being more active just now?

PAR003: Hmm, I don't know. Em.

Researcher: Well you said the weather earlier?

PAR003: The weather, yeah, and time. Time, I don't really have the time.

Researcher: How do you think that you can change these things I mean those are both things that you can't really change? Do you think that there is room for you to increase physical activity in your?

PAR003: I think that if I motivate myself enough there would be definitely be room for improvement.

Researcher: Ok so do you think that part of the problem that you're not as physically active as you like is that you're not motivated to be?

PAR003: Yeah, I'm not motivated enough.

Researcher: Ok, what we're just going to move on to do now is to talk about your answers to the online sorting task so just to give you a little reminder as to what your answers were. This a little print out, so you'll remember that you were given a list of statements. It was 23 statements and you were first asked to sort them into 3 groups in the online programme so it was, you got a statement, and you were to decide if it was "least" "neutral" or "greatest" importance and after that you moved on and you had to sort them into these categories here. So moved from greatest importance, important, somewhat important, down to neutral, somewhat unimportant, lesser importance and least importance, and as you can see from the printout it was a different rating scale for each so for the greater importance you could only put 2 then it moved up to 3, 4,5 then back down to 4,3 and 2 again. So the features that you thought were greatest importance were to be able to tell you your average heart rate and for the app to tell you if you were walking fast enough to achieve health benefits. Then moving down to your least important features were for the app to tell you how many calories you burned and for the app to have to ability to post walking data on social media websites. Now what we've been able to do from analysing the results of the online sorting task and the results from other participants is to group participants together. So there was three groups that came out of the data and the group that you fitted into was the "well-informed group", so this group was wanting to get a lot of data from what a walking app could offer and wanted to know information so they commonly wanted to know things like local information so if there's toilets nearby, access to water, the total time they spent walking and they wanted to be able to listen to music whilst they walked. Now I should tell you that these are the features that stood out for this group alone. Other groups didn't highly rate these features compared with your group and negatively reported features, you didn't want to be able to store your data on a computer or a laptop as a group as a whole, you didn't want audio cues and you weren't interested in calories. Now comparing that to other groups, we've got the goal setters who wanted the ability to be able to set their own goals as part of the app and they wanted a points system, so like the idea of the app giving them points based on how much they were walking. And they didn't want some features which you thought were

important such as the music and they didn't want a map while they were walking. The other group was the musically motivated group, so all of that group wanted music while they walked and that was one of the most important, distinguishing features as well and they didn't want the idea of steps. So just having a think over that, can you tell me if you agree with where you currently fit into the grouping category?

PAR003: Yeah, I do.

Researcher: Can you explain why you think you fit into this grouping category?

PAR003: Em, em, I'm not interested in the points system or the goal setting. (Ok)

Researcher: So thinking about the features of the group that you're a part of, the well-informed group. Did you think that you wanted a lot of information.

PAR003: Yeah, I wanted the app to give me information. (As opposed to?) Rather than giving me goals to stick to or break and giving me points. I want information from the app about what I'm doing.

Researcher: Ok. And in terms of the distinguishing features, so, what came up from positives were the local information, total time, music. Do you think that those were three features that you yourself would find important? Do you agree with them being?

PAR003: Em, I wasn't as interested in the music. I'm actually quite surprised that that was one of the main points within that group but maybe the other people in the group said music was important to them but it wasn't for me.

Researcher: Well it wasn't necessarily what the participants rated as the highest, it was, it just one of the positive one and distinguished them from the rest of the group. What about the negative features, what do you think about those?

PAR003: Em, the audio cue and the calories, they were, they were negative points for me personally.

Researcher: Ok, why is that?

PAR003: Em, the audio cue I don't think I'd benefit from that. And the calories thing, I don't want to be told how many calories I burned while walking cos it's very demotivating to find out that you've burned hardly any.

Researcher: Ok, what about the audio cue? Why do you think that wouldn't work for you?

PAR003: Um, I don't. Honestly I just wouldn't listen to it.

Researcher: What would you imagine an audio cue would be?

PAR003: Um, I imagine it to be just something coming on to say "you need to pick up the pace because you're not walking fast enough to get any benefit" or something like that and I wouldn't listen to it.

Researcher: Ok, can you think of any way that an audio cue could work for you?

PAR003: Um, no.

Researcher: Ok, so do you just think that's it's just something that would never work for you.

PAR003: Yeah. I'd rather walk and find out at the end of the walk whether I'd done, like whether I'd been walking fast enough to have any benefit from it and if not be told at the end and then change that the next time I go for a walk.

Researcher: Ok that's fine. So just moving away now from the responses from the group as a whole and move on to your individual responses. So I'd like to first talk about the two features that you rated as greatest importance to you. So the first point here is talking about

average heart rate so that was something you wanted to know at the end of the walk. Can you tell me why that would be important for you?

PAR003: Em, mostly because I'm interested then also because it'll let me know if I've...

Researcher: Why does it interest you?

PAR003: I don't know. I'd like to know if there's differences between my average heart rate when I start walking and then compared to the average heart rate that I have say after a while of using the app to see (if it made any improvements that way?) yeah.

Researcher: Do you have any other reasons for wanting to know your heart rate?

PAR003: No.

Researcher: You also said you wanted to know, or you wanted the app to tell you if you were walking fast enough to achieve health benefits. That was the other feature that you rated as greatest importance. (Yeah). Can you tell me a bit more about why you selected that?

PAR003: Well I'd like to know that I'm getting some benefit out of the walking. Um, I'd ideally like to find that out after the walk not during and em also like if I'm not walking fast enough to get any health benefits from it then I think the app should say so that you can change it.

Researcher: Ok, so it's important to you that you're going to get benefits from the walking that you're doing (yeah) basically. Is there anything else that you wanted to add about those two features? (No) Ok, so just moving on now to the features that you rated as least importance. So we've already talked about calories and you said that you didn't think that that information was going to be of value to you (yeah) what about the ability to be able to post your data on social media.

PAR003: I'm not really interested on that, I don't really want to post on Facebook or twitter about walking and "I walked this far, I burned this many calories".

Researcher: Why, why is that not something you would do?

PAR003: I dunno, I just don't want everybody to know. The walking is something I do for myself not for anybody else.

Researcher: So do you think that is something that is quite personal and you wouldn't want to share? (yeah). Ok, so how do you think the em the features that you rated as most important would be integrated into the app, so think maybe first about average heart rate. You said that you would want to know that at the end but how do you think that would work as part of the app.

PAR003: I dunno, I'd like to know that during the walk actually (ok) like some sort of small part of the display has your average has your heart rate during the walk and then also like a report on it at the end of the walk as well.

Researcher: Ok and how would it be displayed on the app?

PAR003: I don't really know.

Researcher: Would it be as part of, like a graph, maybe something that you could compare over time or would it be like you could have a graph of when you started walking, when you continued walking, when you stopped walking, maybe time after you finished walking, how long did it take your heart rate to go up and down, does it stay the same or would you want it to say this is your average heart rate.

PAR003: I think a graph would be good to see how it changes through the walk and also you can compare a graph of a walk of a certain date to a graph of a walk on a different date.

Researcher: Ok is there anything else that you can think of as to how that would be integrated into the app? (No). Ok and so moving on to the other feature you said was of

greatest importance was for the app to tell you if you were walking fast enough to achieve health benefits. How would you imagine that would feature as part of the app?

PAR003: Em, I would imagine that to come at the end, like say when you have like a run-down of like what you've done like the distance you've walked, the average heart rate, and then like something to say "this is like this is the health benefits you got from this walk, you can improve it by doing such and such".

Researcher: Ok, so, maybe like another kind of graphical thing as well or would you like it to be something simple? (Something simple yeah).

Ok, so I just wanted to move on now to responses to some of the things here that were a sort of kind of grouping features together. Quite consistently, a lot of people were saying things like "an online walking community", you've said that's of less importance to you and you've said that that's something that wouldn't be of interest to you. Can you tell me what you imagine that would be first of all?

PAR003: The online walking community?

Researcher: Uhuh. How would you imagine that?

PAR003: I would imagine that's some sort of online space where people using this app can go and like see each others information, like say if you had a graph for average heart rate stuff, you'd be able to see everybody else's stuff and talk about it maybe share walking routes and stuff.

Researcher: Ok and why would do you think that wouldn't work for you?

PAR003: That goes back to the whole being able to post on Facebook. For me, when I want to walk to walk it's because I want to walk I don't want to share it with other people like especially like the information whether you've gained health benefits from it or whether your average heart rate and stuff like that and I don't want to be able to share that sort of stuff.

Researcher: Ok, is there any other, I was thinking about walking communities I mean they can present a lot of different opportunities an online walking community can mean a lot of different things. Is there any way that you think it could be something that would work for you? I mean maybe necessarily not about sharing information, sharing routes, maybe as an encouraging tool, but as something a bit different like a social group that maybe meet up regularly to go on walks with people in your local area.

PAR003: Em, yes that might work but then it kind of goes back to the whole when I walk it is me alone walking but maybe in a group would be better so some sort of online community where you can meet people who want to walk together it might maybe.

Researcher: Would you think it would work for you or do you think it would be something that you're not really interested in?

PAR003: I think maybe after some time it might be something I'm interested in. After I've got into the habit of walking maybe it's something I would be more interested in.

Researcher: Do you think that because you don't do as much as you would like, just now that's maybe a barrier for you doing something like this?

PAR003: Yeah, I'd be worried that the people other people going walking would be able to walk further and faster than me so I'd want to wait and maybe look into it when I've done more walking myself.

Researcher: Well what if a group was tailored to different levels, like if there was lower active people, people that were just starting out and maybe people that wanted you know people that wanted different things from the group? I mean there could be people that were more active, there could be people that were less active, people that wanted to go for short walks.

PAR003: Finding people that were around the same activity level as myself and wanting the same benefits from the walk then maybe yes I would be more interested in.

Researcher: Ok, so the other part was just to show you how the statements were ranked overall as a group um so I'm just going to talk to you about that quickly before we finish up.

Ok so the statement that was most popular for everyone in the group was the ability to set goals and then it was to have an audio cue and then it was during walk distance so moving down um to the least important features it was consistently sharing route with a trusted individual and connecting to an online walking community. If you could just take a minute to read over that and then tell me how you feel your views fit in with the groups as a whole.

PAR003: I'd say that I fit in pretty well with the group.

Researcher: Ok, and I just wanted to bring up one more point, um you can see quite clearly here so one of the lesser important features marked as the group as a whole was the ability to share your route with a trusted individual. Can you tell me what you think that is firstly?

PAR003: I thought that was primarily for safety. If you're going on longer routes, walking routes, like say in the hills or something um and the reason that I marked that as lesser importance to me is because that's not the sort of thing that I would the sort of walking that I would be doing at this point.

Researcher: Ok, so.

PAR003: I didn't see it as a sharing your route.

Researching: What about the other walking you do, I mean there's other dangers that can be associated with walking. Do you think that do you feel safe normally when you're walking or do you think that having something like that would maybe make you feel more at ease or?

PAR003: Em, I generally feel quite safe but like I said I don't tend to go on long walks off the beaten track. Maybe if I was to do that I'd want a feature like that in the app.

Researcher: So how do you think it would work, the feature, do you think that it would be something public or private?

PAR003: Private, with...

Researcher: Like a text message or something?

PAR003: Yeah.

Researcher: Ok, is there anything else you would like to discuss or expand on?

PAR003: No.

Researcher: So first I'd like to thank you for completing my online study. The focus of this interview is to go into a little bit more detail on some of the responses you gave in the online study and it should take about 20 minutes or so. Everything that you say is going to be treated confidentially so only me and my supervisors will know who said what and there won't be any names on anything that's published. So firstly I'd like to ask you a bit about what you do just now in terms of physical activity and what your kind of patterns are like?

PAR004: Ok, um, not a lot. (Laughs). Eh, I, obviously I work in the city centre and I live out in Gorgie, south west of the city, I mostly live there because its surrounded by really good bus routes and I take the bus to town to get to work every day so um I occasionally walk home but that's like one a month like very rarely and I never walk to work because I just can't get up that early in the morning. Eh I try and do some kind of physical activity, not specifically walking, but going to the gym or going to a dance class or something like that maybe once or twice a week or sometimes I go walking at the weekends so hill walking, hiking, that kind of thing, but I would say that all of those are occasional well certainly the weekend things are occasional rather than regular. I don't go every weekend by any stretch of the imagination.

