

Adherence to Pelvic Floor Muscle Exercises and the Role of Smart Phone Apps

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ADHERENCE TO PELVIC FLOOR MUSCLE EXERCISES

AND THE ROLE OF SMART PHONE APPS

A thesis presented for the degree of Doctor of Philosophy at the University of Aberdeen through the University of the Highlands and Islands (Moray College and Centre for Rural Health and Wellbeing).

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BSc Rural Development, University of the Highlands and Islands

2014

DECLARATION

I, Catriona Stephen, confirm that I composed the thesis, that it has not been accepted in any previous application for a degree, that the work is my own, and that all quotations have been distinguished by quotation marks and the sources of information specifically acknowledged.



Catriona (Kate) Stephen

8th July 2015

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In memory of my parents Ina and Ronald Lamont.

ABSTRACT

Urinary incontinence (UI) is a condition commonly experienced by women worldwide. Many women suffer in silence as they refrain from or delay seeking help. Pelvic Floor Muscle Exercises (PFME) have proven to be effective and are recommended as the first line of treatment. Regular exercise of the pelvic floor muscles can prevent symptoms developing. However, there is evidence of lack of motivation and poor adherence to exercises. The use of mobile phone applications have been suggested as an effective resource for health behaviour interventions, especially for sensitive or embarrassing conditions.

A mixed methodology was used to gather evidence about the experience of community dwelling women in the North of Scotland over a three month period. Of the twenty three participants who completed a three month explanatory randomised controlled trial, fifteen participants exercised at least daily on average by the end of the trial. Of the fifteen who exercised at least daily, five continued average exercise of at least daily at the twelve month follow-up. Taking part in the study helped women to focus on the exercises and this had a positive impact on their adherence. Eleven out of the fifteen participants with incontinence experienced an improvement in their symptoms after twelve weeks. This had a positive impact on their quality of life. Of those who experienced UI, the women who had the biggest increase in level of exercise also had the biggest improvement in symptoms.

Participants in the intervention group of the trial were provided with apps for PFME. Six out of the ten of intervention group participants who completed the trial reported that the apps were not useful and of the four who found them useful, their level of use was varied. The data from this study suggests that simply being provided with apps or equipment to use the apps cannot be linked to improved levels of participation in the study. This suggests that the provision of technology is insufficient in itself to engage with individuals in health behaviour change and has important implications for future service provision in continence promotion and mHealth.

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LIST OF ABBREVIATIONS

BASNEF	Belief, Attitude, Subjective Norm and Enabling Factors
GP	General Practitioner
ICS	International Continence Society
ICT	Internet Communications Technology
MUI	Mixed urinary incontinence
NHS	National Health Service
NE	North East
NICE	National Institute for Health and Care Excellence
PFE	Pelvic Floor Exercise
PFME	Pelvic Floor Muscle Exercise
PFMT	Pelvic Floor Muscle Training
RCT	Randomised Controlled Trial
SIGN	Scottish Intercollegiate Guidelines Network
SPSS	Statistical Package for Social Science
SUI	Stress urinary incontinence
TIPI	Ten Item Personality Inventory
TPB	Theory of planned behaviour
UI	Urinary incontinence
UUI	Urge Urinary incontinence

CHAPTER 1: INTRODUCTION

This thesis presents research undertaken in 2012/13 exploring the role of smart phone apps in adherence to Pelvic Floor Muscle Exercise (PFME) by women in a community setting in the North East and Highlands of Scotland.

1.1 BACKGROUND

Urinary incontinence is a condition commonly experienced by women worldwide. It is an unpleasant condition which causes “*a great deal of distress and embarrassment*” (Lucas *et al*, 2012, p.7) and affects women of all ages, impacting on their physical, psychological and social health. NHS Quality Improvement Scotland state that “*incontinence can have a profound effect on an individual’s quality of life*” (2005, pIII).

Many women suffer in silence as they refrain from or delay seeking help (Norton *et al*, 1988). Reasons given include embarrassment, not wanting to bother the doctor, the belief that incontinence is part of ageing, and not being aware of effective treatments (Hagglund *et al*, 2003).

Pelvic Floor Muscle Exercises (PFME) have proven to be effective in a range of randomised controlled trials and there is “*widespread recommendation*” for their use as the first line of treatment for symptoms (Price *et al*, 2010, p.314). Regular exercise of the pelvic floor muscles can prevent symptoms developing (NICE, 2006).

In addition to the benefits of PFME in relation to urinary incontinence, the same exercises can improve sexual sensation in both the female and their male partner (Nillsson *et al*, 2011; Hayder & Schnepf, 2010). Despite these benefits, health professionals as well as the women themselves have so far been reluctant to initiate discussions (Sells & McDonagh, 1999).

For PFME to be effective, they must be “*diligently performed*” (Knight *et al*, 1998, p.61) however research has found lack of motivation and poor adherence to exercise (Borello-France *et al*, 2010) thereby limiting their efficacy . There is little understanding about motivation and adherence to PFME and there is a need for further understanding about the barriers and promoters of exercise (Laycock, 2008).

In a rural context, Dougherty *et al* (2002, p.4) found that “*relatively little has been reported about home-based interventions for UI*”. In addition, Brown *et al* (1999) found that women from rural and remote areas visited health professionals less, were more likely to undergo gynaecological surgery, and were more likely to be overweight than women living in urban areas. This suggests a gap in knowledge about home-based support for PFME for women in rural areas.

The use of mobile devices in Internet Communications Technology (ICT) has increased exponentially over the last decade (Boulos *et al*, 2011) with their use in healthcare being referred to as ‘mHealth’. Early indications suggest that there are opportunities for mHealth to be effective in resource poor health settings and for health behaviour interventions (Bennett & Emberson, 2011; Boulos *et al*, 2011; Cumming *et al*, 2014; Riley *et al*, 2011; Garai, 2011).

Continence promotion is poorly resourced despite the prevalence and cost implications of UI to health services and individuals with the condition (Wilson, 2002; Getliffe & Dolman, 2007). Additionally, PFME is a treatment which requires the engagement and effort of the individual in terms of their behaviour and this contrasts with treatment which can be controlled and delivered by a health service. Therefore, both the opportunities for effectiveness in resource poor settings and for health behaviour interventions would suggest that mHealth would be particularly effective for PFME.

In addition, the use of mHealth has been identified as being particularly suited for sensitive conditions where the technology can avoid or supplement face-to-face

communication which may be awkward or embarrassing (Perry *et al*, 2012). This further suggests the potential use of mHealth in the field of continence promotion, especially for community dwelling women who, as previously described, may be unlikely to talk to a health professional about the condition (Koch, 2006).

The research presented in this thesis contributes to the literature exploring adherence to PFME and mHealth and in particular the role played by smart phone apps in this.

1.2 OUTLINE OF THESIS

This thesis will provide evidence about factors which influence adherence to PFME and the role of smart phone apps in supporting adherence. It will provide answers to the following research questions: ‘do smart phone apps for PFME support adherence?’; ‘in what ways do smart phone apps for PFME support adherence?’; and ‘what elements of smart phone apps make them effective in supporting PFME?’.

Chapter 2 will provide a detailed review of the salient literature. In section 2.1, urinary incontinence (UI) is defined and described. Section 2.2 outlines treatments for UI and ends by outlining issues around motivation and adherence to PFME. Section 2.3 introduces concepts around health behaviour change; models of health and exercise behaviour are identified. mHealth solutions to problems around adherence are suggested and results from research in the use of smart phone apps in other areas of health and health behaviour will be presented. Issues around acceptability to users of the technology and the appropriateness for its use for PFME are discussed. The behaviour change model for internet interventions presented by Ritterband *et al* (2009) is reviewed in terms of its appropriateness for use in a study of PFME apps. The chapter ends by considering the policy context for continence promotion and mHealth.

Chapter 3 describes the methodology used in this research. It explains why a mixed methods approach was taken and outlines each of the three methods used: focus groups; an explanatory, pragmatic controlled trial; and telephone interviews. The recruitment process will be outlined and information about the design and use of study protocols is provided.

Chapter 4 presents the thesis's findings regarding factors relating to pelvic floor muscle exercises which influence adherence. The adherence of participants in the trial is presented as well as the use made of apps by participants in the intervention group. Knowledge about and awareness of PFME are discussed in section 4.2 including the influences of having been taught how to exercise and of having previously undertaken exercise. Section 4.3 includes a description and discussion about self-monitoring and recording of exercises with Section 4.4 describing how participants developed routine exercise and the influence of competition and fun on exercise uptake. This chapter further describes different exercise regimens and the importance of the correct identification and contraction of pelvic floor muscles. The influence on adherence of women's confidence in their ability to correctly identify and contract muscles is also presented as well as consideration of the influence of choice of exercise regimen and of the ability to personalise apps.

Chapter 5 is split into three sections. Section 5.1 focuses on urinary incontinence (UI) and presents data about the symptoms experienced by participants. Beliefs in the effectiveness of PFME and attitudes around incontinence are described in section 5.2. The section also discusses notions of normalcy, feelings of embarrassment and attitudes around incontinence as an illness. Section 5.3 focuses on motivation and includes data about motivation to improve continence, to prevent incontinence, and to improve sexual sensation. Other influences on motivation are also discussed.

Chapter 6 presents characteristics of women and their environment which influence adherence to PFME. Section 6.1 discusses the influence of age, including menopause and the time elapsed since childbirth. In section 6.2, self-reported

healthiness, general exercise levels and weight are discussed in relation to adherence to PFME. Section 6.3 illustrates links between the socio-economic status of participants and their adherence to exercise. Data about the personality traits of participants is presented in section 6.4 including a discussion of the usefulness of specific personality traits as a predictor of exercise adherence. In section 6.5, the success of participants at previous attempts to change health behaviour is examined in relation to the ability to predict successful adherence to PFME.

The later sections of chapter 6 focus on the characteristics of the environment in which women exercise. Section 6.6 focuses on the health and social environment with 6.7 focussing on influences of wider society including the geographical context and research environment.

The concluding chapter 7 summarises the main findings of the thesis. The chapter is characterised by reflectivity about the study design and in the analysis of results. Recommendations for future research, practice and the development of continence services will also be made.

1.3 THEORETICAL APPROACH

When examining approaches to research in health promotion and prevention, Thorlindsson (2011, p.24) stresses the “*need to employ multiple methods and more mixed research designs that help us to look at on-going social processes as well as demographic and epidemiological data*”. There is a need to move beyond reductionist models, which try to explain complex behaviour based on single factors, and instead to embrace interdisciplinary theories and paradigms (Thorlindsson, 2011). An interdisciplinary approach to research on health is required which encompasses “*multiple levels of analysis*” integrating across basic and clinical research using new methodologies (Bachrach & Abeles, 2004, p.27).

This, combined with the fact that research questions “*do not fit neatly within the confines of a single established methodology*” (Kahlke, 2014, p.13), resulted in the use of a ‘generic’ approach in this thesis (Caelli *et al*, 2003), which incorporated elements from the disciplines of health web science (Cumming *et al*, 2014), sports science, health and behavioural science. Kahlke (2014, p.49) suggests that generic studies offer an opportunity to “*develop research designs*” which use tools from established methodologies and as such engage in rigorous research which crosses disciplinary and methodological boundaries.

The methodology used in this study is outlined in chapter 3 where the methods and tools used in this “*methodological mixology*” (Kahlke, 2014) are described.

1.4 APPS FOR PFME

Five applications (apps) for use on mobile devices were used in this study. In alphabetical order these are: Kegelcamp, Kegeltopia, Kegeltrainer, Pelvic Floor Fitness and Pelvic Floor Health. In order to avoid the potential commercial sensitivities and the promotion of one app over another, the apps will not be referred to by name in the remainder of this thesis.

The thesis refers to aspects of the apps, attitudes to the apps and the use of apps throughout and examples where apps have influenced motivation and adherence to PFME are provided and discussed.

The table in Figure 1 overleaf provides the location for each app on the iTunes app store.

Figure 1 Table showing the details of the apps used

Name of app	Artwork for App	Link to location on iTunes app store
Kegelcamp		C:\Users\PHD\Music\iTunes\iTunes Media\Mobile Applications\Kegel Camp 1.51.ipa
Kegeltopia		C:\Users\PHD\Music\iTunes\iTunes Media\Mobile Applications\KegelTopia 1 1.ipa
Kegeltrainer		C:\Users\PHD\Music\iTunes\iTunes Media\Mobile Applications\PFE 3.2.0.ipa
Pelvic Floor Fitness		C:\Users\PHD\Music\iTunes\iTunes Media\Mobile Applications\my pff 1.0.2.1327504422.ipa
Pelvic Floor Health		C:\Users\PHD\Music\iTunes\iTunes Media\Mobile Applications\Pelvic Floor Exercises 1.3.ipa

CHAPTER 2: REVIEW OF LITERATURE

This chapter provides background context to the study from the available literature and identifies where there are gaps in knowledge. Initially, an overview of the wider problem of urinary incontinence (UI) is given. This is followed by a summary of treatments for mild UI and a justification for the focus on pelvic floor muscle exercises (PFME) and the literature around PFME is reviewed. Tools which support PFME are described and the literature around their use is also reviewed; innovative tools which involve the use of recent developments in information communication technology (ICT) are included. Towards the end of the chapter, aspects of health and exercise behaviour are examined from the perspective of PFME.

2.1 URINARY INCONTINENCE

This section provides information about urinary incontinence (UI) in women and gives an overview of prevalence and risk factors. The range of effects of UI on the lives of women is given and some indication of the costs of UI is provided. First line treatments of UI are outlined.

2.1.1 DEFINITIONS AND DESCRIPTIONS OF UI

The National Institute for Health and Clinical Excellence (NICE) (2006, p.1) describes urinary incontinence (UI) as a “*common symptom that can affect women of all ages, with a wide range of severity and nature*”. UI is defined by the International Continence Society (ICS) as ‘the complaint of any involuntary leakage of urine’ (Abrams *et al*, 2002, p.168). Thomas *et al* (1980) include the inappropriateness of the time and the (geographical) location of the leakage of urine in their definition. The Public Health Service which is part of the Agency of Health Care Policy and Research in America defines UI as “*the involuntary loss of urine which is sufficient to be a problem*” (in Doughty & Crestodina, 2006, p.2).

The ICS describe UI as a symptom, a sign, and a condition (in Abrams *et al*, 2002). Aslan *et al* (2008) describe UI as a multifactorial syndrome whereas others describe it simply as a common, debilitating or embarrassing problem (Knight *et al*, 1998; NICE, 2006). Monga (2002) uses the term disease in connection with UI whereas others maintain it is a symptom and not a diagnosis (Irvine *et al*, 1999). Flynn (1999, p.32) gives a physiological classification of incontinence as “*any situation that causes the intravesical pressure temporarily to exceed the intraurethral pressure*” resulting in the involuntary passage of urine. UI can also be viewed as the opposite of continence which is defined as “*the act of storing urine in the bladder until a socially appropriate opportunity for bladder evacuation occurs*” (Grey, 2006, p.21).

There is a level of ambiguity around the words ‘problem’ and ‘complaint’ which point to the “*intensely subjective*” nature of incontinence where “*leakage perceived as very problematic by one individual may be a minor nuisance to another*” (Doughty & Crestodina, 2006, p.2). Women who do not perceive their leakage as a problem will be less likely to seek help and as such will be less likely to be included in prevalence studies (Getliffe & Thomas, 2007; Colburn, 1994). This is compounded by widespread attitudes in society that UI is a normal and expected consequence of ageing and childbirth (Doughty & Crestodina, 2006; Monga, 2002; NICE, 2006).

Although incontinence may not be a self-improving condition (Bo *et al*, 1989 in Parkkinen *et al*, 2004), it can present as transient symptom (Getliffe & Dolman, 2007; NICE, 2006). As such, it may be useful to think of continence as a continuum, with no leakage at the extremity of the ‘continent end’ and continuous leakage at the extremity of the ‘incontinent end’. Women may shift along that continuum throughout the life course with a tendency towards incontinence with ageing.

Outwith academia, the term ‘bladder leakage’ or ‘light bladder leakage’ is commonly used by companies such as Kimberly-Clark Worldwide Inc. and SCA Hygiene Products to describe urinary incontinence. Terms which are rarely used and no longer recommended include reflex incontinence and overflow incontinence (Doughty & Crestodina, 2006). For the purposes of this study and during this thesis, the ICS

definition 'the complaint of any involuntary leakage of urine' will be used (Abrams *et al*, 2002).

2.1.2 TYPES OF URINARY INCONTINENCE

The two most common types of UI are 'stress' and 'urge' incontinence; described as 'mixed' when they co-exist (Neumann *et al*, 2006). Stress UI is considered the most common type (Neumann *et al*, 2006; NICE, 2006; Knight *et al*, 1998) but accurate prevalence rates are difficult to establish as a result of under reporting of symptoms (section 2.1.3). Previously known as Genuine Stress Incontinence, this has more recently been replaced by the term Urodynamic Stress Incontinence or Stress Urinary Incontinence (Garnett & Abrams, 2002, Cartwright & Cardozo, 2010).

Stress urinary incontinence (SUI) is characterised by involuntary leakage of urine as a result of increased abdominal pressure (stress) exerted on the bladder, such as with sneezing, coughing, laughing, physical exercise, breathing in deeply, standing up from sitting, constipation and sexual intercourse (Colburn, 1994, pp.66-67). Gomez 2003, p.6) suggests that with SUI, "*the root of the problem is muscle weakness*" (and a physiological description of the muscles involved in the mechanisms of continence will be described in section 2.2.2.1.

NICE defines urge urinary incontinence (UUI) as the "*involuntary urine leakage accompanied by or immediately preceded by urgency*" with urgency being defined as "*the complaint of a sudden compelling desire to pass urine which is difficult to defer*" (NICE, 2006, Glossary). Cardozo *et al* (1993, p.18) add to this definition "*with involuntary loss of urine occurring before the woman can reach the toilet*". UUI is also described as Over Active Bladder (Aslan *et al*, 2008)

The co-existence of SUI and UUI is known as mixed UI. Figure 2 presents patterns of incontinence affecting women (Cardozo *et al*, 1993, p.17):

Figure 2 Table showing patterns of incontinence

Type	Characteristics
Stress	Caused by coughing, sneezing, exercise
Urge	Preceded by sudden, strong urge to void
Dribble	Constant
Giggle	Isolated symptom, <25 years
Intercourse	Caused by penetration, orgasm
Nocturnal enuresis	Leakage at night

Although SUI and UI are described as the most common types of incontinence (Neumann *et al*, 2006), the difficulties in establishing accurate prevalence rates are discussed in the following section.