Researcher: Ok that's fine. Ok so next I'm going to talk to you a bit about group responses now what we've done is group, we've used a statistical programme to group peoples responses together so into similar sort of groups and this is the group that you fitted into. That's factor 2, now the kind of distinguishing features about this group that were different from the others were that people kind of wanted the app to be quite motivational so they wanted things like a points system and goal setting, that sort of thing, and that's a bit different from the other groups because the factor 1 group were quite focused on having music and the factor 3 was quite a lot of information they wanted from the app so things like a map and local information and things like that. So just having a look over that and based on what I've told you about the other groups do you think that you agree with how you've kind of fitted in to this group?

PAR004: Yeah I think probably. I really struggled to do that task actually, partly I think I want it to do everything so having to pick things that like having to fit into the number of things per category having to have things I didn't want I actually found pretty hard because I kind of thought actually no I do want quite a lot of that so it was really a case of doing the priorities so it wasn't so much that like I definitely think that I would that the priority for me would be motivational things so I would definitely agree with that so things like the points system and goals and that kind of thing seems to fit however having said that things like information, local tips or routes that kind of thing, or actually the music as a motivational tool would be quite important to me as well so I kind of as I say I think me to a certain extent I think loads of it is important, there's not a lot that's not important, but I think my priority would be the motivational aspects. That seems reasonable.

Researcher: Great, em ok, so I'll just talk now to you about the responses that you actually given these are (Oh good, I had no idea what I'd did or what I'd said) those are your ones there so I'll speak to you first about the ones that you've kind of marked as the most important to you and then I'll talk to you a bit about the ones you've put as least important em so we'll touch on what you just talked about there, if you could tell me a bit about more about having a points system as part of the app and why that would be good for you?

PAR004: Em, I'll admit this to you now, partly because that's kind of the work that I do. (Laughs). We do some work in incentives and behaviour change and that kind of thing so I understand a lot of that from a theoretical point of view and so professionally and also I kind of believe in that because personally that's the kind of stuff that's important to me as a just as an individual in my life. I tend to have very poor motivation, I know this, but I struggle still to do anything about it so having some kind of motivation for small things that accumulate into a bigger achievement and things like that I think definitely would work with me and I actually signed up for, now who the hell was it, was it walking streets did a thing in May, May. They did a month's campaign about getting people to walk more and I signed up for that and I know that, and they had different challenges and things, and I walked more to work in that month than I have in my entire 6 years of working in this building beforehand and it was stupid, and I did collect points from doing that what you kind of did but they didn't give you anything at the end of the day it was literally just you clock up some electronic points and then they disappear at the end of the month, there was no real bonus to it, to my overall life but I still quite liked the clocking up the points and getting and doing different challenges and taking photos of different things on my way home and stuff to get more points so the sort of the gaming aspect I suppose we talk about it sometimes that kind of rewards type thing does work with me.

Researcher: Ok, great, and em the goal setting as well for. How would that be important to you?

PAR004: Um, again in terms of I think sort of if you're gonna accumulate points or something like that to be working towards something to have a purpose to it. The one downside of that thing that I did so as I say you just clocked up electronic points and there was no benefit to it whereas if I was actually if I had actually been working towards a goal of walking a certain distance in a month or doing or achieving a certain fitness level by a particular time, having that kind of, something to work towards is quite important for me, um, I'm also going to do the Ink Trail in seven weeks which is quite a big goal and is currently giving me a bit more motivation to get off my backside and do something so again I know that having something to work towards for me is quite an important thing.

Researcher: Ok, great, and em the overall distance as well. That was another one that you put as greatest importance to you. Can you just talk to me a little bit about why overall distance would be one of the most important things?

PAR004: I think because it's a really basic, simple measure that you can that you can always do that easily. You can always suss out how far you've gone and then if in terms of accumulating short walks and stuff you can then accumulate them into something bigger and more meaningful um. And I think it was something actually from that activity I did, I think I did this task about the same kind of time as I was doing that walking task which is possibly where some of my meanings are coming from but one of the ways that I logged my walks was just by how far it was and it was easy, like it was really simple information to put in to something like that. I didn't have to do loads of calculations or anything em and it was a good way of comparing how far I walked today to yesterday and that kind of thing so it was really, just that kind of simplicity of comparison its quite meaningful.

Researcher: Ok, and em, you also said earlier on about music being a motivational tool for you as well. Can you talk to me a bit about that, would that be something that would be quite important for you to have as part of the app or even just to work alongside the app?

PAR004: Yeah I think it's probably more of an optional thing em like I think I'd use the app without it and just use my own music sources or something like that but again something I've been looking into recently is another programme that's supposed to encourage you to get running and one of the things that's making me think about that is that there is a load of playlists and track lists that some are official and some are just people who are doing it who have developed but they're all sort of done so the beat is the walking rhythm or the pace for the different types activity you are supposed to be doing. Em, and again having that kind of thing set up so you can just go tap I'm doing a 30 minute walk today at this speed and having that music that's pre-set to help you walk at that speed I think would actually be quite useful and it would be good, as I say I don't think it would be essential and I would probably

use it without it but it would definitely be something that would encourage me to use it more. And I think I would probably get more from it as well if I had say something that was keeping me at the right pace, the right rhythm, that kind of thing.

Researcher: Great. Em, and then just to talk about the ones you've put as least important to you. Can you talk to me a bit about audio encouragement and how you would imagine that would work as part of the app?

PAR004: Em, audio encouragement, in my head that's a sat nav type lady telling me I dunno where to go or to speed up and slow down and that would drive me round the bend. I don't like being bossed about (laughs) and I don't use sat nav ever and I just think that would be extremely patronising and irritating. So, although I can see for some people they might like that, absolutely not something that I could hack at all. And in terms of social media, I do use social media but I'm not the kind of person that publishes really kind of personal stuff and to me walking and activities is quite it's really tied to my weight and sort of therefore self-esteem and quite personal issues that I really don't want to be publicising. Even if it is to my friends that I've chosen to be friends with on Facebook, I still not am interested in them knowing about. It's, it's for me to be doing not for comparison to anybody else or for anybody else to know about as far as I am concerned.

Researcher: Ok, em, and I also wanted to talk to you about em this feature here so the ability of the app to tell you if you're going fast enough to achieve health benefits. Can you tell me if you think that that would be something that would be of use to you and if you'd like to know that sort of information after a walk or during a walk or something?

PAR004: Yes because like I say to me a lot of it is about health benefits, physical weight activity, but also to a certain extent sort of mental health as well sort of the walking benefits of just being out in the fresh air and having nothing to think about. I think I strongly believe there is a thing in terms of that and the relaxation benefits as well but in terms of walking fast enough is totally for health type stuff um and in terms of what I would be doing it would be I would want to do it to get a health benefit and I know that probably a lot of what I do, like I do really short little things, but we're talking 5 minutes not 10 or 15 minutes um and its only to the bus stop whereas it would be better if I walked a bit further um so what the sort of the pace about walking fast enough but also "well if you just walked an extra 2 minutes you'd actually reach that kind of critical limit of what is a health actually would give you some health benefit whereas you walking 2 minutes doesn't really get you very much". But no I think to me that would be, as I say I think that's where I struggled to shove them all to the top, um but knowing about the health benefits and whether I am achieving those or not I think would be quite important to me.

Researcher: Ok, great. Em, the last bit I just wanted to talk to you about was things that people kind of rated quite low overall and it was quite frequently the social sort of features so we've talked about social media, the other two were the online walking community and the ability to share your route for safety purposes. Em, maybe we'll start with safety purposes. Do you think that that's something that you would think about using or are you not really concerned with?

PAR004: I think for most of the walking that I do and would do it wouldn't really be an issue because as I say not a lot of my walking is or would be specifically for walking it would be commuting to and from work. It would be something that I would build into what I do already therefore it's going to be around town um I know the routes pretty well already and there's not that many options so there's not that far off route I could really go and it's all very urban very streetlight like I don't really have a lot of safety concerns with it particularly um. It would be different if we were talking about like leisure walking like up in the hills or something like if I was doing that on my own or something I could see so if you were to combine commuting walking with all forms of walking including leisure stuff that would possibly be more useful but I think on a day to day basis it wouldn't I wouldn't bother to tell anyone where I was going.

Researcher: And, em, the other one was the online walking community. Do you think that that's something that you would think about using as part of the app?

PAR004: Again I think if it was more social and more leisure based then yes probably but if it's just building more activity into my everyday life, no, because I don't have enough time in my day as it is and I kind of wanna be going from A to B as fast as possible without having to be social with somebody (laughs) um whereas I like doing that and at the weekend or something and yeah, leisure and recreation time that would be different. On a sort of day to day building more activity into my life no, I'm quite happy on my own. And as I say in terms of mental health and relaxation benefits you get more from that I think personally being on my own and having some down time without having to engage with other people. How anti-social does that sound? (Laughs).Don't take that wrong, I do like people really!

Researcher: I think that's everything that I wanted to ask you, is there anything else that you wanted to expand on or talk about that's not already been mentioned?

PAR004: Em, I guess it's really, I just think it's really difficult, I as I say I really struggled to do some of it because so much of it I was kind of like, or even if I wouldn't find it useful myself I could see how other people would find that useful and I really struggled to differentiate some of that for me as well. Like a map function, now part of me thinks a map

function would be useful because I like maps and I use maps and I much I am quite a visual person so seeing a route mapped out would give me a really clear indication of where I was going as opposed to a written list of directions so comparing those two things a map function would be really good. But equally, I have a pretty good sense of direction and I don't get lost that often, so actually I'm not sure, and particularly for walks around Edinburgh for example. I really don't need a map; I know the city well enough by now so it's ok. But I can see how other people, who are a lot less spatially aware or who do get lost very easily, like some of my friends, would find a map function quite useful. So that was kind of like why I suppose it landed up in that kind of thing because although personally I can see the value in it to me it wasn't massively important em. And I think, yeah, I would probably say that actually that I though most of it was important up to maybe minus 1.

Researcher: Em, and I notice that you've put storing data quite high up as well (oh yeah), is that something that you would fit, do you like to keep track of what you do on a laptop or something?

PAR004: I think, yeah. I think having that ability and again it ties into I guess the goal setting and the building things up into a big sort of health package, the ability to go back and look at what you've done or see for it to store the data and show you a trend pattern and "hey look you were doing really well 2 weeks ago but you've been a total slacker this week". On a graph kind of thing and like "you were doing really well but it's really dipped" so the ability to store that data and display it I think would be quite good for me, um, I know I've done a few like healthy eating logs and stuff and that kind of logging mechanism, having the data there and having it displayed on a sort of day by day week by week basis, it's quite it's quite motivational in itself um. So I think yeah, it would not just because it stores the data but because of what that could do I think I would probably put that quite high.

Researcher: Do you think that your use of the app would change over time, so you might have different requirements when you start to as you progress to using it?

PAR004: Yes, and I would expect most people probably would as well actually because I think when you start activity it's really hard and you need different kind of things like the motivation thing is really important um whereas when you get more used to it you need the kind of maintenance motivation which is possibly different um and that's where the kind of having the track of how well you've done over time or you're doing much better than you were or you're doing much worse than you were, that kind of longitudinal data um once you've been in it for a while that kind of thing would be quite useful which obviously you wouldn't get immediately when you just start. Um, what you really need is something to get me moving, which is a challenge!

Researcher: So did you have anything else you wanted to add?

PAR004: No I don't think so.

Researcher: Ok so firstly I'd like to thank you for completing the online sorting task and thanks for meeting me for an interview today. I'm researching the potential for a mobile walking app to help people monitor their physical activity levels and to help encourage them to become more physically active as part of my MPhil. The focus of the interview today is to expand on some of the responses you gave in the online sorting task and it should take around 20 minutes to complete. Everything you say will be treated confidentially which means only me and my supervisors will know who said what and there won't be any names on anything that's published. There are no right or wrong answers so don't worry about any of the answers you give, just try and be as honest as possible. So firstly I'd like to ask you about your current physical activity patterns so what you like to do at the moment and how often, that sort of thing?

PAR005: Ok well I do a little bit of walking, not very much, I would like to do more but at the moment that's about as much as I do. I don't do any other activity, exercise, I used to go to a gym but I gave that up and I want to get back to, I don't know if I'd have the discipline to go back to the gym, I'd like something a bit more enjoyable.

Researcher: Ok, the walking you do at the moment. How often to you do that? Where and who with?

PAR005: Em, back and forward to work. It's quite em, to my route to the tube in the morning is about a ten minute walk and back at night and that's about the sum total (laughs).

Researcher: Ok that's fine, ok so the next part of the interview is going to be focusing on the responses em that the group gave as a whole so everyone that filled out the sorting task were separated into groups based on their responses and this was done using a statistical software package and so like I said it's been split into three groups and the group that you fitted into was this group here, this factor 2. Now, the distinguishing features, so the features that make it different from the other two groups, were the people in your group wanted things like a points system, they wanted to be able to set goals for themselves so they were really looking for the app to be quite encouraging that way whereas other groups the factor 1 they were quite focused on the most important thing for them was music and they also wanted some feedback features as well like distance, and that sort of thing, and factor 3 was really all about feedback features as well so distance, local information, total time, that sort of thing.

So just wanted to check that you understand how this is kind of working, so you understand that this is the group that you're fitting into?

PAR005: Yeah, it's a kind of motivational one that I've opted for.

Researcher: Yeah, do you agree with how you've been placed into this group?

PAR005: Yeah probably, with the answers I have given I'd have been looking for a bit of help.

Researcher: Why do you think you fit into this group?

PAR005: Because you said it was people that wanted a bit of help with the walking app and I must have answered along those lines.

Researcher: Ok, so thinking about the features that have been distinguishing from these groups so things like the points system and the goal setting, would you consider that to be quite important for you? I mean looking at your answers you've said goal setting would be quite important for you.

PAR005: What was the points system again?

Researcher: Em, well the idea of a points system would be that you get points based on how much you are walking. That was something that was less important for you.

PAR005: Yeah, I don't know that I would be that interested in that, eh gaining points no.

Researcher: Ok but for the app to be sort of encouraging to set goals rather than getting a lot of information from the app?

PAR005: Yes I think so because I think there's quite a lot of things out there already. I mean I'm not I'm not really sure what there is but I'd imagine there are there are a lot of apps out there already that do that, that give you information, you want something that would be a bit different.

Researcher: Ok, and something that's going to be a bit different in an encouraging way (yeah) as well as providing (yeah). Em the next part of the interview is going to be focusing on the responses that you gave. So firstly I'd like to speak to you about the features that you rated as most important. So we'll start if you could tell me a little bit about goal setting, why that's important to you and how you'd imagine that would work in the app?

PAR005: Well obviously I would have to set myself a target em to get myself motivated, it would have to be incremental. You know, targets incremented so if I achieve a certain level then that will give me the satisfaction to go on and go up to the next level each time so that's what I mean about goal setting. If I achieve it then it'll be self-satisfying. (Ok) And it's only really me that will know about it.

Researcher: Ok that's fine. And how would you imagine that would work as part of the app?

PAR005: I would say probably em time. Time is an important factor so I would probably say right "I'll go out a 15 minute walk today". Em I'd maybe set myself 3 days a week or 4 days a week of doing a 15 minute walks and then each week I might increase that to 20 minutes and to half an hour and then see what distance I'm covering in that time and then I won't want to put it beyond the half an hour I don't think, I'd want to speed it up a bit and get a bit fitter that way.

Researcher: Ok and the other feature you said was of most importance to you was usage instructions to maximise the health benefits of a walk. Can you tell me why that would be important to you?

PAR005: Can you explain what you mean by usage instructions?

Researcher: Yip, so something on the app to tell you how to use it so that you're getting the best out of the walks that you do. So you're getting, you know, so you're doing walks that are going to be giving you health improvements.

PAR005: Oh right. Em, well, I obviously if I'm walking in a time length so I'm walking at a distance and time I'll want to know the calories I'm burning up so I want the app to be able to tell me how I can achieve a certain goal in calories like if I'm maybe doing hills or something (ok) increase the calories that I'm burning off in say 15 minutes I would have to do an incline or something in walk.

Researcher: Ok, as well those kind of usage instructions can maybe tell you how to best utilise the time that you have so it might tell you something about the speed that you're walking about.

PAR005: Yes, because when I went to the gym and used the treadmill I did a set time on the treadmill but it would be more interesting if it was outside. I think it would be less monotonous.

Researcher: Ok so but it would be important for you to find out what speed you should be walking at to get the most benefit?

PAR005: I think that would be important yes.

Researcher: Why would that be useful?

PAR005: To find out what speed I'm walking at? So that I would know how to maintain a speed level each time to achieve the desired results.

Researcher: Ok so we'll just talk a little bit now about the features that you rated as least important for you. One of them was local information. Can you start by telling me what you think local information would be as part of the app? What's that to you?

PAR005: Em, well, it would just be like a map that would, I have an orange map app at the moment which tells me where I am located and if I type in a postcode or place it will tell me exactly how to get to that place so I am thinking the app could do a similar thing, maybe on a smaller scale, like on a local scale.

Researcher: Yeah, you're right. The things it might tell you if there's public transport nearby or if you can access toilets. Things that are maybe specific to walking. So why, why do you think that that is something that is of lesser importance to you personally?

PAR005: I don't know, I now think it probably is of greater importance because if I'm not, if I'm in a different area, I'm not going to know what's nearby so that would be useful to have. If I if I had that facility on the app it would be able to tell me where the parks are locally and such like but other than I would have to look at something else. I just didn't want it to be too all encompassing, I wanted it to have the simplicity factor but that was why I was being sort of, keeping that part of it out, because I was just not wanting it to be too complicated an app.

Researcher: Ok so having quite a simplistic app would be quite important for you?

PAR005: Yeah, easy to operate.

Researcher: Em, so moving on to audio encouragement. That was the other feature that was rated as least important for you. Can you start by telling me what you think that is and how you think it would feature as part of the app?

PAR005: Well I think audio encouragement means someone motivating you verbally and eh you know like a personal trainer type thing which I think would be ok to start with but I think it would get kind of annoying after a while, I would prefer music.

Researcher: So why, again you've kind of mentioned it again, but maybe you could go into a bit more detail as to why that's least important to you?

PAR005: I just think that each type they would be saying the same thing and I would, that would demotivate me in the long run rather than motivate me because it would become annoying to have a person that's not real telling me (ok) I just wouldn't like it.

Researcher: Ok, do you think there is any way that that audio encouragement feature could be implemented as part of the app in a way that you would want to use it or do you think it is just something that wouldn't work for you?

PAR005: I don't think it would work for me.

Researcher: Ok, em the final part of the interview is going to be talking about some of the features that were rated quite low overall from the group as a whole and these were quite commonly the social features so these were things like the ability to share a route for safety purposes which you put as lesser importance for you, and the ability to post to social media which is also of lesser importance to you and the online walking community which you said was neutral. So firstly I would like to ask you, maybe if you could talk a little bit about the online walking community and what you think that would be?

PAR005: Em, well it would be getting in touch with other walkers em to walk as a sort of group, em, but I'm not quite sure how it would work as in if I suddenly decide I want to go for a walk, you know I wouldn't be going at the same time every day. I would prefer to be spontaneous about my walking so arranging to be with someone at a set time, I don't think would be for me really. Although I see the benefits of walking with someone else as a long term, you know to keep it going long term. I can see that might be a good thing although I'd prefer it to be someone that I knew.

Researcher: Ok, em, onto sharing a route for safety purposes. What would you imagine that would be and how would you imagine that would work?

PAR005: I don't know how it would work as in feeding back to the person; it would just be a contact to let them know where I am.

Researcher: So maybe for example, if you're a mile away from your house it could send a text message to your partner or family member saying "I'm a mile away from home". Or if you're out a walk somewhere quite rural it could send them a text message with your location. The idea is that it would one select person or one or two select people.

PAR005: And how would it do this? Press a button to say?

Researcher: It could be, or it could be done automatically.

PAR005: I could just send a text message. (Yeah) Do you mean it would avoid the need to take a phone with me?

Researcher: It would avoid the need; I mean it would be on the app, you wouldn't need to take the phone out of your bag. Or if something happened to you or something, the point is if you had an accident or if something happened to you then the person would know where you were.

PAR005: Another thing, issue, I would have would be carrying this equipment about. This app. Like it would be on your phone, how would you attach it to your body as your walking?

Researcher: Oh do you not take a phone with you normally?

PAR005: No. Well no I haven't done that before but I would obviously be able to try it out.

Researcher: Ok, so back to sharing a route for safety purposes. So how would you feel about, so we've talked about how it could be used, how would you feel about that feature? Would that be something that's not very important to you or?

PAR005: I don't think it would be that important to me because I would just send a text message or phone myself.

Researcher: Ok and the final feature in that sort of group is posting to social media. I think that's, well things like posting to Facebook or Twitter or something like that. Would that be important to you?

PAR005: I don't think so. That would be for younger people to do. I wouldn't want to broadcast what I'm doing, I don't think that would be motivational for me to broadcast what I've done. I can see it would be for some people but not for me.

Researcher: And do you think that sharing that type of information is quite personal?

PAR005: Yeah.

Researcher: Ok, eh well I think that's all the questions I have for you. Is there anything you want to add or you feel like hasn't been talked about?

PAR005: No I think that's, we've covered goal setting we've covered distance, maximising health benefits.

Researcher: Were there any features not mentioned that you feel would be good to have in the app?

PAR005: Em, probably, like would you be able to go home and load it onto the computer afterwards?

Researcher: Yeah, em, I think you actually put, you've got here some of the more important features, I mean we've not really talked about them, but you've put it as highly important to you being able to store data as part of the app and being able to download it to your computer.

PAR005: Yeah I think if I was able to do that from an app on my phone I think that would be very useful and very motivational because that's something that I would definitely use and as I said it's personal to me. I wouldn't be broadcasting it to Facebook I would be logging it onto my computer, tracking it that way.

Researcher: Why do you think that would be useful and motivating to you?

PAR005: Because I already do that with em my life, my planning my life round a spread sheet with what activities I'm going to do, I keep a spread sheet of what my plans are in the future from week to week and day to day so if I had this I could build it in alongside that.

Researcher: Was there anything else you wanted to add?

PAR005: Not really no.

PAR006 interview

Researcher: Firstly I'd like to thank you for completing the online part of my study and thanks for meeting me today. I'm researching the potential for a mobile walking app to help people monitor and encourage them to do more physical activity which is part of my MPhil at the University of Strathclyde. The focus of today's interview is to expand on the answers you gave in the online sorting task and it should take around 20 minutes. Everything you say will be treated confidentially so only me and my supervisors will know who said what and it won't be put in anything that's published.

So first, I'd like to ask you a little bit about what you do at the moment in terms of physical activity so what you like to do and how often?

PAR006: Well walking, depending on the weather which is very temperamental. I at least try to go for at least one walk a week but this week I've maybe done 2 proper walks from going up the Pentlands and going for a proper walk but I've been walking about generally quite a lot.

Researcher: Ok, so for leisure you would maybe go on a longer walk (yeah) and then for walking to get somewhere, is that something you do every day?

PAR006: Em, it's just more recently because a lot of my friends live in town so I'll leave my car at work or I'll leave it at home and then when I come into town I'll walk about like 2 miles on the road or wherever we're going. Because they're students they like walking places (laughs).

Researcher: Do you do walking on your own or when do you go up the Pentlands is that by yourself?

PAR006: Sometimes but because I'm part of that walking group we do organised walks as well but they're usually organised at the weekends and it's a big group of people, you know like 20 people doing it. But more recently I've just been going on my own for like a short walk but for a long, long walk then it's as a group because it's safer.

Researcher: Do you feel like you're happy with how much you do right now or would you like to do a little bit more?

PAR006: I think I would like to do a little bit more but it's just with the weather, working, sometimes you just can't be bothered and get lazy.

Researcher: Ok, so the next part of the interview is going to be focusing on the group responses. When I talk about group responses I mean through the online sorting we were able to separate the responses into three groups so these are some graphs of what the common responses were of each group. So you actually placed into factor 3 so the kind of common features of factor 3, well what actually made it different from the other factors, is that people were actually interested in local information so things like access to toilets/water when you're out and about and walking, total time and I think quite a few people wanted music as part of the app as well. The main sort of idea from the people in this group was that people wanted quite a lot of information from the app, so things like distance, and they wanted the app to tell them things about their walk, whereas the other groups were a bit different. For example, in factor 2 the people wanted the app to encourage them so they wanted a points system and they wanted to be able to set goals as part of the app. The other group factor 1 the thing that was a bit different from everyone else was that everyone in that group wanted music that was the most important thing for them. It's quite similar in a way to the group that you're in. Music was quite important but they also wanted the feedback type features like you've said yourself. I don't know if you remember what you've said but these are the responses that you gave. You were wanting a map of the route, distance and things like that.