2.1.3 PREVALENCE AND UNDER REPORTING

UI is often described as a common problem experienced by women throughout the world (Dolman, 2007, p.57; Fultz & Herzog, 2001, Minassian *et al*, 2003; Gomez, 2003). “Overall prevalence rates (that is, prevalence across the lifespan) are not available for UI” (Doughty & Crestodina, 2006, p.3) as a result of variations in the way data is collected and the ambiguity around definitions of UI (Getliffe & Thomas, 2007; Monga, 2002), as previously discussed (sections 2.1.1 and 2.1.2.).

It is estimated that “less than half of the adults with moderate or severe UI seek help from healthcare providers” (SIGN, 2004, p.4). Some women are reluctant to speak about incontinence symptoms to health professionals because they are embarrassed (NICE, 2006) or ashamed (Sugaya *et al*, 2003) while others accept symptoms as an

“*inevitable and intractable*” result of ageing or of child bearing (Colburn, 1994, p.14). Some studies have estimated that women can experience incontinence symptoms for up to five years before seeking help (Sells & McDonagh, 1999).

Women with UI do not always perceive the condition as a medical problem and “*in the absence of an ‘illness identity’ it is often not considered or recognised as appropriate for discussion with a health professional*” (Getliffe and Thomas, p.10). Individuals vary in the way they perceive their symptoms; some may not rate the perceived bother of symptoms highly if they have co-morbidities that are perceived as being more serious (Sells & McDonagh, 1999; Teleman *et al*, 2005) whilst other individuals may perceive themselves as having an intolerable problem with only a small amount of leakage during aerobic exercise (Sells & McDonagh, 1999; Bo, 2002). These factors affect data around the incidents of incontinence and will influence estimates of prevalence.

Dumoulin *et al* (2005) and Colburn (1994) have identified negative attitudes of health professionals as a further reason for low levels of reporting and subsequent difficulties in estimating prevalence. Incontinence can be viewed by health and care staff as irritating and time consuming. Patients can pick up these negative attitudes and be less inclined to seek treatment on (Sells & McDonagh, 1999; Wagg, 2002). Sells and McDonagh (1999, p.2) suggest that the “*the vast majority of patients with incontinence are not being assessed for treatment*”.

In studies of the wider population, Wagg (2002) describes the data about prevalence of UI in community dwelling women as sparse and Strickland (2014, p.63) identified the need to “*focus on community-dwelling women*” in order to provide support out with clinical facilities.

UI is considered to be more common in women than asthma, diabetes, hypertension and depression (Getliffe & Dolman, Eds, 2007). Eason *et al* (2004) suggested that half of primiparous women will experience symptoms during their last trimester.

Dolman (2007) estimates that half of women who undertake regular exercise will experience symptoms and may take measures to absorb leakage during their exercise.

Age UK suggests that more than 2.5 million people in the UK over the age of 60 suffer from urinary incontinence (Age UK, 2011) and Cardozo *et al* (1993) estimated that 40% of women over 80 years are affected. Monga (2002) and Aslan *et al* (2008) identify a lack of inclusion of data about individuals in residential care and this would suggest that general prevalence rates do not reflect the proportions of people with UI in residential care. Given the ageing demographics in many countries around the world, this prevalence is likely to increase with the ageing population and with it increasing demand on services and costs associated with dealing with incontinence (Wagg, 2002; Marques *et al*, 2010).

Researchers are now reaching agreement about the terminology and measurements used for UI (NICE, 2006; Abrams *et al*, 2002; Haylen *et al*, 2010), and this may improve future ability to extrapolate overall prevalence rates by consolidating data from a broad range of studies.

Given the universal acknowledgement that UI is a common problem and the likelihood that prevalence will increase with the ageing population, the need to address incontinence issues “*cannot be ignored*” (Wagg, 2002, p.103). There is a need to “*actively promote better knowledge and understanding of treatment options and cure prospects within the general public*” (Getliffe & Thomas, 2007, p.10). Based on reports from NICE (2006) and others (Colburn, 1994; Paddison, 2002; Getliffe & Dolman, 2007, Cumming *et al* 2011) that many women with UI not only do not access continence services, they do not access basic advice and support from their local GP or nurse, it is clear that service provision does not currently match the needs of women.

The prevalence of UI, the scarcity of resources and the phenomenon of reluctance to, and delay in accessing available resources, when considered together paint a significant challenge. This study is an attempt to increase understanding of how this challenge can be met and to test a novel type of service provision.

2.1.4 RISK FACTORS FOR URINARY INCONTINENCE

Although UI can occur at any age, as indicated in section 2.1.3 above, it is more prevalent in older women (Getliffe & Dolman, 2007; Goode *et al*, 2010; Perry *et al*, 2000). Obstetric factors and parity can contribute to UI, with a third of women experiencing symptoms after childbirth (Hay-Smith, 2008). Episiotomy is also a potential cause of weakening of the pelvic floor (Freeman, 2002).

The menopause is also a recognised trigger point where oestrogen deficiency can affect continence (Brown *et al*, 1999; Dolman, 2007; Cardozo *et al*, 1993, Cumming *et al*, 2011). A sedentary lifestyle, obesity and constipation are other factors which can adversely affect the pelvic floor (Marques *et al*, 2010; NICE, 2006; Colburn, 1994; Flynn, 1999; Getliffe & Thomas, 2007). Some other risk factors found in cross-sectional studies include smoking, genetics, family history and diet, and anorexia nervosa (NICE, 2006; Getliffe & Dolman, 2007; Colburn, 1994).

These risk factors are common aspects of the lives of community dwelling women and, excepting the antenatal to postnatal period, may not involve interaction with a health service. As a result, women from this group may be less likely to report symptoms of incontinence (Strickland, 2014). There is a need to promote awareness of “*treatment options and cure prospects*” (Getliffe & Thomas, 2007, p.10) to these women and to adopt a positive approach to promote continence (Colburn, 1994) to the general population of women who are at risk of incontinence in the future. This involves preventative care and community education (Doughty & Crestodina, 2006; Getliffe & Dolman, 2007; Speakman, 1999).

Additionally, women can experience transient UI symptoms as a result of “*acute health or environmental factors*” (NICE, 2006, p.1) or from urinary tract infections and chest infections which cause a severe cough. More persistent symptoms can be the result of congenital lack of functionality of the lower urinary tract, a bladder fistula, spinal and / or brain injury, or long term conditions such as Multiple Sclerosis and Parkinson’s Disease (Flynn, 1999; Hilton, 2002; Cardozo *et al*, 1993).

This study focuses on continence promotion to community dwelling women as opposed to continence treatments within a clinical setting.

2.1.5 EFFECTS OF URINARY INCONTINENCE

Incontinence is not normally life-threatening but it can have a negative influence on the “*physical, psychological and social wellbeing of affected individuals*” (NICE, 2006, p.1; Fultz & Herzog, 2001; Riss & Kargl, 2011). Gomez (2003, p.92) suggests that although “*incontinence isn’t painful or disfiguring ... it accounts for more misery and humiliation than any other common disorder*”. Physical problems such as impaired skin integrity and unpleasant odour (especially with mild symptoms which are not immediately noticed) can be experienced as a result of UI.

Women can feel more vulnerable and experience a lack of feeling at ease and a loss of a sense of mastery or of being in control (Sells & McDonagh, 1999). Distress, anxiety and depression can develop and individuals can become angry and hostile (Getliffe & Dolman, 2007; Doughty & Crestodina, 2006). Monga (2002, p.3) suggests there is a “*significant impact on a patient’s day-to-day activities and social interactions*” as well as affecting their “*self-perception of general wellbeing*” and a “*detrimental influence on their quality of life*”.

Women can adopt a range of behaviours to accommodate the condition, such as carrying additional clothing and absorbent pads, frequent checking of clothing and the excessive use of perfumes (Getliffe & Dolman, 2007; Sells & McDonagh, 1999). To avoid the embarrassment of the leakage of urine in public, women can become socially isolated as they become subject to this bladder leash (Cumming *et al* 2011) . Individuals can experience stigma as a result of leakage in public (Geltiffe & Dolman,

2007; Anders, 2002). They may avoid using public transport or even leaving their home at all (Getliffe & Dolman, 2007; Gomez, 2003; Sells & McDonagh, 1999) thereby becoming isolated.

Quality of life questionnaires specially designed for people with incontinence such as I-QOL and SUIQQ and others (section 2.1.7) can help to measure the effect on women. But, these questionnaires are not able to include the multiple aspects of life outlined and, as such, are limited in their capacity to wholly reflect the effect of UI on women.

Incontinence affects others, not just the individual with the symptoms (Doughty & Crestodina, 2006). Incontinence can be the 'straw that breaks the camel's back' for carers who can no longer cope and has been identified as a contributing factor for admissions to residential care (NICE, 2006; Wagg, 2002; Getliffe & Dolman, 2007). Carers can become frustrated and exhausted with the additional burden resulting from incontinence episodes and their morale can be negatively affected (Sells & McDonagh, 1999; Hui *et al*, 2006). There is a risk that these negative attitudes are transferred to the incontinent person, affecting the quality of care. Marital relationships can be affected adversely as women avoid sexual activity and suffer low self-esteem (Colburn, 1994; Cardozo *et al*, 1993; Monga, 2002). As with the effect of UI on the individual previously discussed, it is difficult to accurately measure the effect of UI on partners, carers and family members because of the range of the effects.

Given the severity and range of effects of UI which negatively impact on quality of life and the commonness of the condition, it is surprising that continence services are relatively insignificant in size. Isaacs (1992) suggests that an inverse care law is in place, where less attention is given to a condition the more common it is! Some incontinence experts have suggested that the attitudes of health professionals to incontinence does not help for; it may be easier to prescribe absorbent pads than to embark on a continence programme, especially when co-morbidities exist that are perceived as being more life threatening (Sells & McDonagh, 1999; Colburn, 1994). This combined with commonly held societal beliefs that incontinence was both normal and inevitable (Monga, 2002) appear to have resulted in a lack of attention to the promotion of continence.

As estimated cure rates of continence treatments are as high as 70% and, even when a complete cure isn't achievable, improvement in symptoms is usually possible (NICE, 2006) this would suggest opportunities for effective continence promotion. There is therefore a particular need to focus effort and resources on preventative measures so that women are safeguarded from avoidable, negative effects of incontinence. Given the reluctance of women to contact health services about their incontinence, the opportunity of promoting continence within a community setting to the general population presents an option which merits investigation.

2.1.6 UI IN THE WIDER CONTEXT OF HEALTH SERVICES

Continence promotion programmes are only successful if they involve the "*full cooperation*" of women (Colburn, 1994, p.74). Motivation and adherence are two factors of success (Freeman, 2002). The notion of individuals being motivated to adhere to health behaviour fits within the wider context of health services and changing roles described below.

The World Health Organisation said in 1968 that we had reached the age of responsibility and used the concept that "*people – the public, patients and potential patients – are as much producers as they are consumers of health care*" (in Stacey, 1994, p.88). There appears to be a paradigm shift from Patient- or Client-centeredness to coproduction (Freire & Sangiori, 2010). Patient-centeredness is a concept which encouraged a focus on the needs of the patient as opposed to the needs of the health service provider (Slater, 2006), whereas coproduction involves people and patients in the design and delivery of services (Boyle & Harris, 2009; Realpe & Wallace, 2010). Within the field of continence promotion Getliffe & Thomas (2007, p.15) describe Patient Care Pathways, as a main feature of current healthcare policies where the "*emphasis is on prevention and self-care, with the patient as an active agent rather than a passive recipient*". The need to engage with women in responding to tackling UI and its sequelae is therefore a critical consideration in promoting successful treatment.

Concurrently, there has been a shift in attitudes towards UI. Previously, there has been a tendency by health professionals simply to help with containment, by the prescription of pads and to accept symptoms as “*inevitable or intractable*” (Colburn, 1994, p.14). This change in attitude involves a shift from treating women as passive recipients of containment aids to supporting them as active agents in the prevention and treatment of UI. The first lines of treatments of UI are based around behavioural changes (lifestyle changes, bladder training and PFME) which are discussed in detail later in section 2.2.1. These treatments are successful only if women co-operate as active agents rather than passive recipients and, as such, fit well within this new paradigm in health care delivery.

However, despite self-care having been identified as a “*fundamental component*” of treatments such as PFME (Milne & Moore, 2006, p.41) there is little understanding of the experiences of women and the factors which impact on the success of treatments (Borello-France *et al*, 2010; Dolman, 2007). Specifically, factors influencing motivation and adherence to exercises have “*received limited attention in the literature*” (Paddision, 2002, p.38). If women are to be encouraged to adopt a self-care approach to preventing and alleviating UI symptoms, increased understanding about motivation and adherence to continence programmes is required.

Self-management is a term commonly used in health education, health promotion and patient education programmes (Lorig & Holman, 2003). Self-regulation and implementation intentions have been identified as “*promising avenues in the pursuit of interventions that can support long-term lifestyle change*” (Thirlaway & Upton, 2009, p.267) and therefore the study of behavioural health, which is “*concerned with the maintenance of health and prevention of illness ... through the use of educational inputs to change behaviour and lifestyle*” (Ogden, 2007, p.3) is required.

“*Research now needs to consider the mechanisms behind the establishment of habitual behaviours*” (Thirlaway & Upton, 2009, p.267) if the paradigm shift is to become embedded and “*preventative policies need to be put into practice which requires health care professionals and individuals to make a commitment to lifestyle*

change” (Thirlaway & Upton, 2009, p.269). Paddison (2002, p.37) goes on to suggest that “*it is imperative, therefore, that health professionals develop an understanding of factors that can influence motivation if they are to optimise clients’ chances of successfully incorporating pelvic floor exercises into their lives*”.

Research is required to support health professionals in developing increased understanding of health behaviour around the prevention and treatment of UI.

The need to engage with women in the treatment and prevention of UI has been clearly established and fits with current thinking in the delivery of health services, however there is a gap in understanding about how best women can be supported in this engagement. There is a need to investigate options for this engagement and to study their effectiveness.

2.1.7 COSTS OF UI

The costs of incontinence must be seen in the same way that under reporting and lack of help seeking behaviour impacts on estimates of prevalence. If women are receiving limited or no health services for incontinence as a result of the under reporting of symptoms, this will have a bearing on the costs which can be directly associated with incontinence. Two assumptions can be made; costs of incontinence would be significantly higher if all women with symptoms received health services for their condition, and women themselves incur costs as a result of their symptoms.

Despite the lack of detailed cost information about incontinence (NICE, 2006), there is evidence of a substantial economic burden imposed by incontinence. Dolman (2007, p.57) mentions “*high costs to individuals and services*” and Neumann *et al* (2006, p.24) identify the impact on costs of “*increasing numbers of women living longer and the known association of incontinence with increasing age*”. This would suggest that any existing reports of costs are unrealistically low and that costs will increase in the future as the population ages.

Costs to health service providers include incontinence pads, laundry, incontinence aids and medication (Turner *et al*, 2004; Wilson *et al*, 2001). Over a decade ago, the cost of products for incontinence was identified as “*one of the biggest forms of expenditure*” for the NHS, then estimated at around £350 million (Anders, 2002, p.225). This figure includes prescription items. At the same time in the USA, the direct and indirect costs associated with incontinence were estimated at over \$16billion per annum (Doughty & Crestondina, 2006). However, given the prevalence of incontinence in the care of the elderly (Isaacs, 1992), and the unquantified costs of washing (individuals and laundry and changing (clothes and bedding), there is a likelihood that these costs are underestimated. It is clear, therefore, that there is potential for considerable cost savings to health and social care services if UI symptoms were alleviated or cured.

A visit to the feminine hygiene section any large supermarket will testify to the market for sanitary products for incontinence. There has been “*tremendous growth*” in recent years with companies “*constantly changing and developing their products*” (Anders, 2002, pp.225-226).

In addition to the direct cost faced by individuals (incontinence pads, additional clothing, laundry, skin treatments) there are costs relating to adaptive behaviour and the psychological and social effects of incontinence. There may be a reduction of social and economic activity associated with isolation which can have wider implications at family and community level. As with savings to health care providers there would be, therefore, clear economic benefits to large numbers of individual women who have UI symptoms if there could be an alleviation or cure of symptoms.

As well as cost, the other main measure of health economics is Quality-Adjusted-Life-Years (QALYs) (Wang & Bakhai, 2006). Although as previously stated, there is a lack of cost information, there are a number of Quality of Life instruments for UI which may be useful in developing an improved economic analysis of treatments for UI in terms of QALYs (Imamura, 2010). They are: I-QoL, SEAPI-QMM, King’s Health Questionnaire, Incontinence Impact Questionnaire, UI Severity Score (UISS),

CONTILIFE, ICIQ, Bristol Female LUTS-SF and the SUIQQ (Getliffe & Thomas, 2007; Ross *et al*, 2006). Guidance for use of these incontinence-specific quality of life scales is provided by NICE (2013) but as yet, one single questionnaire has not been accepted as the “*gold standard*” (Ross *et al*, 2006, p.280). The three questionnaires in this study (Appendix XII) used a question from the ICIQ as a “*brief and robust measure for evaluating the symptoms*” of UI (Avery *et al*, 2004).

2.1.8 CONTINENCE PROMOTION

Aro & Absetz (2009, p.126) have suggested that “*policy makers want information on the most cost-effective and sustainable ways to promote public health*”. Getliffe & Thomas (2007, p.13) found relatively little research-based evidence evaluating the effectiveness of public awareness campaigns around continence and discussed the difficulty in identifying “*appropriate measurable outcomes other than increased numbers of people seeking help or further information*”.

In order to gain understanding of the complexity of behaviour and lifestyle change and to evaluate health promotion interventions, Aro & Absetz (2009, p.126) have suggested the use of a comprehensive mix of “*creative and dynamic multi-level strategies*”. They say, “*when the question is about changing behaviour, there may not be any answers or tools specific enough to satisfy ...*” (Aro & Absetz, 2009, p.126) and that “*... we need to put more effort into showing what works best for whom, with different target groups and settings, and with different timeframes included in our analyses*” (Aro & Absetz, 2009, p.128). They describe the need for theories which can tap into the participatory nature of health behaviour as currently “*we do not have adequate evidence for what really works*” (Aro & Absetz, 2009, p.128).

A recent study by Riley (2011, p.53) concluded that “*web-based health behaviour interventions have proliferated in recent years and appear to be an efficacious method for delivering health behaviour interventions in a cost-effective manner*”. The

web and the rapid pace of technological innovation in health have brought opportunities for service redesign with subsequent analysis of efficacy and cost-effectiveness. This would suggest that there are opportunities for cost-effective web-based interventions to promote continence.