So I just wanted to ask you a little bit about that. Do you agree with how you've been placed?

PAR006: Yeah, I would say so. Like I think if you're walking on your own then music might be an important thing but since I walk as part of a group it would probably be quite rude to be sitting listening to music while walking about with people and generally when I'm walking about anyway I don't tend to listen to music unless I'm in town but if I'm going on a proper walk then I don't so to me music is not that important. And I'd like to know, I think it would be quite good if you could look at your whatever and be able to say "wow, I've walked 11 miles." Or "Wow, I didn't know I'd walked that much". Because sometimes when you are on a treadmill for example you go "ugh I've only done 2 miles". But sometimes when you're actually walking and just having a good time and then look you don't realise how much you've done so I think that's quite a good thing to know and monitor. And if you get lost then I think it would be a good thing to have maps and things like that.

Researcher: And if you are going on new routes and things like that? (Yeah). Ok, can you explain why you think that you fit into this group? So it's all about getting information from that app. You've already touched on it a little bit but if you could maybe expand on that.

PAR006: Em, I'll try. I think depending what you're using the walking for, if it's for exercise I think it would be good to say "Oh well I've done 6 miles" that and maybe it would tell you the calories. If you're maybe trying to build up your progress say go from 6 miles to 10 miles a week then it would help you monitor that and to see if you are achieving that. But I'm not one of those people that need encouragement, like I'm quite, I don't need someone saying walk faster or walk. I generally know how fast I need to walk like if I'm walking to burn off calories but that's not really why I do it. I just enjoy walking. It's a good form of exercise so, and I like scenery and landscapes so.

Researcher: Do you think that, what you were saying about building on walks that you've done in the past, so maybe building up from 6 miles to 10 miles, is that something that you think would be important for you?

PAR006: Well I think for me and the walking group it's not generally the size of the walk that you enjoy but it's, it helps us with planning walks and we're trying to, to help other people who are trying to do it, it's really good to know. Like you could say "this is 10 miles, we've ascending 100 metres". If it's for exercise you could even maybe say "you would burn off 5000 calories" or something so it would be quite handy for that and it's generally for safety features as well. So if it's someone that maybe could only walk handle 3 miles then it could work for them and you could advertise it better.

Researcher: Ok, so I'm just going to move on now to the individual responses that you gave in your online sort. So, I'll start off with the ones that you said were most important to you and that was a during walk distance so can you start by saying how you would imagine that would work as part of the app?

PAR006: I think for well part of walking group we do, I'm not one of the organisers but say if I wanted to be and anyone could be in our group, if I was planning out a walk it would be quite good to say "right we're going to go to the top of the Pentlands, that's 6 miles" and then if I was walking I could say "well I can indicate that was 6 miles it took me 2 hours" and I could plan out stops: toilet stops, lunch stops and things like that, so it would be quite handy that way so you could have pointers and things like that.

Researcher: So do you think, would that, would you want that in the kind of form of an audio cue to say "Oh you've reached 2 miles" or "you're this far away from this point".

PAR006: Yeah, it could be quite good actually to have a like an audio type of thing but then at the same time it would be quite good just to be able to just to look at it and just to be able to track it myself and you could maybe set an audio thing.

Researcher: Like on a map? (Yeah). Ok, and so I guess that's kind of touching on your next point here. Map while walking. Can you tell me a bit more about why you think that would be important for you?

PAR006: I think it would be quite good for establishing the terrain that you are walking in as well and so you could maybe say "you will need waterproof trousers" or "you're going to walk through a bog" or something like that. And also if you do get lost I think having a map is a reassuring thing, like I get quite nervous if I'm in a new area and I don't know where I'm going. And trying to plan a walk it's good to have a map.

Researcher: Especially if it's something you're doing on your own I suppose (Yeah definitely). Ok well great, can you think about when you would use these two features? I know that you do different types of walks. Would these be primarily something you would use when you're going on your longer walks to the Pentlands or would you use them as an everyday sort of thing?

PAR006: I would say I would probably use it more when I'm just doing the long walks because generally when I'm just walking up and down the road I don't track it, I don't use a step meter or anything like that or speedometer or whatever. But em, I think it generally would be for long walks or when I'm doing organised walks with the walking group.

Researcher: Great, ok, so just to touch on the ones that were least important for you. Can you tell me a bit about why you don't think the points systems and audio encouragement would be something that would work for you?

PAR006: For me personally I think it's just, I've never been one of those people, for example with diets you count points and calories and I've never been like that. It's never, in a way it does encourage or discourage me. It doesn't have an effect on me at all so that's why the points system, audio encouragement maybe a little bit if I was wanting to push

myself, but I'm not really that way inclined I'll usually just go with the flow. If I reach it if I don't I'm not too bothered with myself if I don't.

Researcher: Ok, do you think that there is any way that these features could be part of the app that maybe you would think about using them or do you think that they just wouldn't work for you?

PAR006: I think it could definitely be, like the audio encouragement I think could be a good idea if I was doing it to lose weight or to say for example I used to do the race for life so that was quite handy like something to say "right you've done 5K- well done. Do this tomorrow and make it 6K" and then you do it and it encourages you to keep on doing it. So when you're training for something you're trying to build up the mileage it's quite difficult sometimes to motivate yourself or to train. And if you have something to do that for you. Or you know they'd be like "oh you're 2 weeks ahead- well done". I think that would be pretty good for motivation purposes.

Researchers: Ok, so maybe for someone who is just starting out or maybe trying to build on it? (Yeah). Ok so just moving on now. I wanted to talk a little bit about some of the features that were consistently marked as quite unimportant as the whole group and those were quite frequently the social features so things like the online walking community, the ability to walk your information on social media and the being able to share the route for safety purposes. I just wanted to talk to you, I mean, just looking at yours here I think that well the walking community was maybe a little bit higher but they were all generally in the lower area as well. Can you maybe talk to me a little bit about you think they would be? Maybe not the social media as that's quite clear. But what do you think sharing the route for safety reasons would be and how do you think you would feel about that?

PAR006: I think it could mean two ways so I think it could be very good for safety reasons but I think it could also be bad because the people could know exactly where you are and then maybe someone you don't necessarily want to know where you are as well so it could be kind of useful for stalking kind of purposes so that would be my only thing about that. But I think if it was being shared to your walking community then it's a bit different then because if you know who it's going to so it might not be so bad. And also see if you get separated from the group that would be a good idea but then again you normally have communication with them anyway like you have a mobile number or something so if someone gets lost there is always someone you can contact. And generally they don't go that fast that you're going to get separated.

Researchers: Another kind of idea behind that would be something like, if you were doing like a daily walk or a walk home or a walk at night then that feature could potentially send a text message to your partner or a family member to say "I'm one mile away from the house" or something like that.

PAR006: Oh that could be quite handy actually! I didn't know that it would be able to actually do that you know that specifically. That would be quite good especially these days you can't be too careful. (Yeah).

Researchers: Ok, and then the online walking community. Can you tell me a bit about how you think that would work and what you would think about that?

PAR006: Well for example the meet up group that I'm part of, you know they post, once they've been on a walk they post photos and stuff like that so I think it would be quite good to have it simultaneously like they could update the website.

Researcher: Ok so linking an app (yeah) to something like that?

PAR006: Yeah I think so, I think it would be quite good and quite interesting to say "oh look they've managed to get up Arthurs seat in an hour" and be able to see the photos they've taken. I think that would be quite interesting.

Researcher: And if you could arrange walks from your phone?

PAR006: Yeah definitely. Especially a lot of them like I think it was Elaine that put me in touch with you and she was saying you know this would be really helpful blah blah blah and she's one of these people that's always has like a wee pad thing and it's to go and check and see how many people she had in the group and the map and the how far you go and all that kind of thing so she's quite good at doing that kind of thing so she would love that I think.

Researcher: So just thinking what other features were quite low ranked overall. I think the only other things that were consistently low overall were things like audio encouragement which we've already touched on a little bit so is there anything else that you want to add or you feel like hasn't been discussed.

PAR006: Em, I think it would be good if you could get an app that lets you kind of alter like you may want the points system and you may want it for safety. It would be quite good if it could have everything in and you could pick and choose how you want to use it just like you might have on your mp3 player you might have like "oh I like it on shuffle" or "I like it on this" or "I like it on that" like different ways of using it.

Researcher: Would it be important for you to have it, like it could have a lot of information in it, but then sometimes that might be a bit off-putting if people are quite new to things like that so would it be important to you to still have the features available but still have it quite simple?

PAR006: I think so because user friendliness always gets compromised when you have too much stuff. To me I'm quite I would say I'm quite savvy when it comes to technology like if I was to get a new phone I can usually figure out without looking at the instructions. But em for someone who's maybe not so inclined and who are wanting to get fit or they're wanting to do you know go on walks that are a little bit timid it might be quite good for them to have a really easy application because it might stress them out enough to be going on a walk never mind going "whoa" you know I'm lost like me and my sat nav that stresses me out more than if I just drive and find the place. (Yeah) Sometimes, for example, I should a walked to, we were doing a walk in West Linton so I put it in Google, going to West Linton. It tried to drive me through the Pentlands and it's like, there's no road there! It just makes stuff up. So you have applications that just don't quite work it can sometimes make it worse for you.

Researcher: So first I'd like to thank you for completing the online sorting task and for meeting me for an interview today. Today we're going to expand on some of the answers you gave in the online task and it'll take about 20 minutes to complete. Everything you say will be treated confidentially so only me and my supervisors will know who said what and there won't be any names on anything that's published. So the first thing I'd like to ask you is if you could tell me a bit about your current physical activity and what you do just now and how often and that sort of thing?

PAR007: So I aim to exercise about 3 times a week but that doesn't always happen. I've recently started doing rock climbing and snowboarding and I do enjoy running outside. I aim to do it at least once a week but it doesn't always happen once a week to be honest.

Researcher: Ok that's fine, do you do these things with other people or are they things you do on your own?

PAR007: I prefer to run on my own and em most other exercise I do like sports I like to do with other people.

Researcher: And are you happy with how much you do at the moment or do you feel like you'd like to do a bit more?

PAR007: I'd probably like to do more, I'd prefer if I ran two or three times a week or jogged two or three times a week outside em but it just doesn't really happen at the moment. I would prefer to do more to be honest.

Researcher: Ok, what stops you from doing more do you think?

PAR007: Probably work and em I feel like it takes a lot of time to get ready to go out and run. I suppose in reality it doesn't really. Maybe laziness I suppose.

Researcher: Ok. The next part of the interview is going to be focusing on group responses to the online sorting task so what we did was use a statistical programme to group peoples responses together so it created three different groups and em the group that you fitted into was factor 1 and this is it, this is the list of it here. So this is your group average and how people within your group have rated the factors. So three here, that's greatest importance moving down to zero is neutral and minus three is least importance. The distinguishing sort of features within your group were everyone wanted music as part of app (yes, I do) as well as they also wanted feedback features as well and a negative thing for everyone in the group was they didn't want steps. And the other two groups were a bit different because factor 2 was quite focused on having the app motivate them to do more exercise so things like points system and goal setting and factor 3 was quite, they wanted a lot of information from the app so things like local information, maps, total time and that sort of thing. So just reading over that there can you em tell me firstly if you agree with where you have been placed into the into that group based on how I've described the other two groups to you and what you see there?

PAR007: Hmm yeah I do agree with it- music is important. I find that music, having music, motivates me to do better in myself while I'm while I'm out. Em, the thing that motivates

me I suppose as well as overall distance but is calories so I suppose that would be a motivating factor, is knowing how many calories that you've done. So between sort of the music, the overall distance and the calories that are the things that are most important to me. And the steps, knowing how many steps I've done and things that isn't very important to me at all so I would say that I do fit in well to my category.

Researcher: That's fine. Em and then I'm gonna talk to you now about your own responses. This is how you rated the features there so I'll ask you just a bit more about em two features that you've said are most important so you've already kind of mentioned them a bit but maybe if you could start with calories and tell me maybe a bit about why that's important to you?

PAR007: Yeah, em personally I'm quite focused on a balance between the food that I eat and the exercise that I do so when I'm being really healthy I look at the calories that are in my food. I look at my calorie intake and then look to burn off a certain amount of calories to feel that I've done a good amount of exercise to balance it out so is that's important to me. It may not be the best way to judge it but for myself personally that's what motivates me and in terms of music as I said before, that's what motivates me as well to do well. If I'm running with a beat that's quite good I tend to do better than without running with any music at all.

Researcher: Ok, do you find that you like to run with fast paced music or do you like do you try and find music that you can run to the beat or do you, is it just having something there?

PAR007: I prefer em something that has got maybe a good beat and something that is a bit faster just to keep up the tempo a little bit. I tend not to run to the beat but em something that's quite fast paced keeps me going. If I'm listening to something that is a bit slower I'd probably just start walking to be honest rather than trying to jog.

Researcher: And then em the features that you've rated of least importance to you were the points system and audio encouragement so maybe if you could just talk to me about first about a points system and why you rated that as you did?

PAR007: Em, the points, how would the points system work? Would it just, if you maybe run a certain amount a day times a day it would give you points and it would build up? (Yeah). Personally I just wouldn't see any value to that really. As I said before it would be more sort of the calorie aspect I would look at so in terms of points I probably wouldn't look at that to be honest even if it was a feature on it. I would look at my own goals myself rather

than a points system that was made up on the app and audio encouragement; do you want me to mention that? (Yes) Em, I would want to listen to my music throughout and if there was something on it sort of encouraging me throughout that would probably just irritate me slightly to be honest.

Researcher: Ok that's fine. And then the next part is just kind of going into em how people rated certain groups of features overall and the social features were quite commonly rated low overall so I just wanted to talk through some of them. Now one of them was em sharing a route for safety so I'm just trying to see where, so you've rated that quite low as well. Can you start of by telling me what you would imagine that would be and whether you think you would use something like that?

PAR007: Yeah, em, so for example if I was going out for a walk or a jog I would generally tell people where I was going anyway so somebody would always know where I was so in terms of safety I wouldn't need that and also I wouldn't in terms of safety really for example if it was going on Facebook to maybe the 300 odd friends I've got on Facebook I wouldn't, everybody on that knowing where I was possibly isn't the safest thing in reality anyway so if loads of people know exactly where I was. Yes it is friends on Facebook but there maybe was a few people on it that I don't want to know exactly where I am all the time so I wouldn't really want to share it in terms of things like that but I would tell friends and things where I am anyway so somebody would always know where I am.

Researcher: Ok and the other ones were posting to social media which again you've rated quite low can you just tell me do you use social media yourself?

PAR007: Yeah I'm on Facebook a lot and I do enjoy going on social media sites but I only like people to know where I am for certain things. I very rarely check in to locations unless it's maybe going out to the cinema or something like that with friends. I don't really enjoy the aspect of people putting things up all the time on Facebook for example "I went to the gym today" it seems sort of, for one of a better word sort of a show-off thing to do, and I don't really like to advertise that I'm doing exercise. I'd prefer to do it without everybody on Facebook knowing.

Researcher: Ok and the last one was connecting to an online walking community so again can you tell me how you would imagine that would work and whether you think you would use it?

PAR007: Well that is an interesting aspect, I have put that quite low at minus one. Em, a walking community maybe would be a quite a good idea but in terms of all the other things that were there it's not something that I would maybe do. Em I am part of a group that's called meet-up where you can join different groups that people that have the same interests so it's something that I'd be interested and it sounds good but in reality I don't actually think I would meet up with other people to go walking or jogging. I prefer personally to go by myself.

Researcher: Um and then just going through a little kind of things as well so I've noticed that you put em fast enough for health benefits kind of at the higher end of the scale. Can you tell me why that would be important for you for the app to be able to tell you that?

PAR007: Yeah em I think it's important to know that if you're going out for a walk em that it is that you know that it is giving you some sort of health benefits otherwise it doesn't make it very worthwhile and in terms of going walking and jogging personally I don't know I don't know where how fast I should be for the best health benefits so it would be very good to know just to make sure that you're getting the most out of what you're doing to make the most of your time.

Researcher: Ok and then as well in that category you've said eh for the app to have the ability to store data. Em, do you think that having that kind of information would be beneficial for you?

PAR007: I think it would be good to be able to compare so I would like to improve on what I'm doing so week by week it would be good to see what how I did the week before and see that you're that I'm improving, able to do longer distances in shorter periods of time. So it would be good to be able to compare if I was only if I was going for a walk say maybe twice a week or a jog and not knowing how I was doing previously it wouldn't really give me anything to compare it to so it might not encourage me so much to do better the next time I go out.

Researcher: Ok and the last kind of thing that I wanted to talk to you about was em a map function because you've kind of put that quite low yourself. Do you think that that would be something you were, wouldn't really use or?

PAR007: I would use it; it would be beneficial to have as part of the app eh the map function where you went. Basically I did I scored that quite low because I would go around areas that I know most likely and I do have Google maps on my phone which I use really regularly so

because I've already got a map for that I would be less likely to use it. But as it being part of the same app then it would be useful but just because I've got another app that does a very similar thing that's why I scored it quite low.

Researcher: Ok I think that's everything I wanted to ask you. Is there anything else that you wanted to expand on or talk about or any feature that you think could be included that wasn't that's not been mentioned?

PAR007: Em I haven't thought of anything that I would probably include. I think everything's really covered here. Em, I do think that an app is useful though em for walking and going jogging. I think it definitely encourages you to do more and even having it on your phone is keeps it fresh in your mind that to go out and actually do it so I definitely think an app is beneficial. Obviously you can't have all the functions on it but even the app itself with some of the main features that I like, like the calories and the music and the health benefits, I think it's definitely something that everybody should have on their phones.

Researcher: Ok great, thank you.

PAR007: Thank you.

Researcher: So firstly I'd like to thank you for completing the online part of my study. Um the focus of this interview is to expand on some of the responses you gave in the online part of my study so everything you say will be treated confidentially so only me and my supervisors will know who said what and I won't disclose it anything that's published. So, just to start off, can you tell me a bit about your current physical activity patterns?

PAR008: They're good. I cycle to work every day. That's about it. (Laughs).

Researcher: Ok, so how long does that take you to cycle to work?

PAR008: Um, it's about a mile and a half to the train station and then it's about 2 miles to work and back again.

Researcher: Do you feel like you'd like to do some more exercise or are you happy with your current levels?

PAR008: I am happy; I'd like to vary it.

Researcher: In what way?

PAR008: Try other stuff.

Researcher: Such as?

PAR008: Rock climbing. (ok) That would be enough.

Researcher: Oh right. Ok the next part of the interview is going to be focusing on group responses to the online study. Now what we've done is used a statistical programme to sort the responses into three groups so the group that you fitted into is the factor 1. I'll let you have a little look at that. Now the distinguishing features of factor 1 was that everyone was quite focused on having music as part of the app and they didn't like the idea of steps, now those were different features to each the other factors. Factor 2 was really focused on having the app encourage them to be more active so having things like goal setting as part of the app and a points system were positive things for factor 2. Factor 3, they were really focused on getting a lot of information from their walks. Things like local information and distance and maps and things like that. Em, so having a look at factor 1 do you agree with where you currently fit into the grouping category?

PAR008: I don't know. I would go more for the mapping features and the storing my data, music is obviously very important maybe not as important as the other things. (ok) I'd agree that steps is minus 1, I'd put it as minus 2 maybe.

Researcher: Ok. And some of the other features that are ranked higher up, how do you feel about those?

PAR008: I don't like audio cues, well; it's not that I don't like them. I'd put them about zero. Em, map yeah might be a bit higher.

Researcher: Can you tell me why you em, why you don't like the idea of having an audio cue? What would you imagine that would be?

PAR008: It's not that I don't like it; it's just that it's not high on the list.

Researcher: How would you imagine that would work as part of the app?

PAR008: Tell me to go faster or slower, how far I've walked. Maybe set targets with it, I don't know.

Researcher: Yeah, um, well audio encouragement would maybe tell you to go a bit faster or slower and audio cue would be telling you updates about what you've done so maybe say if you've walked a mile "you've walked a mile".

PAR008: Oh I see audio encouragement now, yes. Yeah I wouldn't like audio encouragement at all, ok; audio cue is in an appropriate place.

Researcher: Ok. Em, so the next part of the interview is going to be focusing on your own responses and these are the responses that you've gave. Em, so I'll first ask you about the two features you ranked as greatest importance to you now, I think that was, was it overall distance was one of them (yep) can you tell me why that would be important?

PAR008: Em I could compare my progress over time. It's always nice to have a number to tell you how well you've done at the end of something.

Researcher: Ok. That's fine. And music was the other one?

PAR008: I have to be able to listen to music while I'm walking but I don't necessarily have to be able to control it from inside the app but I'd have to be able to leave the app, control the music and then go back in without losing all my settings and things.

Researcher: Yeah, that's fine. So music though. Why is that important to you whilst you're walking?

PAR008: Well walking can be quite boring and I like listening to music while I do it. I like listening to music while I do any exercise.

Researcher: Why is that?

PAR008: It gives me something to take my mind of it.

Researcher: Ok, any other reasons?

PAR008: That's about it, it just makes it a bit more, I don't enjoy exercise for the sake of exercise. I enjoy exercise for the benefits of it so I need to take my mind off it while I'm doing it.

Researcher: Ok, and just moving on now to the features that you em that you were least important to you. Em, now sharing a route for safety purposes. Can you tell me what you think that would be?

PAR008: Em, you pre-plan your route and you send it to a friend so they know where you're supposed to be and when em in order to do that you'd have to do lots of setting up, tell it where you're actually planning to go and then if you change your mind you've told them where you're going and you're gonna to be somewhere different so you know not only does it lose any benefit it actually sends them to the wrong place.

Researcher: Ok, but if for example em the app could send your partner or a family member a text message to say "this is where I am" or "I'm one mile away from home" or something along those lines and you don't actually have to do anything?

PAR008: Hmm. No, I think it would just annoy people and it would lose its benefit after a while and people would just get sick of receiving messages like that.

Researcher: Ok, do you feel that safety is not a priority for you really or not something that you would worry about?

PAR008: I don't need an app to keep safe. It's not something, it's not a feature, I'm not saying it's not important but it's not a feature I would look for in this kind of app.

Researcher: Ok and the other feature was an online walking community so can you tell me why you think that would be of lesser importance to you?

PAR008: Em, I can't think of anything more boring than joining a community to talk about where I've walked. I don't think I'd like to join a walking, you know a real live walking group or anything like that, so I don't see why I would join an online walking community. I can get information about nice places to walk without joining a community; I can just look it up on the internet. Happy enough with that one?

Researcher: Ok and then the final part is just going to be talking about some of the features that were ranked low as the group overall and as well I'd like to touch on storing data because you mentioned that earlier that that would be something that would be quite important to you, although you've put that as neutral here, but can you just talk to me a little bit about that. Why, why would storing data be, as something you specifically mentioned?

PAR008: Em, I'd like to be able to rank my walks over time and see if I'm improving or whatever. Maybe get aggregate data on I've walked 25 miles in the past year and a half, it's a good average for me.

Researcher: Ok, and so would you want that as well to be able to have that data onto your PC or your laptop or something?

PAR008: Yeah that'd be quite good.

Researcher: For tracking purposes or?

PAR008: Yeah, I already use certain apps for tracking and things like my cycles to work and things like that and it would be great to be able to, you can download the data onto the app and that's not that important it's just cool to look at, but things like average speed, total distance, calories burned, like that over time would be good.

Researcher: And how would you use that information?

PAR008: Em, if it was presented to me as a graph over time I could see if I was improving or not. I know if I was, you could tell if I was struggling in on a certain day, did I put more exertion in or something like that.

Researcher: Ok, and the other part was just to talk about like I said the features that were ranked quite low overall and these were quite commonly the social features so we've already talked about sharing the route for safety and the online walking community, em another one which was quite low overall was posting to social media, now you've put that as neutral, can you just talk to me a bit about that?

PAR008: I would get sick of seeing other people do that very quickly so I would be a big hypocrite if I did that all the time. I can imagine, it would probably be important for other people you know that wanted to be part of a community of walkers but that's not why I would want the app so I wouldn't really need to share my experiences with anyone.