In addition, there are opportunities to develop continence promotion services which could help to address the challenge of future demand on incontinence services as a result of the ageing population. There is a need to target the population of older women who have symptoms but who have not sought help to prevent future deterioration and to improve their quality of life. Additionally, the benefit of promoting continence prevention to younger women, and to older women who currently are symptom free, would potentially result in savings in future years when the pressure on services will be even greater.

2.2 TREATMENTS FOR UI

UI was viewed in the past, by some health professionals, as “*an intractable condition about which nothing can be done – except bombarding the sufferer with incontinence pads and other aids for containing the urine*” (Colburn, 1994, p.1). In more recent times the emphasis has moved “from containment to the promotion of continence through conservative to more complex treatments” (Getliffe & Thomas, 2007, p.17).

Treatment of UI will depend upon the cause and type of incontinence experienced by the individual and the importance of appropriate assessment has been identified as of paramount importance by many experts (Colburn, 1994; Dumoulin *et al*, 2011; Neumann *et al*, 2006, Bo, 2002). Sometimes referred to as ‘conservative’ interventions, there are three non-invasive treatments for stress and / or urge urinary incontinence; lifestyle interventions, bladder training and PFME (Neumann *et al*, 2006). These are “simple, low cost remedies and more importantly, differ from other forms of incontinence treatment in that they have a low risk of adverse effects and do not prejudice other subsequent treatments” (Wilson, 2002, p.211). Bladder training is used as a treatment for urge incontinence whereas lifestyle interventions and

PFME are initially used for both urge and stress incontinence. In general, Schmidt *et al* (2009, p.218) recommend that “*the least invasive and safest therapies, such as PFME, should be considered as the first line of treatment for UI*”. When the first line treatment is unsuccessful there is a range of clinical, surgical and pharmaceutical interventions available and there is a substantial body of research around the efficacy of individual techniques and treatments.

The main challenge in reviewing the effectiveness and cost-effectiveness of non-surgical treatments has been the lack of consensus on methodology for assessment and treatment of UI (Imamura, 2010). Despite this, with regard to PFME specifically, a number of studies describe the treatment as safe, low cost and effective (Schmidt *et al*, 2009; Sugaya *et al*, 2003; Neumann *et al*, 2006).

2.2.1 LIFESTYLE INTERVENTIONS

There are five main lifestyle interventions which can be incorporated into a continence promotion. These are; “*altering fluid intake, quitting smoking, modifying the diet to eliminate possible bladder irritants (e.g., reducing caffeine, alcohol, and carbonated beverages), reducing weight, and regulating bowel function to avoid constipation and straining during bowel movement*” (Burgio, 2004, p.7). In addition, other lifestyle interventions which “*may prove beneficial for individuals*” but which are unlikely to have a major effect include; postural changes, avoiding lifting heavy objects, wearing loose clothing, having more sex, and reducing emotional stress (Wilson, 2002, p.215).

There is paucity of research on the effects of these lifestyle changes on incontinence (Wilson, 2002) and especially of individual lifestyle changes with no other treatment (Borello-France *et al*, 2010; Burgio, 2004). This lack of evidence leads to some ambiguity around their efficacy. There are some risks associated with reducing fluid intake and weight reduction for some women (Wilson, 2002). In general, however, many of these lifestyle interventions relate to health behaviours which the majority of the population would benefit from adopting and maintaining whether or not they experienced UI symptoms.

Simple lifestyle changes can result in the cessation of leakage episodes in individual and should be considered as part of a programme for continence. Due to the complexity of combined lifestyle interventions it is difficult “*to discern the actual impact*” of any one lifestyle change on outcomes (Borello-France *et al*, 2010, p.1502).

2.2.2 PELVIC FLOOR MUSCLE EXERCISE

PFME, sometimes referred to as Pelvic Floor Muscle Training (PFMT) or simple Pelvic Floor Exercise (PFE) “*involves recruiting pelvic floor muscles for muscle strengthening and skill training*” (NICE, 2006, p.50). Knight *et al* (1998, p.61) hypothesise that “*strengthening these muscles and developing an increased awareness of their activity may result in an improvement in continence*”. Indeed, the aim of several treatments for urinary incontinence is to rehabilitate the pelvic musculature (Schmidt *et al*, 2009). Exercises to strengthen pelvic floor muscles are effective in the treatment of stress and mixed UI and no evidence of any adverse effects of the exercises has been identified (SIGN, 2004): “*There is good evidence that daily pelvic floor muscle training continued for 3 months is a safe and effective treatment*” (NICE, 2006, p.11).

Paddison (2002) has suggested that there is potential for financial saving as a result of the successful implementation of a PFME programme. The case for using PFME programmes as a cost-effective measure is strengthened by the consensus that, even when used with adjunct therapies, PFME programmes are considered low-cost (Williams *et al*, 2006; Wilson *et al*, 2001; Wilson, 2002; Sugaya *et al*, 2003; Schmidt *et al*, 2009). It is clear, therefore, that there is an economic argument in favour of the promotion of PFME to treat UI.

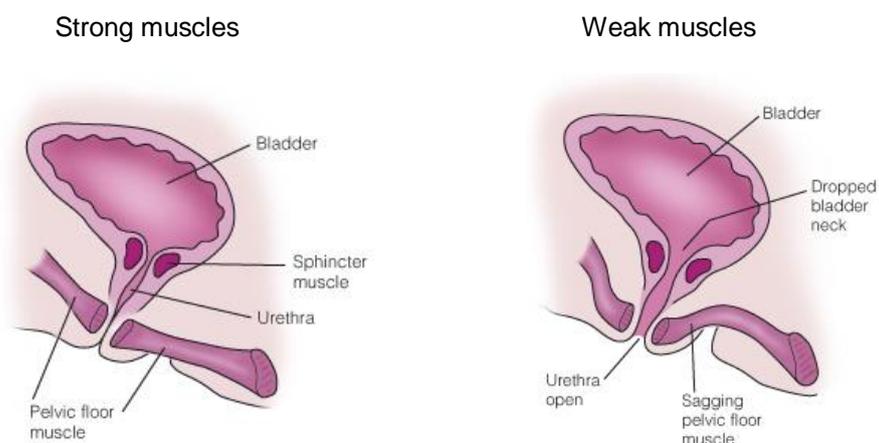
2.2.2.1 PHYSIOLOGY OF PELVIC FLOOR MUSCLE EXERCISE

“*The pelvic floor is made up of a group of muscles and connective tissue that extends as a sling cross the base of the pelvis*” (Marques *et al*, 2010, p.420). Herschon

(2004, p.S9) provides a detailed description of the anatomy of the pelvic floor and suggests that the “*hammock hypothesis*” is a “*readily understood way to explain the continence mechanism*”. The notion of a supporting ‘hammock’, also detailed by Colburn (1994) and Gray (2006), is described as “*a coordinated action of fascia and muscles acting as an integrated unit under neural control*” to provide urethral support (Herschon, 2004, S10). This hammock-like structure or sling (Paddison, 2002; Colburn, 1994), has been developed as “*an attractive theory*” in the study of continence (Freeman, 2002, p.335).

Gallo & Staskin (1997) focus on “*enhancing patient compliance to pelvic floor exercises*” to improve both muscle tone and function and the support provided at “*the level of the bladder neck and urinary sphincter*” (1997, p.174). Pelvic floor muscles provide “*support for the pelvic organs, the bladder and elements of the spine*” (Marques *et al*, 2010, p.420). These muscles are “*versatile and constantly useful*” in helping the sphincter “*to prevent leakages*” (Gomez, 2003, pp.3-4). Figure 2, illustrates the difference in urethral closure force between strong and weak pelvic floor muscles which can result in urine leakage (Boots MD).

Figure 3 Diagrams illustrating strong and weak pelvic floor muscles (images copied from Boots MD, online).



A contraction of pelvic floor muscles causes “*inward lift of the muscles, with resultant increase in urethral closure pressure, stabilisation and resistance to downward movement*” (NICE, 2006, p.50). This physical therapy can improve the function of pelvic floor muscles (Sugaya, 2003) by “*increasing strength, coordination, speed and endurance ... which helps to maintain an elevated position of bladder neck during raised intra-abdominal pressure with adequate urethral closure force*” (Neumann *et al*, 2006, p.2). “*Unlike nerves, muscles have considerable ability to self-repair and, with the appropriate stimulus*” (Marques *et al*, 2010, p.420) and thus it is possible for pelvic floor muscles to be rehabilitated as a result of exercise.

The primary supportive pelvic floor muscle is the ‘levator ani’ (Colburn, 1994; Gray, 2006). The levator ani is described as a remarkable, dynamic and flexible muscle which acts as a “*single functional unit*” with the pubococcygeal and the ileococcygeus muscles most directly involved in maintaining continence (Gray, 2006, p.29). Unlike other muscles, it is not easy to identify when the levator ani is fatigued or exhausted (over exertion does not result in muscle ache or panting) and this characteristic should be noted in design of programmes for muscle training (Gray, 2006).

2.2.2.2 PFME REGIMENS

Despite over 50 randomised controlled trials which demonstrated the effectiveness of PFME (NICE, 2006), “*there is no consensus on the amount of exercise necessary to improve pelvic floor muscle function*” (Marques *et al*, 2010, p.419). Bo & Haakstad used three sets of 8-12 contractions, each held for 6-8 seconds in various positions (standing, sitting, and kneeling) in their study published in 2011. In her 2002 study, Bo recommended that this regimen was undertaken every 1-2 days. Borello-France *et al* (2010) prescribed up to 45 contractions per day in three sets of 15 with an alternative progressive regimen for women with weaker muscles. Burgio, who was a co-author on the Borello-France study, recommended a hold time of 2-3 seconds initially building up to 10 seconds in a previous study (2004). Colburn (1994) recommends hourly exercise of up to 10 contractions, each held for 5 seconds with a rest time of 5 seconds between each contraction, and for this cycle to be repeated 5 times with a 60 second rest period between each cycle. The importance of

exercising each hour is stressed rather than the number and duration of contractions. Colburn (1994) also recommends the “*rapid twitch*” of muscles, with 5-10 repetitions, in addition to the regimen of slower contractions. Dolman (2007) describes these exercises as quick flicks which are held for 1-2 seconds; five of these quick flicks are recommended within a 10 second cycle. Gallo & Staskin (1997) recommended 10 minutes of exercise two times each day which involved approximately 25 contractions each held for 10 seconds with a rest time of 10 seconds between each contraction. In 2003, the study published by Goode *et al* had a regimen of 15 contractions held for 2-4 seconds with rest times of 2-4 seconds between each contraction. These were to be repeated three times each day with one session undertaken when lying down, one session in a sitting position and the third session while standing. The duration of contractions was increased up to 10 seconds, with equivalent rest times, as the study programme progressed. Additionally, participants were asked to stop or slow the flow of urine during voiding, once each day (Goode *et al*, 2003, p.347).

The ‘knack’ of contracting pelvic floor muscles prior to coughing, sneezing and lifting is recommended by Bo (2002) and Dumoulin *et al* (2011). While Dolman (2007) stresses the importance of rest times between contractions and suggests that these should be at least of the same duration as the contraction, or longer. Dumoulin *et al* (2011) indicate that, a PFME protocol should have a mix of strength and endurance.

In the longer-term, there is agreement that maintenance of pelvic floor muscle strength can be achieved with lower frequency (Bo, 2002; Borello-France *et al*, 2010), but, as with the initial treatment regimen, there is no consensus about what that frequency should be. Colburn, in the context of low levels of adherence in the longer term suggests that “*any form of exercise is probably preferable to none*” (1994, p.75).

It is apparent from the regimens described above that there is diversity in the advice given to women about PFME and ‘the “*optimal*” protocol for pelvic floor muscle training is still elusive’ (Marques *et al*, 2010, p.422; Dumoulin *et al*, 2011). Dolman

(2007) recommended that there should not be a generic regimen of exercise but that a programme of PFME should be based on each individual's strength and ability. This notion fits with the findings of Neumann *et al* (2006, p.24) that "*patients have different characteristics which demand a reasoned approach to the choice of treatment at any one time*".

Laycock *et al* (1999, p.74) suggest that four principles of muscle training should be applied to PFME; "*overload, specificity, maintenance and reversibility*". The principle of specificity fits with Dolman's personalisation of exercise to individual ability and the maintenance principle fits with the notion that exercises should become a life-long habit (Dolman, 2007). Where many previous regimens have only involved 6-12 weeks of exercise, Laycock *et al* (1999, p.75) proffer 3-6 months as the length of time it takes to train muscles. Their regimen includes a mix of exercises where long hold contractions are undertaken for up to 3 minutes during regular daily activities and where quick contractions are "*performed in time to music*" (Laycock *et al*, 1999, p.75) for the average length of a pop song.

The use of music may not simply be useful in helping women to 'keep time' but may harness affect and enjoyment to motivate women to exercise and support longer-term maintenance. Huberty *et al* (2008, p.374) recommend the strategy of "*increasing motivation and enjoyment relative to activity*" as useful in increasing long-term adherence.

For more than a decade there has been "*a broad consensus in PFME therapy research that adherence needs improvement*" (Alewijns *et al*, 2002, p.149). There is a need to identify "*behaviour modification techniques*" which are tailored to the individual in supporting women with exercise (Ueda, 2004, p.147). Different regimens are required for older women, women with different severity of symptoms, and to fit with other individual characteristics of women (Neumann *et al*, 2006).

2.2.2.3 IMPORTANCE OF CORRECT IDENTIFICATION OF MUSCLES

Gomez (2003, p.84) suggests, rather romantically, that “*contracting your pelvic floor muscles correctly is as delicate and subtle as playing the violin*”. Cardozo *et al* (1993, p.117) believe that exercises, especially when done without the supervision of a trained health professional, “*are often incorrectly performed*”. Burgio (2004, p.5) suggests that women are seldom initially successful in correctly identifying the muscles and may take repeated attempts.

NICE Guidelines (2006) propose that “*routine digital assessment of pelvic floor muscle contraction should be undertaken before the use of supervised pelvic floor muscle training for the treatment of UI*” (p.13). Furthermore the authors’ of the Cochrane Systematic Review about pelvic floor muscle training, Dumoulin and Hay-Smith (2010), conclude that “*it seems likely that treatment effect will be enhanced if ... a correct contraction is confirmed prior to training*”, however they state that there was no evidence of this found in their review (p.21).

Bo & Haakstad (2011, p.191) recommend that “*proper pelvic floor muscle training should always include assessment of correct contraction*”. Bo is convinced teaching of PFME should only be undertaken by physiotherapists who will take “*a thorough history followed by clinical assessment of the pelvic floor and perineum ... and will select from a variety of techniques to facilitate correct contraction*” (2002, p.257). However, in discussion with Bo in MacLean and Cardozo’s book *Incontinence in Women* (2002, pp.277-8) her view is not shared by other experts who suggest that it is the appropriateness of the training as opposed to the role of the trainer which is more critical.

There are a range of techniques used by health professionals to help women correctly identify muscles, some of which are useful in measuring muscle strength. Although these can be effective and useful in documenting changes in muscle strength as a result of a course of PFME, the procedure is invasive. Given the levels of embarrassment and slowness in reporting symptoms to health professionals, this

type of assessment may “*not be acceptable*” and may be an additional barrier to help-seeking behaviour (Getliffe & Thomas, 2007, p.18). Also, given the estimated prevalence of UI, there is a lack of capacity within health services to offer this type of assessment to all women with symptoms. It is unrealistic therefore to expect assessment by a health professional in the promotion of continence to the wider population.

Gomez (2003, p.84) describes “*the best and most convincing way*” of correctly self-identifying muscles involves insertion of fingers in the vagina. Others, including the Chartered Society of Physiotherapy (2010) describe the sensation of trying to stop the passing of urine and flatus in their recommendations (Colburn, 1994). These less invasive methods may be more appropriate for women who wish to exercise in order to prevent future incontinence symptoms and for community dwelling women who are reluctant to seek help from a health professional.

There is some evidence to suggest that “*the role of the therapeutic relationship*” (Williams *et al*, 2006, p.1049) is useful in supporting the education of PFME and there is some doubt about the effectiveness of written and verbal instructions alone (Whitford and Jones, 2011; Fine *et al*, 2007). It is clear that the correct identification of muscles is only the starting point and issues about longer-term adherence must also be addressed (Whitford & Jones, 2011; Williams *et al*, 2006).

2.2.2.4 SELF-EFFICACY

The term *self-efficacy* can be used in general terms to refer to various different ways in which individuals can draw on their own resources in order to achieve a desired outcome. There is a suggested link between self-efficacy and behaviour change. Thirlaway & Upton (2009) suggest that “*belief in efficacy of the proposed behavioural change and the self-efficacy of the individual contemplating the change are postulated to increase the likelihood of the response*” (p.34-35).

In relation to PFME, Whitford & Jones (2011) are clear that “*confidence in ability to correctly perform the exercises is an important factor in predicting subsequent practice*” and that “*any intervention to improve rates of compliance with the exercises should incorporate instruction that helps women to identify contraction of the correct muscles*” (p. 15). Messer *et al* (2007) define self-efficacy as “*belief about one’s ability to make or pursue a specific action or change*” and suggest that, in relation to PFME, this relates to a sense of mastery as well as motivation, confidence and beliefs (p.943).

In this thesis, the term ‘self-efficacy’ has been used in two different ways. The first is in relation to the ‘self-efficacy score’ which is described in section 3.3.2.2, used as part of the stratification process. In this context, the term is used as a measure of mastery at previous behaviour change. The relationship between this type of self-efficacy and adherence in this trial is described in section 6.5. The main use of the term ‘self-efficacy’ is in relation to confidence in the ability to correctly identify and contract pelvic floor muscles (section 4.2.1).

2.2.2.5 TOOLS TO ASSIST PELVIC FLOOR MUSCLE EXERCISING

Within continence services, a range of tools such as vaginal cones and weights, are available to assist women in strengthening their pelvic floor muscles. For community dwelling women who do not seek help from health services, some large pharmacies will stock these products. A wider range of products is available on the internet. These products do not address issues around motivation and adherence.

In 1997, Gallo & Staskin undertook a randomised controlled trial which effectively used “*an audiocassette tape to enhance patient compliance to pelvic floor exercises*” (p.167). The intervention arm of the group reported increased levels of compliance with the exercise compared to the control group which received the same level of care but without the cassette tape. The tape was used as “*an external cue to action*” and was successful in enhancing more diligent exercise (more minutes of exercise and longer contractions) than women in the control group (p.174).

Other benefits of the cassette tape were identified in the trial; simplicity, non-invasiveness, freedom from side-effects, cost-effectiveness, and the fact that future treatments are not limited by the use of the tape (p.175). A number of further questions arise as a result of this study in connection with the quality of the teaching methods used in the cassette and the longer term effect of use of the tape. Paddison stressed the urgent need for “*further randomised controlled trials comparing the effect of audiotapes on compliance and motivation with exercises*” (2002, p.36).

In 2003, Sugaya *et al* undertook a randomised controlled trial which examined the effect of a specially designed device to support PFME. Again, both the intervention group and the control group received the same level of care except for the use of the device by the intervention group. The device sounded a chime “*three times a day when exercises sessions were scheduled*” (p.416) which resulted in a sense of obligation by participants to exercise. In this study, the impact on UI symptoms was measured: the control group showed no improvement other than on the quality of life index whereas the intervention group showed significant improvements in “*the daily number of incontinence episodes, the number of pads used daily, the quality of life index*” and the amount of urine leaked (measured by pad weight).

All of the participants were existing incontinence patients and some had complications or also received drug therapy, however, these were shown not to influence results showing the comparison between both groups. The age of participants, which ranged from 30 – 78 years, was not correlated with achievement rate (p.420) and the weight of participants, measured before and after the 8 weeks study, did not change (p.420).

The PFME regimen supported by the device was for 2 minutes of exercise three times each day with 1 minute of rapid (2 second) and 1 minute of slow (10 second) contractions. It was “*pocket-sized and could also be worn on a necklace*” (p.418). The chime acted like an alarm, if the button wasn't pushed the chime would be

repeated in 10 minutes time and would continue to sound every 10 minutes until action was taken. Participants had the option of using a blinking light instead of the chime and were asked to use the button as a counter for their contractions.

The device used in this study also incorporated a pedometer which was designed to encourage women to walk to lose weight as part of their continence care. A cartoon character, or avatar, “*grew from a baby to a bride depending on ...the performance of pelvic floor muscle training*” and also “*encouraged greater achievement by smiling*”. If the level of performance dropped from the previous day the character “*became angry*” and “*the device also included some games*” (p.418). Some participants reported that they enjoyed using the device, especially those with high levels of achievement, while others found it difficult to use (p.420). Although the notion of enjoyment of the exercise experience was not given much attention in the Sugaya study, it links with theories around links between affect and adherence to exercise which will be discussed later in this chapter.

The Sugaya study had a small number of participants (41) and care must be taken to extrapolate assumptions to a wider population but Sugaya *et al*'s findings have introduced some new concepts in this field which had not been studied elsewhere in PFME research either before or since. These include the role of affect, rhythm, and alerts in supporting motivation and adherence to exercise.

Other than the two studies described above there is little in the literature about tools to help women adhere to PFME, especially in relation to community dwelling women exercising unsupervised. Given recommendations for more research in these areas, this is a surprising gap in the literature that must be filled if our understanding of continence promotion by PFME is to be enhanced.

Getliffe & Dolman (2007, p.21) have identified the potential of the internet and information communication technology (ICT) as offering “*unlimited opportunities*” as a tool for continence promotion). At the time of publication (2007) they had identified

over 15,000 websites “*dealing with continence issues*” but stressed the importance that “*the general public are guided towards information that is accurate, reliable and up to date*” (p.21). Given the extraordinary speed of innovation and development in internet based ICT, there is a need for timeous research about applications in continence promotion.

2.2.3 MOTIVATION AND ADHERENCE

Adherence (or compliance) with an exercise programme (Neumann *et al*, 2006; Dolman, 2007) and “*a high level of perseverance in carrying out the exercises*” (Colburn, 1994, p.72) are important factors in the efficacy of pelvic floor muscle training (Freeman, 2004). As PFME requires the active participation of women, key success factors are motivation, long-term adherence (Borello-France *et al*, 2010; Dolman, 2007) and “*determination that it will work*” (Colburn, 1994, p.159). Burgio (2004, pp.4-5) suggests that women will “*require a great deal of encouragement and motivation*” and maintaining levels of motivation throughout a continence programme is a major challenge.

The need for future studies to address issues of adherence in relation to the efficacy of PFME has been identified (Whitford & Jones, 2011; Williams *et al*, 2006). Indeed, assessment of adherence to exercise (Paddison, 2002) is recommended by Neumann *et al* (2006) in order to evaluate the effectiveness of programmes of PFME. Neumann *et al* (2006, p.24) state that despite the importance of adherence this “*was infrequently and generally poorly reported with no standardised, validated or reliable approach to its assessment*”.

Addressing motivation is recommended as of central importance to continence promotion by Borello-France *et al* (2010, p.1500). Paddison (2002) stated the imperative that “*health professionals develop an understanding of factors that can influence motivation*” (p.37) as well as exploring with patients the factors which might influence their lack of motivation.

From the small number of studies which look at motivation and adherence, some have shown that women forget to exercise and have difficulty finding the time to exercise and recommendations have been made for the development of techniques which would help women remember to exercise routinely with the aim of promoting long-term adherence (Borello-France *et al*, 2010; Dolman, 2007, p.68). Eustice (2007) suggests that individuals with “*poor self-care skills*” (p.152) may lack the motivation required for successful ‘treatment and management of their incontinence’.

Bo & Haakstad (2011) adopted a population based approach which involved a study of PFME taught as part of a general fitness class for pregnant women. Their findings were inconclusive because they were based on the lack of motivation to attend the classes in general as opposed to levels of motivation specifically for PFME. Nonetheless, their study is useful in recommending the use of adherence strategies and a focus on motivation as part of future programmes for PFME as well as fitness classes for pregnant women. There seems to be a gap in the literature regarding various aspects of PFME for women in the general population in particular (Bo & Haakstaad 2011).

The following studies suggest there is potential for technology to be used in the education of PFME in a community setting. Hui *et al* (2006) used video conferencing as part of “*a continence service to older persons in the community*” and found it to be as effective as conventional management for the management of urinary incontinence in older women (p.347). A study of You Tube clips around PFME (Stephen & Cumming, 2012) showed that there is a growing demand for internet based health information and advice. Sugaya *et al* (2003) looked at the use of a device to help and remind community dwelling women to exercise, however, the participants were patients with incontinence symptoms and who attended urological clinics. The role of the internet and mobile technology will be discussed later in section 2.4.

Experts on the promotion of continence have suggested that there may be a role for including the sexual benefits of PFME in educating women about, and motivating women to exercise (Getliffe & Dolman, 2007; Colburn, 1994). Getliffe and Thomas (2007, p.8) suggest that “*professionals rarely initiate advice on sexual activity*” and yet women report, as discussed previously, that personal and specifically sexual relationships are affected negatively by UI (Colburn, 1994; Monga, 2002). Gomez (2003, p.4) describes the role of the pelvic floor muscles in relation to sexual arousal, orgasm and lubrication in relation to the female while others focus on the role of the muscles in improving the sexual pleasure of the partner (Roe & May, 1999; Nilsson *et al*, 2011). There is a lack of knowledge about the role of sexual pleasure in motivating women to exercise (Roe & May, 1999; Wilson & Herbison, 1998).

Studies have shown the effectiveness of others (peers and health professionals) in supporting women to undertake and adhere to exercises (Dumoulin *et al*, 2005; Parkkinen *et al*, 2004; Bø & Haakstad, 2011; Paddison, 2002; Williams *et al*, 2006). The role of peer support is identified by Getliffe & Thomas (2007, p.19). The notion of involving husbands in their wives’ health behaviour, is discussed by Benjamini *et al* (2011), however, this may be complicated by sensitivities around women feeling coerced to exercise in order to improve the sexual pleasure of their partner (Roe & May, 1999; Nilsson *et al*, 2011).

Dolman (2007) suggests that there is need for education for women which “*must include the reasons why the exercises need to be done, not only during and after childbirth, but as a life-long activity*” (p.68). The need for education was also identified by Whitford & Jones (2011) on finding that women in their study did not regard PFME as personally relevant due to a perceived lack of risk of incontinence. In response to evidence that found women who had previously undertaken PFME were more likely to adhere to a programme of exercise, Whitford *et al* (2007) and Dolman (2007) recommend education of young women in school, colleges and universities. Dolman states that “*teaching girls about the importance of doing pelvic floor exercises before pregnancy offers a proactive strategy towards incontinence prevention*” (p.56). As technology and the internet are used as a norm in the

education of young people (reference), it would seem appropriate that programmes to teach PFME utilise these modalities.

There are opportunities for internet based technology, mobile phones and social media to be used to create virtual groups and to make both peer-to-peer and patient-to-health professional communication faster and easier. Boulos *et al* (2011) discuss the benefits of mobile phones and their potential for use in education, healthcare and medicine. In the context of continence promotion through PFME to community dwelling women, the use of smart phone applications would seem to have clear benefits, especially in those that are too embarrassed to seek help. Research is required to gain understanding of the effectiveness of 'apps' in supporting women to exercise, with particular focus on their role in motivating and reminding women.

2.2.3.1 DEFINITIONS OF MOTIVATION AND ADHERENCE IN THE CONTEXT OF PFME

There appears to be some cross over and confusions in the use of the terms 'motivation' and 'adherence' and further duplication with the term 'compliance' in the literature (Delamater, 2006, Chao *et al*, 2000, p.S215). To ensure clarity in this thesis, the following section discusses these terms and presents working definitions.

Motivation can be defined as "*the direction and intensity of one's effort*" (Kaupuzs, 2013) and Markus & Kitayama (1991) suggest that the study of motivation centres "*on the question of why people initiate, terminate and persist in specific actions in specific circumstances*" (p.239). This definition of motivation includes the concept of adherence in relation to the persistence of actions.

Martin & Dubbert (1982) discuss the difficulties in defining exercise adherence, especially where there is no consensus about the optimal level of exercise and around the various stages of exercise from initiation to maintenance of an exercise habit (p.1013). The term 'adherence' is defined as "*the extent to which a person's behaviour – taking medication, following a diet, and / or executing lifestyle changes,*

corresponds with agreed recommendations from a health care provider” by Sabaté (2007) for the World Health Organisation.

The fact there is no consensus about the levels of exercise required to improve muscle function (Marques *et al*, 2010), far less a recommended maintenance level of exercise or for prevention, results in ambiguity in use of the term ‘adherence’ and indicates that use of the term ‘compliant’ is inappropriate.

In order to avoid ambiguity, this research has taken as a starting point the statement that motivation and adherence are associated with a positive outcome for PFME (Williams *et al*, 2006; Freeman, 2002). Recommendations for research into factors influencing motivation and adherence (Paddision, 2002; Dolman, 2007; Borello-France *et al*, 2010) were then taken to inform the direction of research.

Whilst avoiding the redefinition of the terms motivation and adherence and recognising the cross-over between them, the terms have been applied in this thesis to reflect the experience of women in undertaking PFME in a community based setting. Therefore, for the purposes of this thesis, the term motivation has been used to group factors which influence women in wanting to start exercise and initially setting out to exercise and the term adherence has been used to group factors which influence women to maintain or increase the amount of exercise they do over a period of time.

2.3 HEALTH BEHAVIOUR

NICE (2006, p.19) advise that “*further studies need to be undertaken to evaluate the role and effectiveness of physical and behavioural therapies and lifestyle modifications in the prevention of UI in women*” and there was a need for the evaluation of longer term outcomes in particular. There are a multitude of models and theories around health behaviour (Bowling, 2009; Rollnick *et al*, 2005; Ogden

2007) but in the context of promoting a lifelong pattern of PFME, it is necessary to focus on research around 'the mechanisms behind the establishment of habitual behaviours' (Thirlaway & Upton, 2009, p.267). Health behaviour refers to "*behaviours which have been shown to have beneficial health consequences to those who practice them*" (Stroebe, 2000, p12). Motivation (section 2.2.3) and self-efficacy (section 2.2.2.4) have been established as key cognitive factors in successful lifestyle and behavioural change (Thirlaway & Upton, 2009, p,269).

In Thirlaway & Upton's overview of health behaviour (2009), the "*non-cognitive factors such as habitual responses and enjoyment*" are discussed, both of which have been highlighted as having a role in motivation and adherence to PFME. The "*habitual responses*" they describe link with the recommendations of Whitford & Jones (2011, p.1) of the "*promotion of measures to help establish a habit of exercising the pelvic floor muscles*". And this resonates with research around general exercise where Aarts *et al* (1997, p.366) have found that "*repeated behaviours may be largely determined by habit rather than by reasoned action*". The nature of PFME, where muscles are contracted repeatedly, may be useful in contributing to the adoption of habit. Whitford & Jones (2011, p.15) identify the need for further study on "*the role of habit in the successful practice of these exercises*".

Aarts *et al* (1997, p.366) have found that "*satisfactory experiences enhance the tendency to repeat the same course of action*". Thirlaway & Upton (2009) describe affect "*as a cognitive shortcut to behavioural choice*" in that 'the decision about whether to exercise can be about whether an individual expects to enjoy the experience rather than a cost-benefits analysis' (p.102). For women with no current UI symptoms, the benefits of PFME are in the possible delay, alleviation or prevention of symptoms at some future point whereas the cost (the doing of the exercises) is immediate. This would suggest that the opportunity for women to enjoy the exercise experience should be considered in supporting women to undertake and adhere to PFME.

People do not usually make initial lifestyle choices based on future health implications and by the time they wish to protect their health need to overcome well established bad habits. Ultimately, it would be better if people established healthy lifestyles at the outset but if they wish to change we need to give them the resources to do so and help them believe that they can (Thirlaway & Upton, 2009). Much of what Thirlaway & Upton (2009) discuss here can be applied to health behaviour around continence. They highlighted the “*need to develop research protocols, evidence-based interventions and strategies that can extend our understanding and implementation of successful lifestyle change*” (Thirlaway & Upton, 2009, p.269).

2.3.1 MODELS OF HEALTH BEHAVIOUR

Bowling (2009) discusses models of adherence, models of health-related actions, the health action process model, the health belief model, the spontaneous processing model and the trans-theoretical model of behaviour change. Rollnick *et al* (2005) identify a selection of theories, such as the theory of reasoned action and the theory of planned behaviour, which may be deployed in developing behavioural strategies to promote adherence as well as the role of individual characteristics and the social, cultural and environmental context. Ogden (2007) discusses the additional variables of perceived need, intention type and the roles of past behaviour, humour, supervision and perceived social benefits. Ritterband *et al* (2009) incorporate aspects of website use and website design into their behavioural change model for internet interventions. Many of these elements will be discussed throughout the thesis in the context of web assisted continence technology.

Hubley (2004) has developed the BASNEF Model (p.40) which includes some of the mechanisms of behaviour change and which can incorporate relevant theories, depending on the health condition concerned. He suggests that ‘to understand why people do or do not perform a particular behaviour we have to try to find out how the community ... look at the action’ (p.25), the subjective norm. He also considers the attitudes of individuals and suggests that “*a useful approach is ‘value expectancy theory’ which suggests that people will only perform a given behaviour if they themselves see that it will provide some benefits*” (p.25). He also looks at the

enabling factors which support the transition of intention to behaviour change. This model is a simplified approach to understanding behaviour (Hubley, 1988) and has been used effectively in the contexts of diabetes education (Hazavehei, 2008) and as such it may be appropriate in a public health promotion context. Boulos *et al*, (2011) have suggested that ‘smartphone technology, by its mobility and location awareness, may be able to achieve lower attrition rates’ in health change programmes.

2.4 EHEALTH

Earlier in section 2.1.8, innovations in web based ICT were identified as having potential for continence promotion by experts in PFME. Web-based health interventions come under the umbrella of eHealth (Eysenbach 2001). EHealth behaviour interventions “*have proliferated in recent years and appear to be an efficacious method for delivering health behaviour interventions in a cost-effective manner*” (Riley *et al*, 2011, p.53). Furthermore, mobile interventions (mHealth) have the capacity to interact with individuals in “*the context of the behaviour*” (Riley *et al*, 2011, p.54).

Hubley (2004, p.161) identifies the internet as “*emerging as a major resource for those involved in designing and implementing health promotion activities’ but suggests that ‘its contribution as a medium for directly reaching out to members of the community is still far from clear*”. Davis (2002, p.357) states that “*access to health-related information plays an important role in extending individuals’ knowledge and improving health*” and further suggests that “*internet-based health information is an important resource that, when used properly, has great potential to improve individuals’ lives*” (Davis, 2002, p.363). Levy (2004, p.2) describes the way individuals use the internet “*for information instead of going to a physician or other health professional*” and “*to become active participants in their own health care*”.

Suggs & McIntyre (2009, p.285) suggest that “*practitioners and researchers have an exceptional opportunity to develop tailored websites that will have a meaningful impact on health behaviour outcomes*”. In response to this opportunity Levy (2004,

p.3) warns that “*since the information on the internet is uncontrolled and the quality not standardized, recent research has focused on the quality of the burgeoning number of health resources and too frequently found it to be dismal*”. Too much health information “*conveyed over the internet is biased, incomplete, inadequate, or outdated*”. MacMillan (1999, p.375) asks if it is “*appropriate for all health communicators*” suggesting that internet based communication may not be effective for some conditions.

Hublely (2004, p.161) suggests that “*as our experience of this exciting new medium grows, some lessons are beginning to appear*” and Suggs & McIntyre (2009) draw on their research to recommend a checklist which can be used when developing and evaluating online tailored communication and which might be useful when reviewing web based health interventions and which can also be applied specifically to applications around UI.

2.4.1 mHEALTH

As mentioned previously (section 2.4), Getliffe & Thomas (2007) identified more than 15,000 websites worldwide dealing with continence. In 2011, Boulos *et al* (2011, p.2) described how “*in a relatively short period of time, smart mobile technology has penetrated significantly into society, capturing an entire age spectrum of subscribers in western industrialised nations, from school children to senior citizens*”. They go on to suggest that “*mobile phone provides an essential ‘any time, any place’ portal into the entire world wide web of knowledge*” and that the continuous and pervasive social connectivity “*has important implications for society, and holds a lot of potential in particular for use in education, healthcare and medicine*” (Boulos *et al*, 2011, p.3). They suggest this has implications both to healthcare consumers and providers including the potential benefit of smartphone technology in achieving lower attrition rates in behaviour change interventions as a result of “*its mobility and location awareness*” (Boulos *et al*, 2011, p.9).

A potential barrier to the use of mHealth is the cost of smart phones and there is potential for exacerbation of health inequalities based on socio-economic status

around PFME (Whitford *et al*, 2007). However, Boulos *et al* (2011) report that the affordability barrier may be improving as the prices drop and better data plan deals are introduced. Barriers to the use of mHealth will be further removed where “*mobiles are rapidly replacing landlines in many homes*” (Boulos *et al*, 2011, p.9), Interestingly, Bennett (2011, p.7) suggests that the use of mobile phone technology may “*provide a useful starting point for implementing behavioural change in resource-poor settings*”.