Researcher: Ok, and em, as well just a final point that I wanted to talk about was the the, the two health benefits sorts of features so one of them was for the app to tell you if you were walking fast enough to achieve health benefits. You've marked that as somewhat important. Can you just maybe give me your thoughts about that, how you think that that would work?

PAR008: I don't know, I suppose that ties in with audio encouragement, I don't want the app to nag at me but if I want that information it would be nice for it to be there.

Researcher: Maybe something at the end of the walk or?

PAR008: Well something I could see on the screen maybe if I deliberately went looking for it without being pestered with it.

Researcher: Ok, so would it be something that a piece of information that would be important for you to know or are you quite happy to go along at your own pace?

PAR008: Um, I would be quite happy to go along at my own pace. I can decide if I am going fast enough myself but I wouldn't say no to it being there if it was there.

Researcher: Ok, and then having usage instructions to maximise the health benefits of your walk. Would that I mean you've said that that's of lesser importance to you. Can you give me your thoughts about that?

PAR008: Again I'm just a casual walker so I'm not out to take it as seriously as I possibly can. It can't hurt to have them in there but I probably wouldn't read them.

Researcher: Ok, em, I think that's all that I wanted to ask. Have you got anything that you would like to talk about or expand on that we haven't already talked about?

PAR008: No, I'm happy enough.

Researcher: Can you maybe tell me a little bit about when you would see yourself using an app like this? For what sort of purpose would you go on a walk to use an app?

PAR008: Em, probably hill walking or something like that. (Oh right ok). Yeah, I don't. I wouldn't map my walks around town because they're mostly to get from A to B but em if I'm if I'm deliberately going out walking it'll be on a hill somewhere, maybe without internet access, so that's something you might want to consider. That's about it.

Researcher: So first I'd like to thank you for completing my online study and for meeting me for an interview today. The purpose of this interview is to go into a bit more detail on some of the answers you gave in the online sorting task and it should take about 20 minutes to complete. Everything that you say will be treated confidentially so only me and my supervisors will know who said what and there won't be any names on anything that's published. So the first question I'd like to ask you is if you could tell me a little bit about your current physical activity, what you do at the moment, who with, that sort of stuff?

PAR009: Ok well it's a bit random. I do, I try to go to the gym a few times a week but it doesn't normally happen so for the last sort of few weeks, few months, I've sort of been a little bit on and off doing little bits here and there but not a great amount. I did used to go to a fitness class every week but I don't go to that anymore. I had a little fitness regime that I tried to do every day but I only managed to do it a few times so my fitness at the moment is sort of non-existent. I'm not really doing very much.

Researcher: Is there any reason in particular that you haven't been able to keep it up or?

PAR009: Eh I think I've just been too busy with other things and doing out too much and I haven't been very well really for the last few weeks and I'm just being a bit lazy with it.

Researcher: Do you feel like you would like to do more?

PAR009: Yes definitely. I really need to do some more.

Researcher: The next part of the interview is going to be focusing on group responses to the sorting task. What we did was used a statistical package to sort the sort peoples responses into three groups so based on similar responses so you factored into group factor one and the kind of distinguished thing about that group which was different from the rest was that everyone really wanted music as part of the app and compared with the other two groups, factor 2 was really keen on having the app motivated them so they wanted things like a points system and goal setting and factor 3 wanted a lot of information from the app so things like local information, maps, that sort of thing. Um, so I'll show you this is factor one and how it was grouped for everyone so you can have a little look at that. So this is the most, the top bit and that's down to the least. So the top two were overall distance and music and you can see how it kind of works down so just looking at that, do you agree with where with how you've been grouped into this factor?

PAR009: Em I think I agree with most of it. Em, I think I would have maybe replaced the calories with distance and I think I would have probably brought em the local information a little bit higher because I think like say if you're doing like, it depends what you're doing but if you're doing a small walk then maybe not but if you're doing like a 20 mile cycle it might be nice to know if there's a toilet somewhere or somewhere you can stop for a drink or just for a rest. Yeah I agree with most of these, like I'm not bothered at all social media I don't really want everyone to see how many miles I've done that day, I'm not bothered about that at all. Em, and steps again I don't think that's important. I don't think it really helps for me anyway in the grand scheme of things. And audio encouragement- I definitely agree with that. I can't imagine having a voice telling me to keep going; it wouldn't help in the slightest. I'd probably just get angry at it. I'd be like "stop talking to me!" (laughs). And again speed- that's fine, I'm not that bothered. I'd like to have a map, that's definitely a good thing.

Researcher: That's fine. Ok so we're just going to move on now to talk about the responses you gave. Now this is your, this is how you sorted the features. So your top two were calories and em fast enough for health benefits. Ok, so we'll start with start with calories um if you could tell me why you rated that as the most important or one of the most important features for you?

PAR009: Well I think for me I feel like say if I can like if you're at the gym and you're on a treadmill and it tells you how many calories you've burned it really helps. Because actually it emphasizes that you have done something, you have burned some calories and it's sort of like a confirmation that you've done the exercise um I think it's really useful to know and to see how many you can do an hour and things like that. If you're going the right speed so you're actually using calories, um yeah. So I think for me anyway it's just nice to see how much you've done in what kind of space of time and if you need to do anything else differently to change, like the workout, to change how many calories to make it like a more like for your health kind of thing.

Researcher: Ok and then the other feature you've said was fast enough for health benefits. Can you just talk to me a bit about that and why you rated that as important?

PAR009: Em well I think any exercise, I suppose people do exercise to lose weight they do it for various different reasons, but I think health benefits is probably the most important and I think a lot of people forget about that and they focus more on losing weight or whatever but I think that the health benefits is equally as important as burning calories because otherwise fair enough you'd be burning calories but you could be doing differently that might make you more healthy it might add to your stamina it might reduce like the stuff around your heart and make your heart better. Stuff like that.

Researcher: Ok great, and then I'd also like to ask you about the ones you've said is least important. Now you've already talked a little bit about that but if you could start by telling me about posting to social media and why you don't like to idea of that?

PAR009: Em I don't like it just because I don't really like social media in general. If I want to tell my friends that I've gone for a 10 mile walk then I'll tell them instead of having it posted all over the internet that I've gone for a 10 mile walk today. I don't like, I don't know, for me anyway for other people it might I suppose for encouragement. People might comment on it and say "oh wow that's great, well done you. Stick with that" but I just, it doesn't interest me at all. I suppose if I want people to know that I'm doing it I can just tell them in person.

Researcher: Ok and the audio encouragement as well?

PAR009: Em, audio encouragement I think I just find it a bit annoying. I can't, I would much prefer to be listening to music or not have anything at all as opposed to having a voice saying "you're doing really well, keep going, keep going!" and it's just, it's not even real. It's like a fake voice with fake encouragement (laughs) so I just don't think it would help, not for me personally anyway.

Researcher: Ok, em, and then em you also touched on a little bit about having music, having that as part of the app. Would you, can you talk to me a bit about music and why you would enjoy listening to music when you exercise?

PAR009: I think it's just nice to have something there. Like even, I suppose it depends it could help for different reasons, it could help if it was like really fast pumping music and I find when I'm listening to music like that say if I'm running it automatically makes me run a lot faster because you try and run to the beat and you sort of think "yeah, this is really good" but at the other end of the scale you could just have it on to make you more relaxed and just for more enjoyment especially if you don't find exercise enjoying, you don't enjoy exercise if you had something that you really like to listen to it might just make the experience a little bit better for you I suppose.

Researcher: Ok and you also brought up local information em earlier but if you could expand on that a little bit and tell me why, what you kind of expect from that, and why you would find it beneficial?

PAR009: I think I would expect for it to have things such as like nearest toilets and like say like the nearest pub somewhere that even if something happened you could stop and have somewhere to go or even if you just needed a rest or as I say if you needed water. I think it's important. And I suppose again it depends what you're doing but if you're doing something that's mega and huge it's very important because I get lost a lot and I know if I was doing something by myself and I had something that was telling me "ok if you go another like 5 miles you're going to get to some toilets or a pub" and I think it would make you feel a lot better so you actually know that there's gonna to be something next if you need it.

Researcher: Ok, em, and then eh just I'd also like to ask about some features that were rated quite low from the entire em group as a whole and those were quite commonly the social features so we've talked about social media and I think you've got them quite low as well. The other two were share route for safety and connect to an online walking group. Can you tell me what you would imagine share route for safety was and how it would work as part of the app?

PAR009: Em, I suppose it would be sharing it so if something happened the internet would know where you are and like so I don't know if you were out for a run and you didn't come back they would know where to go as morbid as that sounds but I suppose it would be important for that.

Researcher: Yeah you could set it so it sends your route or your location to a family member or something like that. So can you tell me whether you think that would be of use to you?

PAR009: When you say it like that then yes it would be. If it was just going to send it to someone close to you so they knew if something happened it would be useful.

Researcher: Maybe for specific things that you're doing I guess?

PAR009: Yeah if you are doing something crazy that was really long if you are doing it alone for example it would be good for that.

Researcher: Ok and connecting to an online walking community so the same sort of thing again. How would you imagine that would be as part of the app? Do you imagine it would be...?

PAR009: I think it would just be, I don't know, some sort of either social media or there's like a group of walkers who communicate about going on different walks what they're doing and where they're going if anyone wants to join and things like that.

Researcher: And do you think that you would use something like that or is it not really?

PAR009: I don't think I would use it. It's just because if I was, I don't know, I'm not really into doing exercise in massive groups and like I know people anyway that if I wanted to do something with I could do it but I suppose it would help for other people like say there was someone that was by themselves who didn't know what to do it would be really helpful in that case. Like if they just wanted like some company for a walk in that sense it would be good.

Researcher: But not for you personally?

PAR009: But not for me personally.

Researcher: Ok, I think that might be all that I wanted to ask you about. I'll just double check. Um, yeah I think so. Is there anything that you want to expand on or anything any kind of feature that's not included that you would like to be there or?

PAR009: Em, I'm not sure. I'm trying to think. Can I just ask something about the music say if there was a music feature on it would it be like the app would provide the music or would it be something that you could add your own music to, would it be like radio or?

Researcher: Em I think like it would work as it's just that you could access your own music that you might already have on your phone without so that your own music would work alongside the app.

PAR009: Ok, yeah I definitely like the sound of that. Em, I think that might be it.

Researcher: Do you think that your use of the app would change over time or do you think like do you think that you would have different needs from the app at maybe the start and as you're doing it a bit more you might need or want different things from it.

PAR009: Probably yeah. Like say if I got really really into something, like I got really into walking and I decided that I did wanna join a walking club and get more out there then I'd want things like that and even if personal circumstances changed I might find that I had no-one to come for a walk with me. And I think the more you get used to it the more you would probably use it for different things as well like you might use it for things that you didn't think you would for originally. Like cos they're there you might think "oh actually I could try this and it might work for the better".

Researcher: Ok so having an app that's quite personalise-able is probably quite important?

PAR009: Yes I think it's definitely important. Especially because everyone wants different things so if there was something that did a range of different things for different people.

Researcher: Was there anything else you wanted to add?

PAR009: Whens the app coming? (Laughs)

Researcher: I will let you know! (Laughs).

Researcher: Firstly I'd like to thank you for filling out my online sorting task. As you know I am researching the potential for a mobile walking app so what we are trying to do is find out what sort of features people want and why they want it. So the purpose of this interview is to go into a bit more detail into some of the answers you've already given me to find out why you think that. So it should last about 20 minutes and anything you say will be treated confidentially so it will just be me and my supervisors that will know who said what and there won't be any names on anything that's published.

Ok, so firstly can you tell me a bit about your current physical activity so what you do at the moment and how often and that sort of thing?

PAR010: Well, I struggle a little bit because oh maybe about fifteen years ago I broke a bone in my foot and I didn't realise. Something dropped on my foot, sledgehammer. I thought it was just bruised but it turned out about 8 years later when I started getting pains in my foot that I'd broken it so I had an operation on my foot which would have been what 3 years ago now and I struggled to get back into exercise but em since I moved here I found a new physio and got some new inserts in my shoe and I started running. Obviously I'm walking around a lot more like I said I'm finding Edinburgh much easier in terms of wanting to walk living down by the river cos I love fresh air and I like to get out and about so I tend to walk around for just normal day to day stuff and I try to run 2 or 3 times a week when my foots feeling ok em and I try to go walking with the walking group and I try and get out with them whenever I can probably with my husband. I don't go to the gym so it tends to just be walking, running and a bit of cycling.