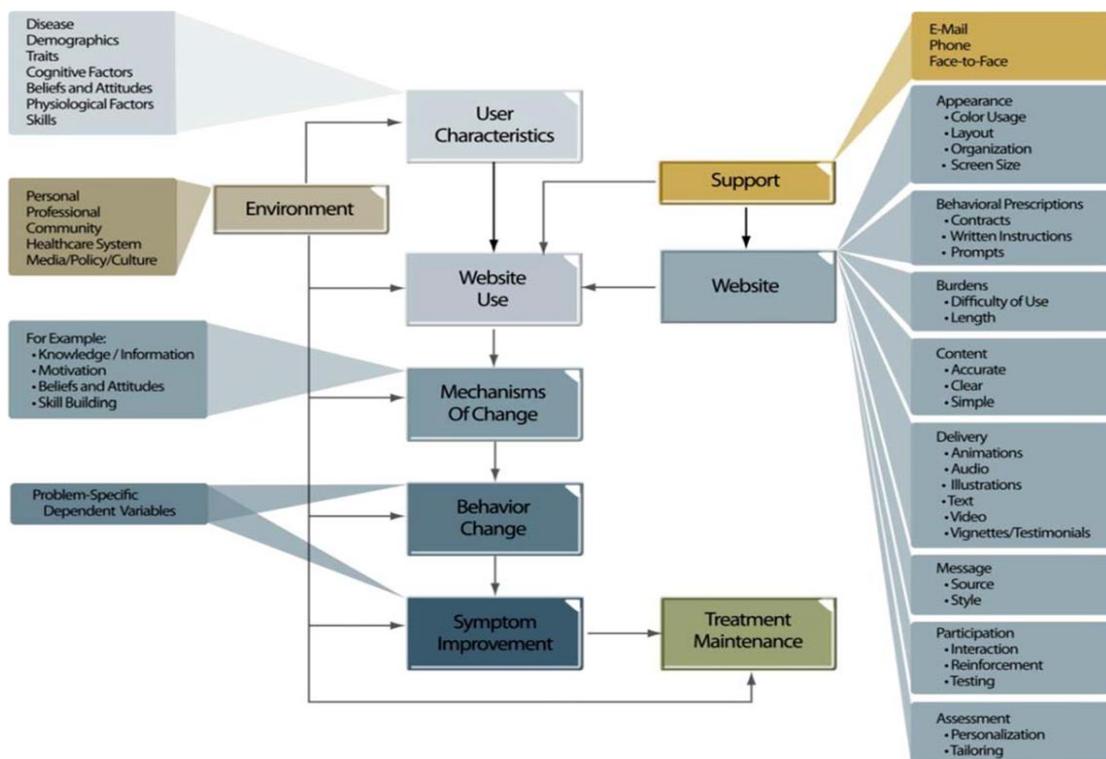
Riley *et al* (2011, p.68) ask the question “*Health behaviour models in the age of mobile interventions: are our theories up to the task?*” They suggest that “*our current health behaviour theories and models need to expand from elucidating between-person differences to explaining within-person changes over time and to evolve to incorporate dynamic feedback control systems to ‘close the loop’*”. Stacey (in Popay, 1994, p.89) discusses the role of technology and warns that “*technology creates a particular kind of patient work, but patients always have to work*”. This suggests that effort and application is required by individuals in using the technology.

In Adams review of the health information on the internet (2010), three aspects of reliability are identified: ‘(1) technical components of websites and internet-based applications, (2) information content (whereby reliability is often used interchangeably with terms such as quality, credibility, trustworthiness and accuracy) and (3) *expected end-user behaviour*’ (p.392). Given its multi-disciplinary nature, Adams (2010) suggests that “*there is need for caution and critical reflection when incorporating ideas, practices and applications from other fields*” (p.397). He identifies the need for “*research on how individual patients and their families use the web, and increasingly, interactive and social web applications, for health-related purposes*” (p.397). This would suggest that simply incorporating existing health behaviour models and health promotion practices into mHealth applications is inadvisable.

Ritterband *et al* (2009) have developed a behaviour change model for internet interventions (Figure 3). This model draws on “*multiple disciplines and previously established theories and models ... to conceptualize, identify, and measure the factors likely to contribute to behaviour change (and symptom improvement) in*

Internet interventions” (p.25). It is recommended for use by developers to “*plan feasible, informed and testable Internet interventions*” and by researchers to “*identify their assumptions behind interventions and direct them to identify which components, areas, and elements need to be examined and measured*” (p.25). Although the model has not been designed for smart phone applications, it is adaptable for mHealth and has been referred to in this study of apps for PFME. Indeed, the model was used as a checklist throughout this study to ensure that relevant aspects were considered.

Figure 4 A behaviour change model for internet interventions (image copied from Ritterband *et al*, 2009)



In applying mHealth to continence promotion, mobile phones may have an advantage in being ‘smaller, more portable and less obtrusive than laptops’ (Boulos *et al*, 2011, p.10). For individuals who are embarrassed about their symptoms, the discreet and ubiquitous nature of mobile phones may therefore facilitate access to an incontinence service. In 2009, Schmidt *et al* (p.221) developed a device for the “*home application of conservative techniques, combining pelvic exercises, biofeedback, and electrical stimulation with effective monitoring of compliance*”.

Although this study did not use mobile technology and participants were patients with UI as opposed to a general population, the findings that the device made 'the patient an active participant in the rehabilitation process' (Schmidt *et al*, 2009, p.221) is useful.

2.5 THE POLICY CONTEXT

As well as research on the media, Bachrach & Abeles (2004) suggest that “*research on the health effects of policy is also an important aspect of applied health research in the social sciences*” (p. 25). Although the participants of this research project may have little or no knowledge of the policy context for continence promotion, it's effect percolates through to local service delivery and public health messages. As such, it is included as an element of the wider environment in which women exercise.

Getliffe & Thomas (2007) suggest that there has been a “*concerted approach to promoting continence in the UK*” since the 1970's (p.12). They list various continence promotion campaigns such as “*Don't suffer in silence*” from 1994 and “*It's no laughing matter*” in 2004. They go on to discuss current policy focus in incontinence:

“Patient care pathways, or integrated care pathways, are a main feature of current healthcare policies. Their emphasis is on prevention and self-care, with the patient as an active agent rather than a passive recipient” (Getliffe and Thomas, 2007, p.15).

This focus for policy fits very well with PFME as the first line of treatment; PFME are effective in prevention and self-management of symptoms and require women to actively and diligently participate as opposed to passively receiving a treatment. It also fits with the Scottish Government's self-management health strategy “*Gaun Yersel*” (2008.)

Also at a national level, the Scottish Government's eHealth Strategy (2011) fits with smart phone applications for PFME. The strategy includes the use of smart phones in achieving their strategic aim of supporting people to "*communicate with the NHS, manage their own health and wellbeing, and to become more active participants in the care and services they receive*" (2011, p.15).

The main focus in the strategy for smart phone use is around communications. There is no mention of the role of smart phone in the latter elements of the strategy around self-care and active participation. This may reflect the paucity of the evidence base for use of smart phones in self-care and active participation due to the novelty of the technology and lack of quality randomised controlled trials to demonstrate effectiveness.

Despite the gap in the eHealth strategy around mHealth, the policy landscape for continence promotion and eHealth both fit with the context of this study in relation to women proactively undertaking PFME to manage or prevent incontinence.

2.6 CONCLUSIONS

From the perspective of health economics, there is a need for programmes to promote continence and prevent incontinence to make savings on current and future resources for health services and individuals. PFME programmes have been identified as being low-cost to deliver but there is a lack of awareness in the population about the potential for symptoms to be prevented, ameliorated or cured.

From the perspective of health promotion and the increased focus on the active participation of individuals in their health, PFME programmes fit within notions of self-management and self-care. Although there is a consensus about their efficaciousness, there is a lack of understanding about factors which contribute to motivation and adherence, both of which impact on success (Whiteford, 2006, p.307). There is a need for health professionals to "*provide women with appropriate*

information and to develop techniques that help them to remember to perform their exercises ... as a life-long activity” (Dolman, 2007, p.68).

Given the worldwide and common phenomenon of underreporting of UI and, consequentially, the high numbers of community dwelling women who cope with symptoms with no treatment, “*further studies on PFME using a population-based approach are needed*” (Bo Haakstad, 2011, p.195).

Although there is a consensus that PFME are effective in preventing and alleviating UI, there is a lack of consensus about the protocol for exercise. There is a gap in the literature around reaching women who do not seek help from a health service and in effective methods of promoting continence to community dwelling women and teaching them how to correctly exercise.

The need to “*develop evidence-based interventions and strategies*” (Thirlaway & Upton, 2009, p.269) to help understand and implement successful lifestyle change is consistent with recommendations for programmes for continence, including PFME (Paddison, 2002; Whitford & Jones, 2011), and eHealth and mHealth applications (Ritterband *et al*, 2009; Riley, 2011). If a continence programme is to include the use of technology and the internet, and if the programme is to promote health behaviour, some combination of theoretical models may be required. As well as this consensus about the need for a strong theoretical grounding in programmes that involve behaviour change and use of technology, there is also a need for a multi-disciplinary approach (Hui *et al*, 2006; Riley, 2011; Thirlaway & Upton, 2009). The literature around PFME reveals a predominantly clinical perspective. There is a need for research which includes evidenced-based theory from other relevant disciplines such as health behaviour, physical exercise, education and web science in order to understand the population of women who either have symptoms but do not seek help and to promote continence in community dwelling women.

As current continence promotion services have no impact on many women who have or may develop incontinence in the future, there is a need for services to be designed which meet this unmet demand based on an understanding of barriers and promoters

of exercise. The role of smart phone applications should form part of research which contributes to this understanding.

PFME research has found that women forget to exercise and find it difficult to find the time (Borello-France *et al*, 2010) and experts have recommended the integration of exercise into routine, daily activities as a method of increasing adherence (Borello-France *et al*, 2010; Dolman, 2007; Hines *et al*, 2007; Whitford & Jones, 2011).

Aarts *et al* (1997) describe the process of habit formation of health behaviours. They suggest that situational cues and satisfactory experiences enhance the formation and strength of habit (p.366). Borello-France *et al* (2010, p.1501) suggested that “*integrating exercises with other well established daily activities*” such as washing dishes, waiting at traffic lights or watching TV news could be useful in promoting adherence. Dolman (2007, p.67).recommended teeth brushing as a daily activity which could act as a cue to exercise

Borello-France *et al* (2010, p1493) and Hines *et al* (2007) found that identifying a set time of day to exercise was useful in promoting adherence. Both studies also identified that by linking exercise to other health behaviours, including the taking of medication, adherence could be supported. Hines *et al* (2007) found that women who had adopted a routine approach to their exercise at the start of their study “*were likely to continue to use that approach and were significantly more likely to have high adherence than those who started out using the ad hoc or unknown approaches*” (2007, p.48). Whitford (2007) and Dolman (2007) also linked routine exercise and habit forming with longer term adherence of exercise and incontinence prevention.

It is clear that UI is a problematic symptom for a large, if undefined proportion of women across the world. The evidence that PFME are effective as a first line of treatment and in preventing symptoms is well established in the literature. Efficacy is negatively affected by lack of motivation and poor adherence to the exercises and there is a gap in understanding about both. Evidence is required about factors which

influence adherence to PFME. The recent growth of mHealth and the potential for smart phone apps to support adherence provide a contemporary focus for the research presented in this thesis. Evidence is required about if smart phone apps for PFME can support adherence and, if so how is this support provided.

CHAPTER 3: METHODOLOGY

As identified in section 1.3, a generic methodological approach was taken for this thesis which involved mixed methods. Three methods were used: focus groups, an exploratory randomised controlled trial and unstructured interviews by telephone. An explanation of the methodology is included in section 3.1. Section 3.2 provides details about the focus group method used, section 3.3 describes the trial, and section 3.4 describes the telephone interviews. The apps used in this study are described in section 3.5.

3.1 METHODOLOGICAL APPROACH

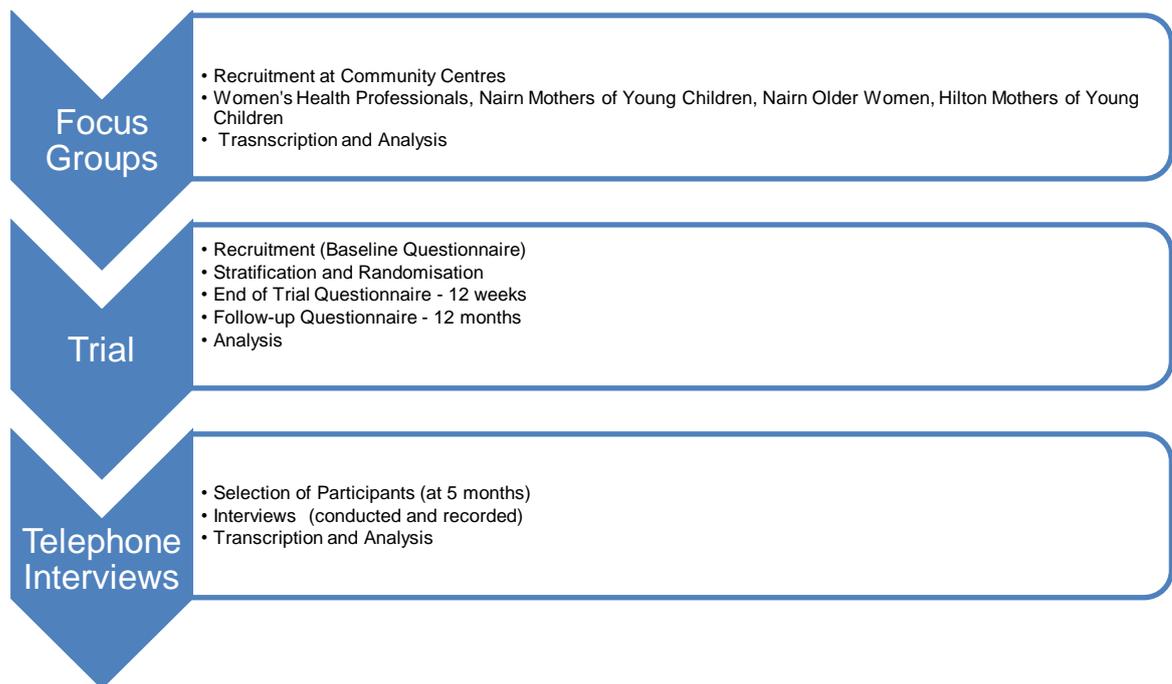
In considering which methodology or combination of methodologies to use to best gather data as evidence about adherence to PFME and the role of technology, it was very quickly apparent that no one methodology would be sufficient to “*satisfy the (health) professionals’ needs*” (Aro & Absetz, 2009, p.126). Aro and Absetz (2009) suggest that, in relation to the choice of method, “*when the question is about changing behaviour, there may not be any answers or tools*” adequate for the task.

Jadad & Enkin (2007, p.8) support Randomised Controlled Trials (RCTs) as the best and most powerful of research designs but they also state that “*they are by no means a panacea to answer all healthcare questions*”. They suggest that in order to get “*the answers that clinicians, patients, or policy makers need*”, other complementary types of studies are required (Jadad & Enkin, 2007, p.8). However, Parahoo (2006, p.101) warns that using different methods, either singly or in combination, “*should be a well thought-out process backed by a strong rationale discussing the purpose and benefits of such decisions and the choice of methods*”.

Parahoo (2006) stresses that the decision making about the use and combination of methods should be driven by the research question. According to Bowling (2009, pp.141-142) qualitative techniques are appropriate in “*exploring new topics and obtaining insightful and rich data on complex issues*” whereas quantitative techniques

can be used “if the issue is known about, relatively simple and unambiguous, and amenable to valid and reliable measurement”. In this study, three methods have been used to gather data about adherence to PFME and the role of smart phone apps, as illustrated in Figure 5 below.

Figure 5 showing the three methods used.



With the use of focus groups, an explanatory trial and telephone interviews (Figure 5), it was possible to gather a mix of qualitative and quantitative data. There is a substantial body of evidence about the effectiveness of PFME and, from that perspective, it is 'known about' and the literature includes valid and reliable tools for measurement. This would suggest and support the appropriateness of established quantitative techniques. On the other hand, the literature identifies a lack of understanding about the complex nature human behaviour around adherence to exercise (Sampelle, 2000). In addition to this, the novel topic arising from the introduction of smart phone technology lends support for the use of qualitative techniques.

In the wider context of health research, there has been a shift from the medical model to a “*more holistic approach ... called the psychosocial model*” which includes a focus on prevention, cost-effectiveness and self-help (Polgar & Thomas, 1991, p.15). This research sought to increase understanding of the experiences of community dwelling women in exercising their pelvic floor muscles and the role of technology and, as such, included elements of prevention, cost-effectiveness and self-help. Focus groups are described in section 3.2, the explanatory trial is described in section 3.3, and a description of the telephone interviews is provided in section 3.4.

3.2 FOCUS GROUPS

Focus groups have been identified as a valuable supplement to other methodologies (Kitzinger, 2005), allowing triangulation in the study of an issue (Flick, 2007). Focus groups are useful in helping people “*to explore and clarify their views*” (Parahoo, 2006, 331). They are a useful method in gathering data from interaction between participants where individuals self-disclose “*what they really think and feel*” (Krueger & Casey, 2000, p.9). Furthermore focus groups are as a useful tool for gauging attitudes and exploring views about new health services (Kitzinger, 2005) and hence, they were appropriate to use to gauge the attitudes of different groups of women about the use of apps for PFME.

The aim of the focus groups was to discover views from community dwelling women about the general acceptability of PFME apps. The views of these women would then be used to inform the design of the RCT (Bowling, 2009, p.141).

A protocol template was provided by NHS Highland’s Research and Development office for use in clinical trials. The template was adapted and simplified for use for the focus groups (Appendix I).

Supervisors were consulted throughout and their clinical advice and research experience informed development. The protocol was given ethical approval through UHI Research Ethics Committee. Confirmation was received through NHS Highland's R& D office that NHS ethical approval was not required.

A pilot focus group was held with physiotherapist from NHS Grampian. This was held prior to the availability of the ten iPod Touches and a power point was used to show screen shots of the apps.

3.2.1 RECRUITMENT TO FOCUS GROUPS

Women from two different age groups were targeted; mothers of young children and older women. Initially, perimenopausal women were considered as a potential target group to include in the study. Perimenopause is the transition phase, before and after menopause, commonly between thirty nine and sixty years (Oldenhave *et al*, 1993). The target groups of Mothers of Young Children and Older Women both included women who could be categorised as perimenopausal and so this target group was assimilated into both these groups.

Involvement by individuals in the focus groups had the potential to affect their experience should they also participate in the subsequent randomised control trial based in Moray. It was important therefore to avoid the recruitment of focus group participants from Moray. At the same time there was merit in the inclusion of participants from a geographical area similar to Moray so that data from the focus groups could be triangulated. Nairn is a Highland town approximately ten miles from the boundary of Moray and was identified as a suitable area within which to recruit for the focus groups. Two focus groups were arranged to be held in the Nairn Community Centre.

10 iPod Touches were available for use by participants in the focus groups but ten is considered too large a number for a focus group on a complex subject matter

(Krueger & Casey, 2000, p.73). Holloway & Wheeler (2005) suggest the optimum number of participants is between three and six. Recruitment to the focus groups involved an invitation to specific groups but, potential participants were encouraged to bring a friend. This meant that numbers would depend on who turned up on the day. The iPods belonged to the Moray Health Partnership and were purchased for use in this thesis.

Initially, efforts to arrange the focus groups were made through the community centre managers who were very helpful. Unfortunately this did not lead to any positive responses and it appeared that there was insufficient interest.

The researcher therefore arranged to visit the community centres in person. Flyers (Appendix II) were handed to prospective participants and were also left in the reception areas. During these visits, interest was expressed by individuals and dates and times for focus groups were agreed and arranged to suit participants.

The young mothers' focus group was arranged at the community centre in a room large enough for the children to play. Play equipment was provided as suggested by Krueger and Casey (2000, p.117). The focus group for older women was arranged for the tea time at the end of the following week's exercise class.

The venue for both these groups meant that participants were in a familiar setting and this would have contributed to a relaxed atmosphere which would have helped them, especially reserved participants, to feel able to contribute. Women in the young mothers' group were able to participate because they could take their children with them and therefore did not have to arrange child care. The older women's group benefited from being immediately after the cup of tea which followed their exercise class. The participants did not have to arrange to come to the centre at a different time and it was easier for them to participate.

The presence of the young children caused numerous interruptions and the nature and level of noise they produced made transcription of the group discussion more challenging. Because of the energy generated by their fun exercise class there was a general hubbub generated by the older women during their tea. The focus group started at the end of the exercise group tea session when non participants drifted out of the room and participants settled down round the table with the focus group materials and iPods. Holloway & Wheeler (2005) suggest recruiting participants to focus groups from naturally occurring groups but the experiences described above suggest that there can be additional challenges in managing these focus groups.

One particular challenge of managing a focus group of older people concerns hearing difficulties. A softly spoken Highland accent from a comparatively young female researcher is no match for a group of elderly ladies who conduct spontaneous conversations throughout a focus group! As with the young mothers' focus group, transcription is more challenging when there is more than one person speaking at the same time.

3.2.2 FORMAT OF FOCUS GROUPS

Initially, participation information sheets and consent forms were distributed to each member of the focus group. Then voting slips saying “(A) *Please say how much you agree with the following statement ‘Smart phone applications are a useful tool which could help individuals in Moray to self-care and self-manage their health’*” and with a 5 point likert scale between strongly agree and strongly disagree were distributed for completion. Participants were then asked to post their completed voting slip into a cardboard voting box. This exercise was repeated at the end of the focus group using an identical slip except for the use of (B) to replace (A).

The researcher verbally reiterated the purpose of the focus group, i.e. to gather views on PFME apps, and encouraged participants to share their views both verbally and in writing on the sheets provided. iPod Touches were passed round and the researcher talked through how to turn them on and how to open the first PFME app. The

researcher led the process of looking at this and subsequent apps (Figure 1, p. 17) so that each member of the group was looking at the same screen at or around the same time to facilitate discussion. Data from the audio recording of the focus group and from the supporting written material was gathered.

The process of transcribing the audio recordings prompted the researcher to reflect on the format of the groups; specifically around the use of written material and around her role in the groups. The researcher reflected on whether the use of answer sheets may have the effect of limiting the flow of discussion and she also reflected on her role in moderating the groups and in directing conversations to specific elements of the apps. However, this “*directive approach*” fitted with the purpose of the focus group in finding out the views of participants on a number of specific topics (Parahoo, 2006, p.334). In addition to the role of conducting the focus group, there was an additional role in demonstrating the use of the iPod Touches and in providing some support for participants who had limited experience of small touch screens, digital technology or apps.

In order to test out a different format which did not rely so heavily on the researcher or on written responses, a focus group was conducted with a group of researchers based at the Centre for Rural Health. Participants were not provided with question sheets and the researcher tried to take a less participatory role in discussions, although she still led the process of going through the apps. Although the focus group was effective in gleaming interesting perspectives and views about the apps, there was a risk that the view of some participants were not gathered because while some spoke when they wanted to, others were inhibited as described by Scott (2011) and Joyce (2008).

In terms of the researcher’s role, the testing of different formats was useful in providing a level of assurance that the focus groups were being conducted effectively as possible and served to give more confidence to the researcher in her role. In terms of the use of answer sheets, an altered format for focus groups was agreed which amalgamated elements that worked best in the previous groups. This involved

the researcher providing written material after each app was looked at, as opposed to during the discussion stage. This enabled the answer sheets to act as a data collection tool for views that participants were not able to express during discussions without inhibiting the flow of the discussions. The new format was agreed and two further focus groups were arranged to test it. During this review period, two more PFME apps became available and the potential for more focus groups gave the opportunity for these to be used.

Two more focus groups were arranged in Hilton Community Centre in Inverness. Inverness is a city in Highland, approximately 25 miles from the boundary with Moray. As before, there were two target groups; Mothers of Young Children and Older Women.

Recruitment followed a similar format in so far as the centre manager and staff made the initial contact with relevant users of the centre (an older person's group and a parent and toddler group). As in Nairn, this was ineffective in generating sufficient interest from individuals to commit to participating. The researcher arranged to visit the centre during a parent and toddler session and at the start of an older people's group to pass out flyers about the focus groups and to give information about when they were to be held (prior to the older people's group and during the parent and toddler group the following week). The researcher was able to engage with individual mothers at the parent and toddler group and to illicit positive responses to the invitation to participate in the focus group. However, in the case of the older people's group, it was left to the group leader to pass out flyers and promote the focus group and it was not possible to engage with individuals.

The Hilton young mothers' focus group was effective in gathering the views of participants. There was a mix of discussion, time for individuals to try out the apps, and time to write views in the answer sheets provided. Analysis showed that there was not a big difference between the data collected at this group and the Nairn young mothers' group.

No participants were recruited for the Hilton older women's focus group. This would suggest that leaflets and posters alone can be insufficient tools in engaging members of the general public to participate in focus groups and that a face-to-face invitation from the researcher can be effective.

3.2.3 DISCUSSION ABOUT FOCUS GROUPS

Discussions in focus groups can be dominated by more outgoing participants and there is a risk that a consensus view may be apparent on the surface when, in fact, introverted participants may be less confident in expressing their views or may not want to disagree with the dominant voice (Scott, 2011).

Focus groups can present a challenge to a sole researcher who must juggle organisational and administrative tasks with the timing of question prompts and managing levels of participation (Parahoo, 2006). Krueger & Casey (2000, p.105) recommend an assistant to take full notes with the moderator taking few notes and they stress the importance of written notes due to the unreliability of tape recordings. Due to the improvements in technology since Krueger and Casey's book was published, audio recording is easier and of better quality. In this thesis to avoid loss of data if one method of audio recording failed, two recordings were made. The main recording was made from an iPod which was placed in the middle of the table around which participants sat. In every focus group, the quality of the recording was sufficient and the back-up recording was not required. The other technique used was to use question sheets which allowed participants to self-record their views. In the provision of question sheets and the quality of audio recording, the challenges of data collection were overcome.

With regard to recruitment of participants to focus groups, the experience of this study suggests that leaflets and posters alone can be insufficient tools in engaging members of the general public to participate in focus groups. Furthermore, face-to-face invitation from the researcher was found to be essential for this trial. Face-to-face invitations were effective in all the focus groups when other recruitment methods

failed. Where it was not possible to invite potential participants personally, as in the Hilton Older Women group, recruitment was wholly unsuccessful.

3.2.4 ANALYSIS

Focus groups were audio recorded using a voice memo app. Recordings were then sent by email and saved onto the university's secure server. The author transcribed the audio.

The focus groups were useful in establishing that apps for PFME were considered acceptable and were welcomed by many participants as a useful tool for promoting adherence to exercise. These observations from the focus groups provided confidence that the trial would be useful in testing how useful the apps would be for women in a community setting over a period of three months (NICE, 2006). In addition, the focus group with older women highlighted the potential for age to be a barrier to use of the technology.

In addition, data from the focus groups provided useful background information for the telephone interviews, the third method used in this study. The content from the focus groups was used to triangulate analysis with data from the trial and the telephone interviews and with the literature. This was done by searching through the transcriptions for codes and key words identified during analysis of the trial notes and telephone interviews.

3.3 RANDOMISED CONTROLLED TRIAL (RCT)

RCTs are considered the gold standard in health research (Akobeng, 2005) and the Cochrane Incontinence Group commonly includes only RCTs and quasi-randomised studies in reviews (Hay-Smith *et al*, 2008, Dumoulin *et al*, 2011). The methodology is needed where a novel intervention has been developed in order to “*test it among a*

sample ... that represents as closely as possible the population ... to which the intervention will be applied if found to be effective” (Togerson & Togerson, 2008, p.81).

Within the RCT toolkit are a range of study designs. Explanatory trials “*are important to inform the development of effective interventions*” whilst pragmatic trials are “*crucial to evaluate an intervention in a ‘real world’ setting*” (Togerson & Togerson, 2008, p.85). Given that smart phone apps for PFME are a novel intervention which would be accessed and used in a real world setting, this RCT required characteristics of both explanatory and pragmatic trials.

Good trials evaluating complex interventions should be able to answer both pragmatic and explanatory questions. As well as asking ‘Does it work?’, we should also be asking ‘How does it work?’, ‘What components are responsible for efficacy?’ and ‘Can it be tailored to work more effectively with particular types of patient?’ (Emsley *et al*, 2010, p.237). This trial was designed to identify factors which influence motivation and adherence to PFME and to answer the questions: ‘do smart phone apps for PFME support adherence’; ‘in what ways do smart phone apps for PFME support adherence’; and ‘what elements of smart phone apps make them effective in supporting PFME’.

3.3.1 RECRUITMENT

Recruitment to the trial was initiated by the placing of posters in public buildings, businesses and shops in Forres, Findhorn and Elgin and their hinterlands. As response was difficult to predict, the dissemination of recruitment materials was started, initially, in the west side of Moray with the aim of extending recruitment to the east as required.

In order to recruit community dwelling women, recruitment efforts were focused on places where women were likely to visit in the course of their normal lives. In

addition to posters, flyers were left for distribution at community centres, service centres, leisure and fitness facilities, libraries and in café's, counter based services (such as banks and building societies), at hairdressers and in staff rooms.

Some individuals asked for further information and expressed an interest at participating as a result of contact with the researcher during this recruitment activity. Some responded directly in response to the posters or flyers while others were recruited as a result of word-of-mouth information sharing within the community (not involving the researcher).

Because the researcher did not know the names of individuals who she communicated with during while distributing posters and fliers around Moray, it was impossible to gauge how many women who responded positively at this stage had face-to-face contact with the researcher and how many responded purely as a result of the recruitment posters and flyers. There is some evidence of word of mouth recruitment between potential participants within organisations and work places. Individuals were not asked to say how they found out about the trial or if they had spoken to the researcher in person. Although data around this would have been useful in informing future research recruitment activities, this was not the primary focus for the research and efforts were made to limit the number of questions participants were asked.

Individuals were invited to ask for more information and to express their interest in participation by contacting the researcher by phone, text, email or by post. No postal requests were made and email and text were the most common form of contact.

3.3.1.1 EXCLUSION CRITERIA

Exclusion criteria for the trial were drawn from characteristics reported in previous, similar trials, including those systematically reviewed by Dumoulin & Hay-Smith (2010) and Hay-Smith *et al* (2008), and also in discussion with the clinical

supervisors. The exclusion criteria used were: Men, Non-English speaking women, Women < 18 years, Self-reported inability to contract PFM, women suffering from neurological disorders or cognitive impairments.

One individual who informed the researcher of her multiple sclerosis and who did not complete the consent form was excluded from the trial. Copies of the exercise adherence chart and the PFME guidance sheet were sent to the participant who was excluded from the trial and to those who expressed an interest in joining after recruitment had stopped.

3.3.2 FORMAT OF RCT

This section includes a description of the setting for the trial and provides detail about its administration.

The protocol template was provided by NHS Highland's Research and Development office for use in clinical trials as described for focus group use in section 3.2.2. The template was adapted for this trial (Appendix VII).

3.3.2.1 SETTING FOR RCT

The RCT was carried out in a community setting, as opposed to a clinical setting, for a number of reasons. Firstly, as it is known that many women who have incontinence symptoms delay seeking help and remain undiagnosed, this was the cohort who were of interest for the purposes of addressing the hypothesis that mHealth may be a useful tool in the self-management of UI. Secondly, the aim of the study was to test mHealth as a tool for supporting the self-management of symptoms and not a tool for the clinical management of symptoms. Neither self-management techniques nor smart phone apps require a clinical setting. And finally, as the emphasis was on external validity it was important to avoid factors which could negate the 'real life' setting for the trial, such as contact with health professionals or the researcher.

The results of the trial must be considered in the context of its exploratory nature and the resources available for its implementation. Because of the wide range of factors which could influence participants but which may not have been accounted for during the trial, results must be viewed with caution. The explanatory RCT was successful as a methodology in that it provided new data which is useful in understanding adherence and the effectiveness of smart phone apps. However, results should be considered along with the qualitative data gathered from the focus groups (section 3.2) and telephone interviews (section 3.4).

3.3.2.2 BLINDING, STRATIFICATION AND RANDOM ALLOCATION

The lack of ability to blind, far less double blind, means there is opportunity for bias. However, as the aim was to find out new information as opposed to providing evidence behind one particular hypothesis, blinding was not integral to the process.

Ideally, stratification of all participants in the trial should have been done in one stage to allow best match between pairs, which then leads to “*more precise statistical estimates of effect, which in turn requires a smaller sample size*” (Togerson & Togerson, 2008, p.35). However, due to the randomisation process, it was not possible to foresee how many participants willing to use their own equipment would be allocated to the intervention group and not require an iPod. This meant a staggered process was required. This process is described below.

The process used for the random allocation of participants to the control group and the intervention group is the alternation method and is described as quasi-randomisation (Hay-Smith *et al*, 2008). The alternation method involves the allocation of every alternate participant to the intervention group. Togerson and Togerson (2008, p.35) describe the process as “*matched randomisation*” where participants are stratified and grouped into closely matched pairs. Within each pair, one participant is

allocated to the intervention group and one participant is allocated to the control group. This process is described in more detail below.

Although the whole process of stratification and randomisation was witnessed, the witnesses were researchers from the same department and one became the Director of Studies some months later. From the perspective of an outside observer, this could be open to accusations of bias or manipulation. However, in the context of the scale of an exploratory RCT undertaken as part of doctoral research, this method was appropriate. If the trial was to be repeated at a larger scale, a computerised randomisation process would be more suitable.

A total of 47 participation information sheets, consent forms and baseline questionnaires (Appendix XII) were sent out in August and September 2012. Data from the returned baseline questionnaires were input as they were received.

Stratification was undertaken using three variables known to affect adherence to PFME which had been gathered using the baseline questionnaire; current level of PFME, self-efficacy score and attitude to current level of exercise in general. The current level of PFME was chosen to match and compare the results of women who were currently exercising at the same or similar level. Self-efficacy has been identified as a contributing factor to adherence (Borello-France *et al*, 2010). A self-efficacy score was created for the purposes of the study by calculating the proportion of behaviours which individuals had attempted to change in the year prior to the start of the study which they had managed to change. The score could be 100%, if all behaviours had been changed successfully, 0% if none had been changed and either 25%, 33.3%, 50%, 66.6% or 75% depending on the number of behaviours where change had been attempted and the number behaviours where successful behaviour change was made. Women who had reported the same or similar levels of success in changing behaviours in the past were matched. The third variable used for stratification was participants' current levels of general exercise as Borello-France *et al* (2010) had reported it as a predictor to adherence of PFME.

A variety of methods were considered for randomisation; from the use of an internet based randomisation service, the use of sealed envelopes to a function of Microsoft Excel. Ideally, this process would have been conducted by someone other than the researcher to ensure it was blind. Due to the nature of the PhD as a single researcher study and the need to adopt a system that was proportional to the size of the study, and due to the fact that there was no opportunity for double blinding (as the researcher was to be so intimately involved in inputting data and analysing results) blinding was not considered a priority or an achievable goal.

Randomisation was undertaken manually by inputting a cross on every second row in the Excel Spread sheet in what can be described as a quasi-randomisation exercise. To avoid bias or interference by the researcher, the process of stratification and randomisation was witnessed by a Senior Research Fellow and a PhD student based at the Centre for Rural Health. The process is illustrated in the Consort diagram in Appendix XXIII.

Initially the stratification exercise and random allocation was conducted with 20 participants to allow 10 in the control group and 10 in the intervention group (as there were 10 iPod Touches for use in the trial). 7 iPod Touches were allocated to participants in the intervention group and the 3 participants who had indicated they had and were willing to use their own iPhone or iPod Touch were identified to receive apps only. This left 3 iPod Touches available for use. The stratification and random allocation exercise was conducted with a further 4 participants which allowed 2 for the control group and 2 for the intervention group. 1 iPod Touch was allocated and 1 participant was willing to use their own equipment. This left 2 iPod Touches available for use. A week later, when further group of participants had been recruited, four were stratified and randomly allocated to either the control group or the intervention group. The 2 remaining iPod Touches were allocated to participants in the intervention group.

Figure 6 showing stages of stratification process

First Stage (04/09/12)	20 participants (10 iPods available)
	<ul style="list-style-type: none">• 10 control group• 10 intervention group (7 iPods allocated, 3 participants with own equipment)
Second Stage (04/09/12)	4 participants (3 iPods available)
	<ul style="list-style-type: none">• 2 control group• 2 intervention group (1 iPod allocated, 1 participant with own equipment)
Third Stage (11/09/12)	4 participants (2 iPods available)
	<ul style="list-style-type: none">• 2 control group• 2 intervention group (final 2 iPods allocated)

This process resulted in all of the iPod Touches being allocated to participants in the intervention group and 4 additional participants allocated to the intervention group using their own equipment. The willingness of the four participants to use their own equipment allowed the total numbers of participants in the trial to be 28 as opposed to 20.