Researcher: Great, ok. So the next part of the interview is going to be focusing on the group responses so I'll just explain to you what I mean by that. So I'll just show you: these are the responses for the group as a whole. Now what I mean by that is that we did a statistical analysis on everyone's responses who completed the task online and the responses were split into three separate groups. Now this is the group that you fitted into. The three, that's the most important for the group, zero is neutral and minus three is least important features. The kind of interesting thing about the group that you placed in is that everyone placed quite a high importance for having music as part of the app and that was something that was a bit different from everyone else in the other two groups. As well as music the group wanted a lot of feedback features as well. The other two groups were a bit different as well because one of the groups were wanting things like points system and goal setting and encouraging features like that and the other group was quite like more of the feedback features like distance, map, and sort of local information and things like that. So the first thing I wanted to ask you was what do you think about the group that you've been placed into?

PAR010: Um, I'd agree with most of those. I think it's more for me I'd want distance and music to keep me occupied when I start walking because I find that kind of I tend to amble if I've not got the beat of the music to keep going to, I'll sort of slow down and watching where I'm going rather than concentrating on my walking. I like the sort of map idea, I'm surprised with that, I think that was one that I, the running program set out by NHS choices, the couch to 5K podcast (oh right, yeah) and I kinda like that in the first bit when you're sort of new to everything it just then "keep going, keep going, you can do it" kind of thing like every 5 minutes and I found that useful when I first started. Em, and that's kind of (a bit further down?) further down than I would personally put it but yeah. (Great). I think that's about.

Researcher: Ok, that's your responses there and how they compare to your group (oh I thought I had put that higher up?) oh right. There was something, another one that could,

maybe audio cue is quite similar so maybe, oh see yep you've put audio cue there (ah that's where I put it) yeah so maybe.

PAR010: I wouldn't want someone talking to me all the time maybe someone to point out I've done a mile or I've done half an hour. I'm presuming that's what you mean by audio cue.

Researcher: Yes. Great well ok, the next thing the next part of the interview is actually going to be focusing on your own responses so we'll go the some of the features you found to be most important and why and least important and we'll move on like that (ok). So maybe if you could start by expanding a little bit on the audio cue and how you would imagine it would interact with your walking?

PAR010: I suppose a little bit like, because I've experienced the couch to 5K, that the NHS got a girl that started running herself, done the couch to 5K which I think was the main creation of it, and had her be the, it's like having your own personal couch, like a buddy sort of encouraging you along. It's quite good she does some of the other things like she tells you about running techniques and gives you little tips along the way and tells you a bit about how fast you need to go for it to be beneficial you know and making sure you're not going to fast so that you're going to hurt yourself and then she fades out as you progress so she's just sort of like "right you've done your 5 minutes, only another 5 minutes to go" and it kind of breaks it up into chunks because I'm not a natural runner um I found that sort of halfway point thing "only another got 2 minutes to go, oh yes I've done 7 minutes I can I can do another 2". That's really good. And she tells you about your distance and stuff, I mean obviously she can't tell you how many calories you've burned (yeah) because it's not in fact wired into you but I kind of like that. I've been out once without the podcast, I overdid it. I thought I'd been out for 35 minutes which is normal for me but I'd been out for 48 minutes. (Oh right). I feel like I've done myself a mischief. But em you know that's what it's supposed to be like and she cuts into the music every so often and makes sure that you warm up and cool down not sort of doing it slow you're not running across the road or if you're walking you're not just ambling around just to get somewhere. You're walking for a specific purpose, so you're not going to strain yourself or do yourself any mischief.

Researcher: Great, ok, now just to. I know we talked a little bit about music before but maybe if you could expand a little bit about that and why you enjoy listening to music while you are exercising?

PAR010: I like music anyhow in terms of exercise, running and walking, having music that's the right tempo actually keeps you on the same sort of line, keeps you consistent. So

you, like I say, I'm that sort of person I might set off like "oh yes lets go for it" in a brisk walk and I know I slow down and amble along whereas if I've got music I think I would keep going. It helps you keep the pace which in terms of walking as an exercise, as opposed to going from A to B, I think you need to keep pace. That's what the music does for you. And you can also varying it, so if you want to go at a faster pace, just put some faster music in, put a new playlist in your MP3 player. And you do, you speed up and slow down in response to the music, if that's your plan.

Researcher: And how would you feel about something, if you if you could do this as part of an app, if you could say I want to walk at say a brisk pace pick me a song from my library that's going to provide that?

PAR010: If you, if you could give it a sort of general idea what sort of music genres you like I think that would be great. I found a website that does something similar and it's like for running and you put tick what sort of music you like and it gives you a list of suggested songs, that's quite good. That all goes on the tempo of the music. But its too, like, saves you trying to work out how fast you're going. Like if I say right I want a 30 minute brisk walk and it would sort of be able to spin it together. With the couch to 5K programme it's all just like stock music, it's not artists, but it works really well. And it kind of, you know you get the upbeatie kind of things and when you're cooling down at the end it's the sort of gentler thing. If you could get something that could give you a playlist that you could download, that would be brilliant.

Researcher: Ok great. So now just to move on to the features that you rated as least important for you um so we'll start off with posting to social media, can you tell me a bit about that?

PAR010: I don't post a lot to.

Researcher: Do you have a Facebook account?

PAR010: I do but I tend not to share things that are too personal. I need, when I started the running because a lot of my family run I did post one or two things especially when hit my first milestone and ran solidly for 20 minutes without stopping and running 3K but I'm not a big. I've got a friend that tells you what restaurants he's been to and it's like 40 posts a day from him, at least! But I tend to sort of dib in and out and have a look. But I kind of don't want to share everything with everybody kind of thing.

Researcher: Ok, and the audio encouragement, I know we've kinda talked a little bit about that as well...

PAR010: I think the audio cues are are good but I think if you've got someone babbling on I think that can get irritating.

Researcher: So maybe just, kind of like the audio cue in a way, not there all the time but something that's maybe if you've hit a milestone or something "you've hit 5K" or "you've walked a mile".

PAR010: I don't want to sort of harp on too much about the couch to 5K but that kind of at the beginning of each podcast she explains what that particular runs going to be and how it's broken into running and walking and that kind of thing and in the first instance that she's, you need to know that when you're new to something. I mean I obviously don't need someone to tell me what to do but if you struggle you might need a few more tips on walking techniques and the whole thing but then you need that to ground down as you get into it so you can just concentrate on walking and listening to the music.

Researcher: Great ok. And then the next part, I just want to ask you a little bit about how people have rated things overall. Em, so, kind of the top rated feature was overall distance so that was the most important thing to everyone and then moving down, quite a lot of the social things we've already mentioned a couple of them, so like posting to social media, they all featured as a group quite low overall so I wanted to ask you a little bit about some of the other social things as well. I'm just trying to see where it is on the list, oh yeah, the other ones were connecting to a walking community, an online walking community, and sharing a route for safety reasons, I can't see it oh yeah. So I just wanted to ask you what you think that would be and how it would work as part of the app so maybe we'll start with sharing a route for safety reasons.

PAR010: I mean I think that's fairly straightforward. I feel quite safe in my neighbourhood so but if I am going out by myself I would make sure that my husband knows so he doesn't have to worry about me if I'm not back in 3 hours. And I think that's quite important if you're going out by yourself. And I think that's why the connecting to the online walking community idea because we've no social network, or a limited social network here because we are fairly new to the area, if I want to go for a walk or get out I'd kind of like to build in some sort of social element with that. Or perhaps there is somebody else who is by themselves but doesn't really fancy the idea of walking by themselves and you can sort of

walk together and have that sort of social element which also is good for safety because you're not going out by yourself.

Researcher: Yeah ok. So you quite like the idea of having a walking community there where you can arrange walks with others in your local?

PAR010: Well that's why I joined the walking and socialising group. It was never intended be sort of to make close buddies or anything I just wanted to go out for a walk with like-minded people.

Researcher: Ok, I think that's everything that I wanted to ask you. Is there anything else you wanted to expand on or talk about?

PAR010: I did like the idea of the local information on it. I think that's a useful thing. Even if you have always lived in a place you might not know all the best places to walk, the sort of off road places to walk, and I think that would be useful to be able to plug in to. In terms of encouraging people to walk more, if you've got a nice park you can sort of say "walk to the park" and that kind of thing. Where I think sometimes if you've got somewhere to go to its more encouraging to set off if you've got a rather than you just walking round and round in the park you know what I mean so I think that's good. And I think the fast enough for health benefits was a big one for me because we can all walk, we can all put one foot in front of the other and get out there but in terms of like for me because I was off my feet for a long time I want to sort of try to lose some more weight and personally I wouldn't know if I was going fast enough to get my heart at the right rate, that kind of thing. And that would be good. But I that's where you could tie the music in, music's a way of doing making sure you are going keep you at the right pace.

Researcher: Great was there anything else you wanted to say?

PAR010: Nope I think that's it.

Researcher: Thank you very much.

PAR010: No problem.

Researcher: All right, so first I'd like to thank you for meeting me today and for filling out the online part of my study. Today I'm going to be going into a bit more detail into the responses that you gave in the online study and it should take about 20 minutes. Everything you say will be treated confidentially so only me and my supervisors will know who said what and that won't be disclosed on anything that's published. So just to start off, can you tell me a bit about your current physical activity and what you do just now and how often and that sort of stuff?

PAR011: Em, about 18 months ago I was made redundant so last year I think well I did a bit of walking (and something) and everything else, then I joined a walking society etc. to get myself fitter um and in January I got a job that involves doing a lot of walking around during the day so I haven't done so much walking this year and um the next plan would be more walks with the walking group.

Researcher: Ok, but you tend to do quite a lot of walking as part of your daily routine?

PAR011: Yep. I would probably walk I dunno up and down steps um for about an hour every day.

Researcher: Oh right ok, great. So the next part is going to be focusing on the group responses now how we did this was we used a statistical program and it grouped the responses of the group as a whole into three different groups based on similarities so the group that you fitted into was this group here, its factor 3. Now the em sort of distinguishing features about this factor which were different from the other two groups were the everyone in the group kind of wanted a lot of information from their walks so you know things like map and local information, total time, whereas the groups were a bit different because factor 1 was quite focused on music and factor 2 was focused on having the app to sort of encourage them so things like a points system and goal setting. So first I'd just like to ask you if you could have a wee look over factor 3 and based on how I've described it to you can you tell me whether you agree with how you've been grouped into this one compared with the other two?

PAR011: Um, yes, very happy with that.

Researcher: Ok, can you explain why you think that you fit into this group?

PAR011: Um, well because um I don't know what it means by local information but part of from my point of view doing a walk and everything else is I suppose as much the physical activity for it to be a pleasant walk and being able to learn something new about where you're going or whatever. That would help achieve that, rather than I could understand some younger members may want, you know that isn't what they are concentrating on. They're concentrating on go faster or so to me that is a good thing. Um probably I would like for local information in some way toilets could be marked, would be a handy thing. And as I say an offline map which might be easier these days than what it used to be since there's that new um facility for that Google maps has got for doing things offline. I guess it just depends if you have a smart phone or not. I dunno em that could help.

Researcher: Yeah ok. The next part of the interview is going to be focusing on your responses. So I'm going to ask you about the things you've highlighted here as most and least important so we'll start off with the greater importance ones so you've put a map while you're walking so you've talked a little bit about that anyway but maybe if you could expand on that a little bit?

PAR011: Maps can um give you directions if you need to alter a route, so you know what you're next action is that you've got to do if you're following a route you know go from here to such and such a place about however many metres and if for each, since I've done that I've started using a sat nav system on my phone for driving round and everything else and one of the points one of the quite good things it does is if you are following a route say two miles before you're going to have to turn right or left or whatever it counts down until you get to that point so that if if you you know go a walk from here to there and then you are going from there obviously walking on there will tell you how many metres you have to go before you have to change direction. Would be quite a useful facility. And that's something I've learned since then (laughs).

Researcher: Ok, and miles and kilometres maybe if you could tell me a little bit about why those are important?

PAR011: Em, because some people prefer to work in miles to kilometres you know um. And um, being an old fogie I'm a miles man um the younger generation might be kilometres so just being able to set that up.