3.3.2.3 CORRECT IDENTIFICATION OF MUSCLES BY PARTICIPANTS

Instructions about how to 'find' pelvic floor muscles were included in the exercise instruction sheet provided to all participants in the trial (Appendix XI). The instructions suggest that "*Imagine you are trying to stop yourself passing wind and at the same time trying to stop yourself from passing urine. It should feel like a 'squeeze and life' inside*" (Chartered Society of Physiotherapy, 2010).

As discussed in section 2.2.2.3, there is a consensus about the importance of correct identification of muscles. While some experts recommend this is done in a clinical setting with a health professional, others accept that in order to promote exercises to a wider population of women clinical testing is neither feasible nor affordable. Bo & Haakstad (2011), while recognising the benefit of clinical assessment of pelvic floor function, identified the advantage for the purposes of health promotion and prevention of a programme which did not include assessment (p.194). Whitford (2007) similarly, did not “*attempt to verify if the women who reported the practice of the exercises were performing a correct muscle contraction*” (p.305). She justified this by stating the purpose of her study, which was to “*investigate current levels of practice of the exercises, not to test the effectiveness of the exercises*” (p.305).

In a clinical setting, muscle function and strength can be measured (feedback or biofeedback) in order to tailor an exercise protocol to fit each individual. However, based on evidence in the systematic review about feedback and biofeedback by Herderschee *et al* (2013), there is no clear evidence that it could explain the difference between adherence to exercise.

A similar approach was taken in this study. In addition to the written information provided on the instruction sheet, participants in the intervention group also had access to advice on apps about correctly identifying muscles (section 3.5.1).

3.3.3 TRIAL MATERIALS

Materials for the trial were posted to all participants. Participants in the intervention group, who were provided with an iPod Touch, were sent by Special Delivery Guaranteed (the password for the iPod Touch was sent separately). The four participants in the intervention group who used their own equipment received the materials by post but were electronically ‘gifted’ the apps from the App Store.

The baseline questionnaire of 21 questions (Appendix XII) was constructed using questions from a variety of sources with some original questions designed specifically for the study. It was piloted with three young mothers in Aberdeenshire prior to use.

Questions 1 and 2 were around current and past practice of PFME. The NICE (2006) Clinical Guidelines 40: 1.2.2.1 & 1.2.2.2 suggest “*at least eight contractions performed three times per day*” over a three month period (p.14) as a trial treatment of UI. The option of this level of exercise was included in question 1 along with further, decreasingly frequency levels of exercise all the way to never exercising.

Questions 3 and 4 were around the teaching of PFME as this may have been a factor in influencing the performance of women in the trial (Whitford & Jones, 2011). Questions 5 and 6 were around belief in the efficacy of PFME and confidence in contracting muscles. These were identified as potential predictors to adherence during the trial (Whitford & Jones, 2011). Question 7 was about motivation which was the subject of the Whitford & Jones study in 2011 based in the NE of Scotland. Questions 8 and 9 were about identifying difficulties in exercise and barriers to adherence based on analysis of the literature (see previous chapter).

Questions 10 and 11 are identical to a question asked in the Scottish Health Survey (SHS) (2011, p.107 & p.115).

Questions 12, 13 and 14 were around UI. The attitude that UI is a normal part of ageing has been identified as a factor in the under-reporting of UI symptoms (Shah & Badlani, 2002). Question 13 is from the “*ICIQ: a brief and robust measure for evaluating the symptoms and impact of urinary incontinence*” (Avery *et al*, 2004). Question 14 was prepared to test subjective norm, an element from the Theory of Planned Behaviour (Ajzen, 1991).

Question 15 is also drawn from a SHS question (2011, p.114). Question 16 asked for the participant's age. Questions 17 and 18 are identical to SHS questions *Qghpa1* and *Qghma1* (2011, p.109 & 110).

Questions 19 to 21 were to gather information which could be used for the allocation of iPods in the trial and were around technology and apps. The final question was to provide measures of personality based on the Ten-Item Personality Inventory (TIPI) (Gosling *et al*, 2003).

The duration of the trial was three months in response to NICE guidelines (2006, p,11) recommendations that "*A trial of supervised pelvic floor muscle training of at least 3 months' duration should be offered as first-line treatment to women with stress or mixed UI*". After the three month trial period, the post-trial questionnaire (Appendix XII) was sent to all participants with a stamped, addressed envelope for reply. Duplicate questionnaires were sent out as a reminder to those who had not responded after approximately 1 month and a further duplicate questionnaire was sent out approximately 3 weeks after that to those who had not responded. A final reminder was made in the form of email and / or text after another couple of weeks. To allow direct comparison between the pre-trial questionnaire and the post-trial questionnaire the participants' reference numbers were written on the back of each questionnaire.

The post-trial questionnaire (Appendix XII) mainly contained identical questions to the baseline questionnaire and was sent to participant after three months. Questions 1 - 4 were identical to questions used in the baseline questionnaire and were repeated to measure change in behaviour and attitude. Question 5 asked if an app was used in the study and questions 6, 7 and 8 were about the app and use of the app.

The follow-up questionnaire (Appendix XII) was sent at the end of June 2013 to all the participants still in the trial (i.e. participants who had returned the end-of-trial

questionnaire) in order to measure longer term changes in behaviour. The Consort diagram in Appendix XXIII illustrates the process for the three questionnaires.

The participants' reference numbers were not written on the back of the follow-up questionnaire. This was an omission on the part of the researcher which was only realised sometime after the questionnaires had been posted. This omission prevented the ability to trace the record of individuals to follow-up stage and allowed only general follow-up data. After discussion with supervisors about the impact of this omission on the quality of data from the trial, the decision was made to repeat the follow-up exercise to allow the pre-trial, post-trial and follow-up data of individuals to be compared.

In deciding the nature and number of questions used, consideration was made of the level of intrusiveness of the questionnaire. There would have been merit in including questions about socio-economic status, and indeed this data would have been pertinent in providing additional information about the conditions and context in which participants exercised. However, as some of the questions were personal and potentially sensitive, especially those about UI symptoms it was decided not to include questions around socio-economic status. Instead, general evidence about the data zones of participants, based on their post-codes, was gathered to provide some data on socio-economic status and rurality.

The pack of study materials included additional sheets and spaces for notes, comments and further information. Participants were encouraged to add comments about what had helped and / or hindered them from doing their pelvic floor exercises. They were also asked to note how many exercises they planned to do each day and to report, honestly, how many they actually did.

Details about the apps for PFME used in the trial can be found in section 3.5.1.

3.3.4 DISCUSSION ABOUT TRIAL

There was a tension between aiming to achieve either internal or external validity in the planning of the trial. Increased internal validity would be achieved by a high level of control over elements of the trial (such as how many exercises should be undertaken, when, and which app would be used). External validity would be achieved by replicating, as much as possible, real life circumstances. As the sample size and effect size were unlikely to be large enough to produce replicable results, the emphasis was placed on external validity and this influenced the structure of the trial. For example, in normal circumstances individuals would exercise choice about the app they used and the ability to choose an app was facilitated in the trial. Furthermore, health behaviour models suggest that adherence is supported when individuals engage in the planning and decision making around behaviour (Armitage, 2005). Also, the literature indicates that exercises are most effective when tailored to an individual's level of muscle strength and fitness (Dumoulin, 2011). So the ability of participants to choose an app that they liked and that suited their level of muscle fitness was an element of the trial which could positively influence adherence.

3.3.5 ANALYSIS

The trial was designed to allow both quantitative and qualitative data to be gathered. Analysis of quantitative data was expected to be as described in the trial protocol (Appendix VII) where correlations between variables would be tested for normal distribution and then analysed using the appropriate statistic test using SPSS.

However as it became apparent that some participants in the intervention group had not actually used the intervention and that the use made by other participants varied considerably, it was clear that comparison between the intervention group and the control group (Appendix VII) was not possible. As a result, the focus shifted to content analysis of the factors which influenced the behaviour of the participants. This analysis was assisted by coding of data in nVivo.

For clarity, it is important to stress that although some statistical analysis was originally anticipated prior to the start of the trial, there was never an expectation that statistically significant results would be produced; the sample size was too small. However, the author was keen to establish an effect size which might be useful in calculating sample size in a potential future larger scale trial. It had been for this reason that statistical analysis would have deemed appropriate and useful. However, when it was clear that it would not be possible to calculate effect size due to the disparity in intervention use, the focus shifted to more detailed analysis of the qualitative data.

Munn & Drever (1990) advise against the “*temptation*” to use irrelevant “*number-crunching programs*” and the mistake of over-interpreting data (p.44). Therefore, data from the trial is presented in this thesis in a simple, descriptive format. In addition, some descriptive statistical analysis is presented in appendix XXIV for reference only.

3.4 TELEPHONE INTERVIEWS

As with the RCT, a pragmatic approach was taken to select participants for interview. This selection may have been affected by the level of familiarity generated by prior analysis of the data but as the analysis from this methodology would be not blind and as the researcher would inevitably influence other aspects of the interview process, this was not considered to be problematic. However, if a larger scale research project was developed, the selection process could be blinded.

Unstructured interviews conducted over the phone were the third method used to gather data to answer the research questions. The first method, focus groups, is outlined in section 3.2 and the section method, the explanatory trial, is outlined in section 3.3.

The aim of the interviews was to explore phenomena around the experiences of women in adhering to the exercises and in using the apps. This was particularly useful in exploring the ‘unknown unknowns’ and to allow participants to provide their perspectives to allow a “*rigorous and unbiased understanding*” of their experiences (Carpenter, 2010, p.125). The non-directive, unstructured nature of interviews allowed participants “*free expression*” which was “*as near as possible to normal conversations*” (Parahoo, 2006, pp.322 – 323).

Bowling (2009, p.407) suggests that unstructured interviews can “*delve deep beneath the surface of superficial responses to obtain true meanings that individuals assign to events, and the complexities of their attitudes, behaviours and experiences ... to tell their own stories in their own words, with prompting from the interviewer*”. As such, unstructured interviews were a suitable methodology in gathering data of greater depth than was possible with the RCT.

3.4.1 SELECTION OF PARTICIPANTS AND FORMAT OF INTERVIEWS

Once all the post-trial questionnaires were received and the iPods returned or collected, the third method in this study was implemented. Due to the constraints of time and resources it was not feasible to interview all participants and so participants were selected for an interview based on data from the randomised controlled trial. Criteria were agreed with the Director of Studies (Figure 7) in order to sample different groups of participants with similar experience of the trial. Only participants who completed the trial were included in the selection process. Participants were checked for consent and one from each group was then selected. The selection was made by the researcher picking from the list of participant reference numbers eligible under each criteria.

Figure 7 Selection criteria for telephone interviews

Criteria for Selection of Participants for Interview:

1. Participant from intervention group with low adherence
2. Participant from intervention group with high adherence
3. Participant from control group with low adherence
4. Participant from control group with low adherence
5. Participant who found the app useful
6. Participant who did not find the app useful
7. Younger participant

Seven interviews were conducted by telephone in April and May, 2013, corresponding with the seven criteria (Figure 7). The duration of the interviews varied from under seven minutes to over twenty two minutes. To ensure the interviews were effective, an unstructured format was used which would allow participants to direct the course of the conversation and in which the researcher / interviewer would simply either encourage participants to give additional information or to describe what they had said in more detail. The same, initial question was asked in each interview. Participants were asked to say, in their own words, what they thought about the experience of taking part in the study and how they felt they got on. It was hoped that the open-ended nature of the initial interview question would lead to some self-evaluation and reflection by the participants and provide useful, additional data that would enhance that already generated by the trial.

In addition to this format, a question template was prepared to facilitate the asking of subsequent questions as required. This was used as a 'safety net' in case the interviewer became tongue tied through nervousness or in case she faltered in concentration. However, the template was not required in any of the interviews

conducted. To facilitate a natural flow of conversation, the telephone interviews were recorded with consent and no written notes were taken.

3.4.2 DISCUSSION ABOUT TELEPHONE INTERVIEWS

An advantage of conducting the interview by telephone was that it allowed a continued level of relative anonymity to the participants. Up till this point, they may only have had paper or electronic communication in relation to the trial and may not have discussed their participation with another person. If interviews had been conducted face-to-face, this may have been off putting to participants who are not comfortable talking about incontinence symptoms. It was hoped that participants would feel free to speak on the telephone in the knowledge that the interviewer was not based in their area and they were unlikely to meet.

In a practical sense, telephone interviews were convenient. They did not require travel to or around Moray and minimised the amount of time and cost required for each interview. Recording equipment could be set up easily and did not have to be transported and reset in different venues. Sound quality was consistent as the microphone used to record the conversation was placed beside the phone which was set on 'speaker'. The interviews were relatively easy to arrange: most participants were available to speak straight away and others could be scheduled relatively easily.

The lack of ability to observe and respond to non-verbal communication can be detrimental to the quality of telephone conversations (Berg & Lune, 2004). In addition, as a result of the quantity of cold calling received on domestic land lines, people's first reaction to a stranger's voice on the phone may be untrusting and sceptical. Although the trial paperwork indicated more than once that participants may be contacted by the phone in the weeks after the trial ended, individuals may still be caught off guard. The lack of warning for a telephone interview may have caught participants at a bad time or when they were not 'in the mood' to speak about their experiences, especially if other people were around. The spontaneity this

allowed, however, may have contributed to an ease of communication and lack of tension that a pre-arranged face-to-face interview may have incurred (Jackson, *et al*, 2008).

Bowling (2009) stresses the importance of 'rapport' between interviewer and interviewee and this was especially necessary in facilitating discussion about sensitive issues around incontinence. One participant, who freely commented on her incontinence, mentioned that the researcher was the only person she had ever spoken to about her symptoms and this illustrates the effectiveness of the methodology in obtaining data which would otherwise be difficult to get.

3.4.3 ANALYSIS

Telephone interviews were audio recorded using a voice memo app. Recordings were then sent by email and saved onto the university's secure server. The author transcribed the audio.

Two methods of coding were undertaken to facilitate analysis. The first method involved 'copying and pasting' comments into an excel spread sheet. Six sheets were created within the spread sheet and named; Motivation, Promoters of Exercise, Barriers to Exercise, About Apps, Suggestions and Ideas, and Ad Hoc comments.

After a short break (approximately two weeks) to allow a fresh look at the data, the telephone interview transcripts were coded using nVivo (version 10), QSR International. Instead of identifying the codes at the start and subsequently allocating comments to whichever code fitted best, a grounded approach was taken in which nVivo nodes were created in response to the content. A total of 31 nodes were created; 18 trees with 13 branches (Appendix XXVI). Some comments were coded under more than one node where the content dictated. Codes were used to search transcriptions from focus groups and the trial notes provided by participants and were

used as a basis for triangulating data with the literature. Themes which emerged are reported in this thesis.

3.5 PFME APPS

Searches on Apple's app store using the terms 'kegel' and 'pelvic' were used to find apps to use in this study. Initially five apps were found but two were rejected for use in the study as one froze during operation and the other only provided information about exercises with no elements to support the exercise. The three remaining apps were used in the first two focus groups in Nairn in February 2012 (one with mothers of young children and one with older women). A further two apps were found prior to the Hilton focus group in August. All five of these apps were provided to participants in the intervention group in the trial (n=14/28). Four of the participants were provided with the apps for use on their own iPhone and ten participants were provided with an iPod Touch with the five apps installed.

3.5.1 APPS AND IDENTIFYING MUSCLES

The apps used in this study provided instructions on how to identify pelvic floor muscles. The instructions provided on the apps reflected those provided on the instruction leaflet. These instructions centred on the action of stopping mid flow when urinating.

One of the apps included instructions on one-finger digital vaginal assessment. This was the app that contained the largest quantity of text.

3.6 SUMMARY

This research sought to increase understanding of the experiences of community dwelling women in exercising their pelvic floor muscles and the role of technology and, as such, included elements of prevention, cost-effectiveness and self-help. It

was important that appropriate methods were used in order to effectively gather data which could be useful in increasing understanding. The research undertaken for this thesis comprises three main methods: focus groups, an explanatory, pragmatic randomised controlled trial, and unstructured interviews by telephone.

For the trial, the sample size and multifarious influencing factors, which were not possible to measure, mean that it is not possible to meaningfully compare data from the intervention group and the control group using statistical analysis (Munn & Drever, 1990). Therefore, in analysing the data, the focus is on describing the data in order to increase understanding about the experiences of women in adhering to PFME (Munn and Drever, 1990).

Trial data is triangulated with qualitative data from the focus groups and telephone interviews and with the literature. This has resulted in a contribution of new knowledge to the literature around adherence to PFME.

CHAPTER 4: EXERCISE FACTORS

Chapter 4 is the first of three chapters which presents results and discusses findings building on the earlier literature review of chapter 2 from research undertaken in the North East of Scotland exploring aspects of PFME. The aim of Chapter 4 is to identify aspects about PFME which influence adherence and it reports on adherence to exercises reported by participants in the trial and aspects of the exercises that influenced their adherence. The evidence provided helps to fill gaps in understanding about PFME and how women can be supported to improve adherence.

Data about adherence to PFME by participants in the explanatory trial is presented in section 4.1. This includes reasons given by participants for their poor levels of adherence. Knowledge of and ability to exercise are investigated in section 4.2 and section 4.3 discusses the methods used by participants to record exercise and self-monitor exercise. The chapter goes on to discuss aspects of self-regulation such as routine and habit formation and where competition and affect management can play a supportive role (section 4.4). The role of apps is highlighted throughout the chapter.

4.1 WHAT WAS THE ADHERENCE OF PARTICIPANTS IN TRIAL TO PFME?

Although PFME are recommended as the first line of treatment for UI and there is consensus regarding their efficacy in alleviating and preventing symptoms, “*the treatment is often unsuccessful because of patient noncompliance*” (Gallo and Statskin, 1997, p.167). Knight *et al* (1998, p.61) suggest that exercises must be “*diligently performed*” to lead to a reduction in incontinence and that a personalised approach should be taken so that the choice of treatment reflects individual patient’s characteristics (Neumann *et al*, 2006).

The need to address issues of adherence has been recommended for future studies of the efficacy of Pelvic Floor Muscle Training (Whitford & Jones, 2011; Williams *et al*, 2006). Assessment of adherence to exercise has also been recommended by Neumann *et al* (2006, p.24) in order to evaluate the effectiveness of programmes of PFME who state that despite the importance of adherence this “*was infrequently and generally poorly reported with no standardised, validated or reliable approach to its assessment*”.