Researcher: Ok great. Moving on to the ones you marked as least important. Can you talk to me a little bit about the points system and what you think that would be and how you think that would maybe not work for you?

PAR011: Um, I'm not motivated by points or by the amount of exercise someone else is doing; I'm doing it for myself so that's the reason for that. It doesn't do anything for me. Audio management um, I feel that well if its controlling something else like using whatever um then it depends, a lot of phones these days have got their own apps for the music sound better so unless you are interfacing with that then you don't necessarily want to be competing with it (yeah), so that's why I'm not too worried about that, and also if you are on a group walk you don't necessarily want to be listening to music. Or do you mean audio management from the point of view of..?

Researcher: Um like a, something that's going to sort of encourage you along the way?

PAR011: Again I don't need motivating like that.

Researcher: Yeah ok in terms of, I know you mentioned not listening to music when you're on group walks do you think that when group walks would be the time when you would actually use an app like this?

PAR011: Yes, even when I was doing the group walks last year I had Endomondo. I would use that and then be able to tell people and I used to have a go at the leaders "You said it was 5 miles, we've done 7 so far!". (Laughs). So eh, you know.

Researcher: That's good. yeah ok And then I'll maybe just bring up a couple of points about some of the features that were marked as quite low overall by the group as a whole. So the kind of social features fitted into this. Those were sharing a route for safety reasons which you've actually marked quite high compared with the group as a whole and the other ones were posting to social media and an online walking community so em maybe we could start by talking about sharing a route for safety and why you marked that as you did?

PAR011: Um, again if you're walking out on the hills etcetera um if you are sharing the route as you go along and you stopped someone would know where to find you which is the benefit of that um that really stems from my father in law who does a lot of walking had a

heart attack recently, he still likes to go walking etcetera. But you know you can imagine if he was to have a heart attack then he'd be out in the suburbs I think he would be...

Researcher: It’s quite scary eh when you're off in the middle of nowhere?

PAR011: You young things you see, you don't have to think about these things.

Researcher: I often go off places on my bike though and I kind of worry if it’s just me and I end up falling off or something.

PAR011: Well that's it you know it’s anything can happen accident wise or you could trip and break your leg.

Researcher: Yeah and then you're stuck if you're on your own.

PAR011: Correct.

Researcher: Ok and then posting to social media. I mean do you use any kind of social media yourself?

PAR011: I do but I'm not worried about doing at the time ok so on Endomondo again once you completed the walk and you marked it as done it had a facility to say I've done this walk and whatever it was etcetera. Um but you weren't doing it as you were going along.

Researcher: Right ok. Um, so do you think it would be something you would maybe do afterwards? (Yeah) Ok. And em.

PAR011: You had to knock things out to in order to fit things in so to me that was the least important.

Researcher: Ok and the online walking community. Can you just tell me what you imagine that would be and whether you think you would use something like that as part of the app?

PAR011: Um, again I an online walking community I see, um I don't know whether you've heard of a thing called my meet-up? (Yeah I have) Well I that's how I got along with the Edinburgh Walk so I imagine that's what an online walking community is about.

Researcher: Ok, and do you think you would use something like that if you could as part of the app if you could link in to?

PAR011: Possibly, again I it's something I would see it being done after the walk rather than cos talk normally of what happens is on my meet-up once a walks over and everything else it says "Well how did you rate this meet up" and people put in their comments or whatever so it could have an opportunity like that to rate the walk and various things.

Researcher: Ok great. I'm just going to see if there's anything else we need to touch on. Em, well maybe we could talk about goal setting because you've rated that quite high as well. Is that something that you would be quite keen to do?

PAR011: Um, I'm not really sure why I would have done that. Um, I'm trying to think back as to where this came from. Again it might have been me trying to get to a place by a certain time that's the only thing where you're keeping track. I can really think of why I would have rated goal setting. You know, as I say, most of my walking is done for pleasure rather than anything else. So background wise I couldn't walk 15 metres eight years ago so um getting to 5 or 6 miles now is great.

Researcher: Good well done. Ok well I think that's everything I wanted to ask you. Do you want to add anything else yourself or is there any features or information about the app you feel could be included?

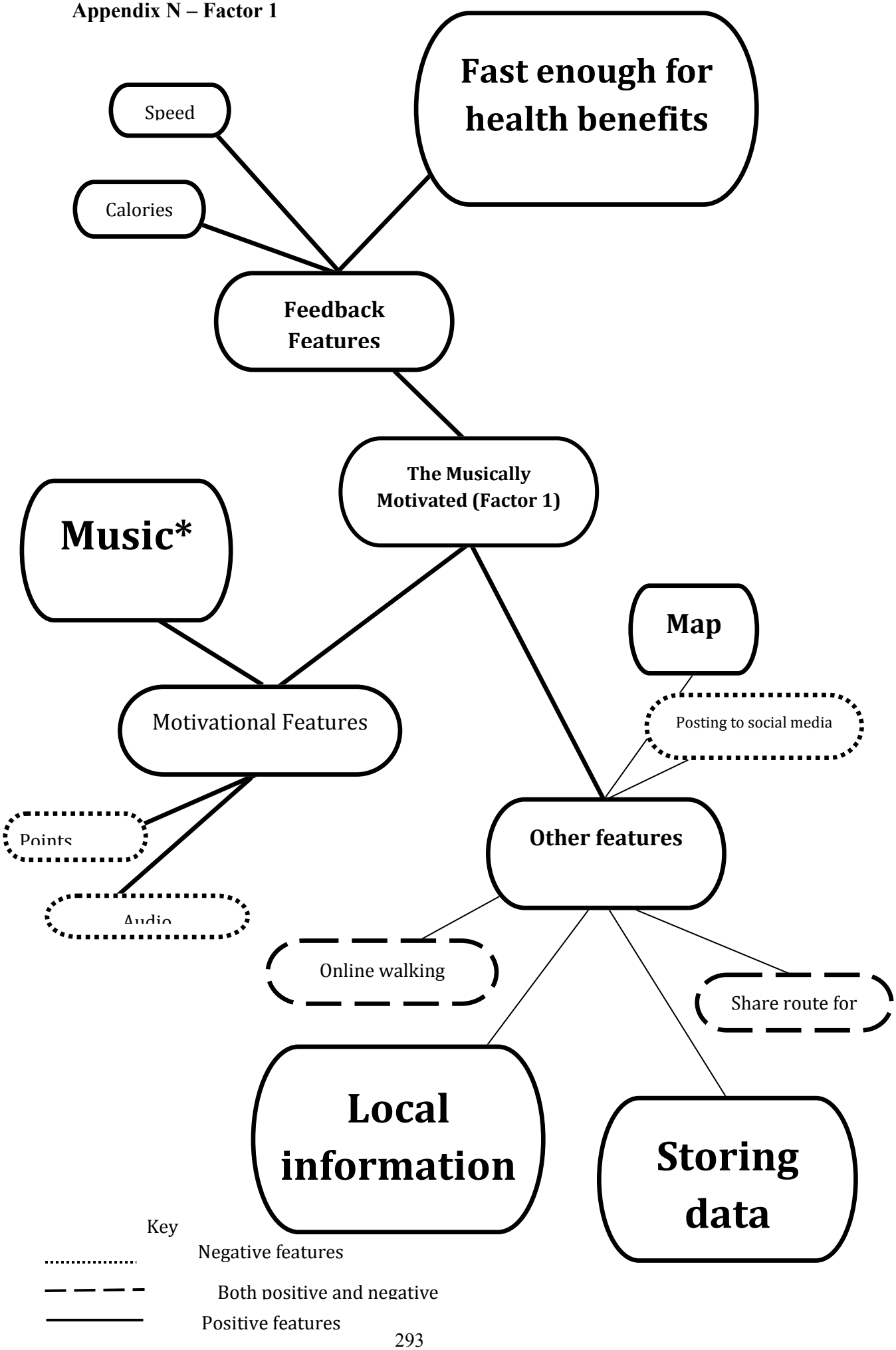
PAR011: Again as I said um those instructions for route changes on a map um the leaders if it comes to a point when you can't remember exactly what you're supposed to do and which way to go or anything else so it's that sort of thing that would be quite useful.

Researcher: That's great thanks, was there anything else?

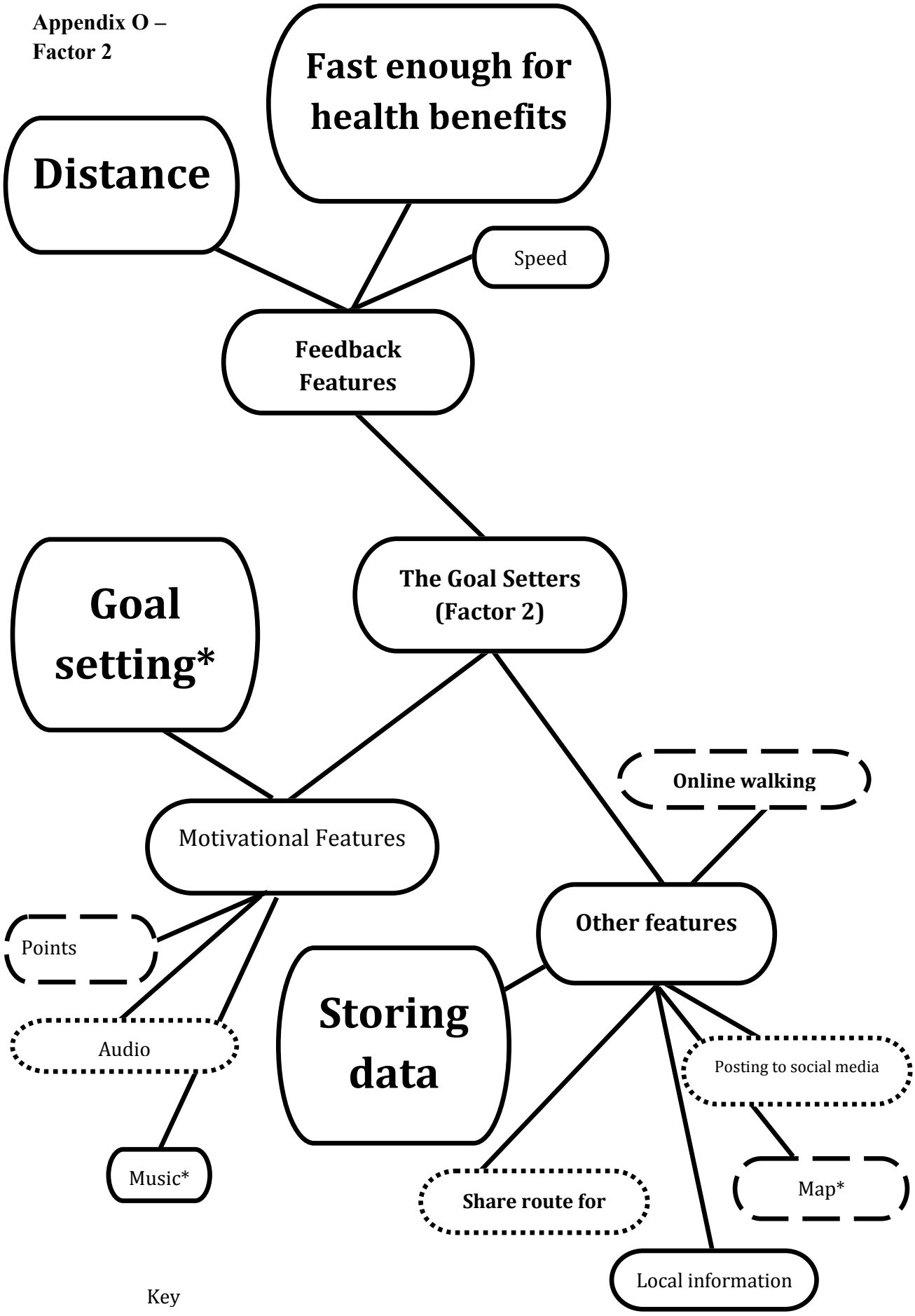
PAR011: One, one other thing is whatever you do in for instance on Endomondo on music wise it will only use the standard android music if you could say this is the music system I want to interface to so set that in settings rather than the standard default Android music, that would be a suggestion.

Researcher: Oh ok. Fab.

Appendix N – Factor 1



Appendix O – Factor 2



Appendix P- Factor 3