In the literature, studies which have looked at adherence have shown that women commonly forget to exercise and have difficulty finding the time to exercise (Borello-France *et al*, 2010; Alewijnse *et al*, 2007). Recommendations have therefore been made for the development of techniques which would help women remember to exercise routinely with the aim of promoting long-term adherence (Borello-France *et al*, 2010; Dolman, 2007, p.68). In addition, Eustice (2007, p.152) suggests that individuals with “*poor self-care skills*” may lack the motivation required for successful “*treatment and management of their incontinence*”. This thesis will build on their findings.

Throughout this thesis, the word adherence refers to the extent to which participants undertook PFME. For the purposes of data collection and to enable participants to record their adherence the question “*On average, how often do you do pelvic floor muscle exercises?*” was asked in three questionnaires. Participants were asked to choose from options between three times a day and never (Appendix XII).

The table in Figure 8 below, provides a summary of adherence by all the participants who completed the twelve week trial (n=23). The second column shows the levels of exercise reported by participants in their answers to the three questionnaires, with ‘1’ representing exercise two or three times per day, ‘2’ representing daily exercise, ‘3’ representing weekly exercise, ‘4’ representing monthly exercise and ‘5’ representing yearly exercise, and ‘6’ representing no exercise at all. The first figure is the reported level of exercise prior to the start of the trial. The second figure is the reported level of exercise at the end of twelve weeks. The third figure in the second column is the

reported level of exercise at the twelve month follow-up (a hyphen represents missing data for those who were lost to follow-up).

Figure 8 Table showing summary of adherence to PFME at end of trial and at follow up

Participant	Exercise level reported on questionnaires 1.2.3	Increased or maintained at least daily exercise by the end of the trial	Increased or maintained weekly, or more frequent, exercise by the end of the trial	Increased or maintained weekly, or more frequent, exercise at follow up
1	2,2,-	Yes	Yes	-
2	5,3,-	No	Yes	-
4	5,5,5	No	No	No
5	6,2,3	Yes	Yes	Yes
6	2,2,1	Yes	Yes	Yes
7	6,2,1	Yes	Yes	Yes
9	6,3,6	No	Yes	No
10	4,2,-	Yes	Yes	-
11	6,5,5	No	No	No
13	6,2,3	Yes	Yes	Yes
14	6,1,6	Yes	Yes	No
15	6,6,6	No	No	No
16	6,3,-	No	Yes	-
17	4,2,-	Yes	Yes	-
18	5,2,4	Yes	Yes	No
19	6,2,1	Yes	Yes	Yes
20	3,3,3	No	Yes	Yes
23	5,2,2	Yes	Yes	Yes
24	3,2,1	Yes	Yes	Yes
25	4,3,3	No	Yes	Yes
26	5,2,3	Yes	Yes	Yes
27	6,1,-	Yes	Yes	-
29	4,2,4	Yes	Yes	No

Of the twenty three participants who completed the trial, fifteen participants exercised at least daily on average by the end of the trial. Of the fifteen who exercised at least daily, five continued average exercise of at least daily at the twelve month follow-up.

Six of the fifteen participants started out by never exercising at the beginning of the trial. Three exercised on average once a year. Two of the fifteen had exercised daily at the beginning of the trial.

Throughout this thesis, data about factors which have influenced adherence will be presented to explain and provide the context for the above figures. In section 4.3, the robustness of the self-reported data and the role of self-monitoring are discussed. The role of smart phone apps in supporting adherence to PFME is considered in section 4.1.2.

4.1.1 REASONS GIVEN FOR PAST POOR ADHERENCE?

Prior to the start of the trial, participants were asked what had made it difficult to exercise (Appendix XII). The following options were available for them to choose from: I forget; I get interrupted; I am too tired; I find it uncomfortable; I have found no benefit; Lack of time due to other commitments; I didn't think I needed to exercise; I do not enjoy the exercise; or Other (Trial participants were asked to specify what they meant by other). Participants could choose more than one option.

The most common reason chosen for what had made exercise difficult was "*I forget*" (n=13). Two participants said they got interrupted; four said they felt too tired to exercise; two said they found it uncomfortable to exercise; one said she had found no benefit from the exercise (belief in the effectiveness of exercise is discussed in section 5.2); five participants said that lack of time due to other commitments was the difficulty; one said she didn't think she needed to exercise (attitudes to PFME are

also discussed in section 5.2); and three said they did not enjoy the exercise (affect is discussed in section 4.4.3).

Of the six 'other' comments which participants specified themselves, one said she never thought about it (this aspect is discussed section 4.2 about knowledge and awareness of PFME); one said she was not convinced that what she was doing was correct (this aspect is discussed in the section 2.2.2.3); two said it was so long ago since they were told how to do the exercises that they were not confident they were doing them correctly (as well as self-efficacy discussed further in 4.2.1, this relates to the duration of time since pregnancy or childbirth when exercises were taught, discussed in section 6.1); another said she had never been shown or clearly explained the benefit of the exercise (the teaching of exercise is discussed in section 4.2.3); and one simply stated she found the exercises difficult.

In the study by Borello-France *et al* (2010), difficulty remembering to exercise and difficulty in finding time to exercise were the two more persistent barriers to PFME. The other barriers they found included illness, family matters, vacation or travel, too tired to exercise, and life stress. Similar 'other' barriers were reported during the follow-up phase, with the addition of "*I don't like or I don't want to exercise*" (Borello-France *et al*, 2010, p.1498).

Clearly, women find it difficult to exercise their pelvic floor muscles; indeed twenty out of the twenty eight participants who entered the trial stated that they have found it difficult to exercise their pelvic floor muscles. Of the twenty three who finished the trial, fifteen participants found it difficult to exercise.

In this, and the following two chapters of this thesis, data is presented about the practice of women in the North of Scotland exercising their pelvic floor muscles and investigates the promoters of and barriers to adherence they experienced.

4.1.2 THE ROLE OF APPS IN ADHERENCE?

As aspects of the experience of participants which acted to promote or as a barrier to exercise are discussed throughout this thesis, the role of apps are highlighted. This section, gives an overview of the experience of participants with the apps and how this relates to their adherence.

Figure 9 Table showing comments from participants about the apps

PARTICIPANT	SUMMARY
6	got bored & fed up with reminders
9	could not get to grips with it
10	didn't find apps great to use
14	preferred using sheet to app
16	didn't use apps
26	preferred using sheet to app
7	initial use then stopped
18	helping with timing and remembering
19	helping with timing but just used a bit
23	encouraging & helped with focus

The table in Figure 9 above, presents comments from the ten participants in the intervention group who completed the three month trial about their experiences of app use (n=10). It is clear that although four comments about the apps are positive, two of these (Trial participants 7 and 19) suggest only limited use of the apps. The

remaining six comments indicate that the apps were not used or that the experience of using the app was not positive.

Data about adherence to exercise of participants in the trial showing the difference between participants in the intervention group and the control group is presented in the table in Figure 10 below. It is important, however, not to assume that the difference in outcome of each group is caused by use by use of apps as the comments presented in Figure 9 clearly indicate that some participants in the intervention group did not use the app and for others, use was variable.

Of the fifteen participants who achieved or maintained daily exercise at the end of the trial, there was a fairly even split between those who were in the intervention group (n=8) and those who were in the control group (n=7):

The table shown in Figure 10 below presents a lack of consistency of results in relation to the success of participants in both groups to achieve or maintain daily exercise by the end of the trial. Although more participants from the control group did not exercise daily by the end of the trial, this may reflect the fact that higher numbers from the intervention group were lost at this stage. It is important to reiterate that it would not be possible to explain differences between the intervention and the control group based on the intervention itself, as not all participants in the intervention group actually used the apps.

Figure 37 presents the difference in adherence to daily exercise between the control group and the intervention group using SPSS cross-tabulation (Appendix XXIV). Figure 38 illustrates the cross-tabulation results on a bar chart (Appendix XXIV). These figures have been included as an appendix to illustrate how statistical analysis would have been conducted had participants in the intervention group all used the apps.

Figure 10 Table showing adherence results between intervention group and control group participants

Achieved or maintained daily exercise at the end of the trial (n=23):	
Intervention	8
Control	7
Did not achieve or maintain daily exercise at the end of the trial (n=23):	
Intervention	2
Control	6
Maintained daily exercise at follow up (n=17):	
Intervention	4
Control	1
Did not maintain daily exercise at follow up (n=17):	
Intervention	5
Control	9

The data presented in Figures 9 and 10 indicate that although some participants in the intervention group did not use the apps, others found the apps useful in supporting their adherence. From comments made by participants in the focus groups, from trial notes and telephone interviews, it is possible to augment the above data and to develop greater understanding of the experience of app use and how this relates to adherence to PFME.

When focus group participants were asked if they thought that the apps might help them do more exercises, the Inverness mothers held mixed views. One mother said that she regularly does the exercises and, although she liked the apps and thought they would be useful, she was confident she would continue to exercise with or without them.

Another mother suggested that apps may have a motivating effect in terms of promoting interest and raising awareness but that this had a short term effect and would not impact on adherence:

'I think all the things are good but then, but, well, what I do is, I'll have a quick look but then I don't remember to look at it again (Participant from Hilton focus group with mothers of young children HM1).'

Alternatively, another mother spoke about how the app would specifically help her to exercise by providing something visible that could be used to discourage interruptions from others. She thought this would support adherence:

'I think the good thing is that you've got hold of this and its making noise and doing something. You can also say to people, look I'm doing this just give me a minute. Whereas if you're sort of doing it in your head, people talk to you and you forget and it's like how many did you do and you know (Participant from Nairn focus group with mothers of young children NM1).'

One of the Nairn mothers said she would choose an app which “*told her what to do*” because otherwise she would “*probably forget*”. Others saw the benefit of being able to choose the duration and type of exercises to fit with current levels of fitness and muscle strength. In addition, one woman agreed “*that's quite good because you could choose depending on how much time you had*”. All these aspects of the apps were suggested by focus group participants to have a positive influence on adherence to PFME. In the following paragraphs the focus is on the explanatory trial results about adherence, comparing the control group with the intervention group.

These varied comments from focus group participants reflect the varied experiences of app use by trial participants:

'It was fun but soon got bored with the apps (Trial participant 6 TP6.1).'

'In the end I stopped using the app and just did the exercises myself (Trial participant 7 TP7.1).'

'I'm afraid none of the apps were interesting or motivating enough to use them more than 3 times (Trial participant 26 TP26.2).'

'The app really helped ... I'm not doing the same quantities (after the trial) because I haven't been able to find an app (Trial participant 18 TP18.1).'

There is a clear distinction between adherence to PFME and adherence to, or use of apps. The role of the apps in supporting adherence to exercise is varied. Some women clearly link app use with adherence to exercise and identify aspects of the app which support exercise. Others do not recognise any benefit of the apps in supporting their exercise adherence. For others, the apps seem to have supported exercise initially and in the development of habitual exercise (section 4.4).

This point is reiterated by Ritterband *et al* (2009, p.24) who warn that interpreting data is not straight forward; *"it is much more difficult to make sense of usage data, as someone who appears to be a "dropout" or non-adherent user may actually be someone who obtained "success" with a low treatment dose"*.

The role of apps for some may be in motivating exercise (section 5.3.5). The success of the app is therefore not measured in the longer term use of the app but in adherence to the behaviour the app was intended to support. As Ritterband *et al*

suggest (2009), it is useful to ensure awareness of this aspect of success when interpreting data.

Figure 11 Table showing further detail of participants and the usefulness of apps

Of the participants in the intervention group, those who found the apps useful	4 (out of 10)
Of those who found the apps useful, those who increased the frequency of their exercise	4 (out of 4)
Of those who found the apps useful, those who had UI symptoms which improved	2 (out of 2)
Of the participants in the intervention group, those who didn't find the apps useful	6 (out of 10)
Of those who didn't find the apps useful, those who maintained regular exercise or increased the frequency of their exercise	5 (out of 6)
Of those who didn't find the apps useful, those who had UI symptoms which improved	4 (out of 5)
Of the intervention group who got an iPod, those who found the apps useful	3 (out of 7)
Of the intervention group who just got apps, those who found the apps useful	1 (out of 3)

Although the same apps were provided to all participants, there is likely to be a difference in the experience of participants who used their own familiar technology and those who were provided with the iPod Touch. Data showing differences between those who were provided with an iPod and those who used their own equipment is presented in Figure 11 above.

Four participants used their own iPhone throughout the trial while the remaining ten were provided with an iPod Touch. For participants who were used to carrying their phones around with them throughout the day and who were familiar with the technology, there may have been fewer barriers to app use. Whereas, participants who had never used touch screens, smart phones or apps, the process of familiarisation with the technology was a barrier:

'Did not understand how to work it properly. Not used to such modern technology (Trial participant 9 TP9.1).'

'It might have to do with I'm not so familiar with smart phones and, well I found a bit in each of them that was helpful but not so much as to say this is really fantastic (Trial participant 28 TP28.1).'

In addition the barrier of unfamiliarity, there was an inconvenience factor. As the iPods were an additional device for participants, some may have found it difficult to keep it close at hand throughout the twelve week trial. Indeed, this was the experience of Participant 10.

'I think I would have had better results if the app had been on my phone, as I carry it around all the time. I didn't find either of the apps great to use (Trial participant 10 TP10.1).'

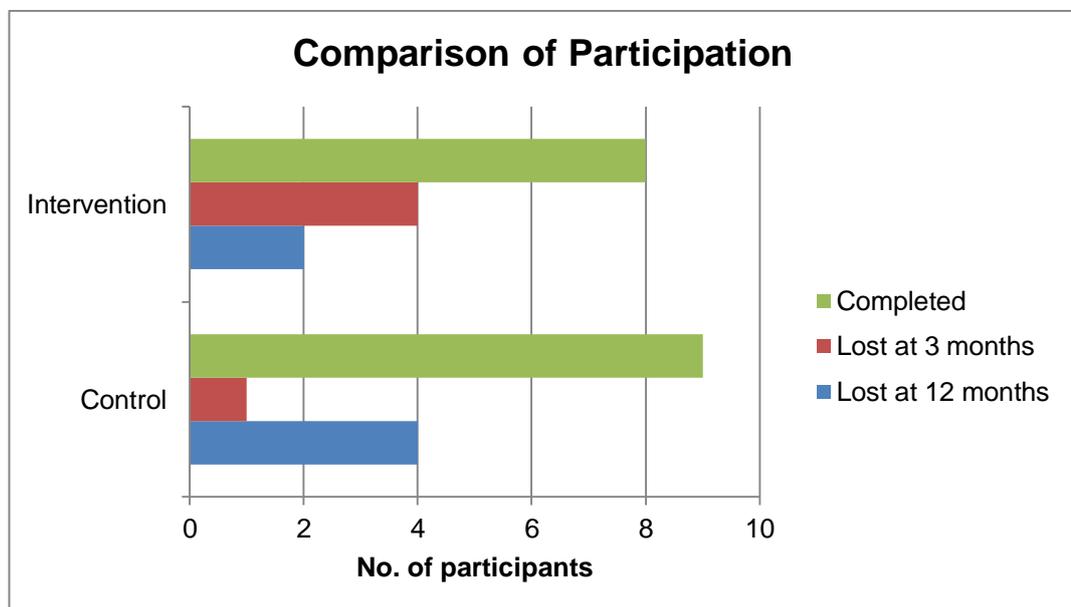
'I couldn't find the app for my own phone which I carry with me most of the time and often forgot when I didn't have the iPod with me (Trial participant 18 TP18.2).'

Familiarity with the technology, and the nature of its use, has influenced the way participants interacted with the apps for PFME. This would suggest that as smart phone usage proliferates (Boulos *et al*, 2011), women will be more likely to use apps for PFME. In the next section, the possibility that the technology acted as an incentive to participate in the trial is examined.

4.1.2.1 APP USE & PARTICIPATION IN TRIAL

In this section, information about the participation in the trial at the start, at the end of the trial (3 months) and at the 12 month follow up is presented. Trial information is presented in the format of a Consort diagram in Appendix XXIII.

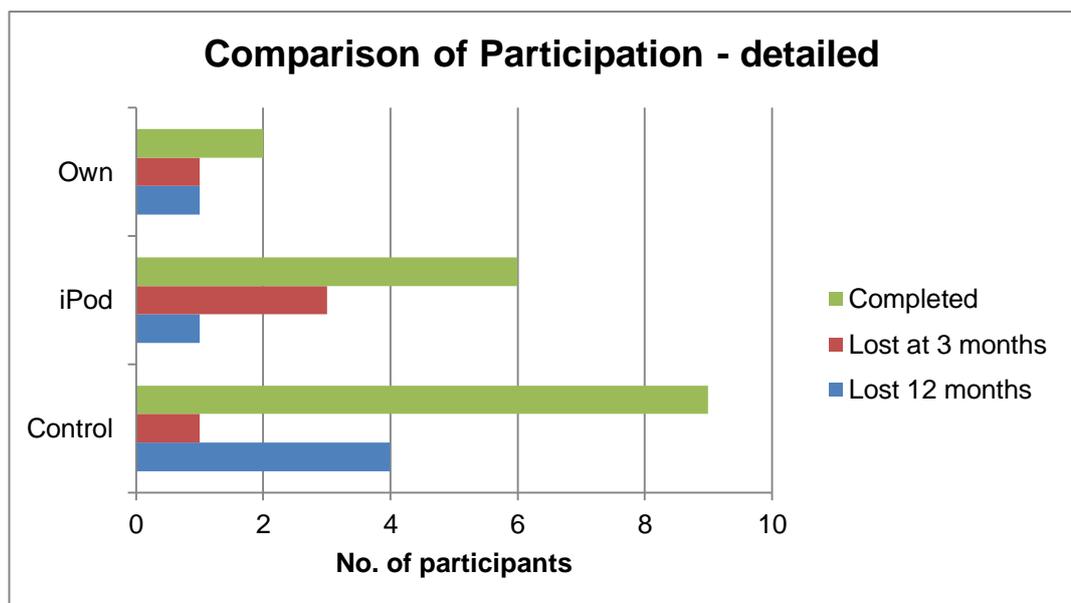
Figure 12 showing a comparison of participation in the trial between control group and intervention group



Twenty eight women were recruited to the trial. Five were lost by the end of the trial and a further six were lost at the follow up a year later. Figure 12 above, illustrates the comparison of participation by group. Figure 13 below illustrates a more detailed

comparison which includes a breakdown of the intervention group into those who had an iPod and those who used their own equipment.

Figure 13 showing a comparison of participation in the trial between control group and intervention group with device used



Out of the twenty eight participants recruited to the trial, fourteen were allocated to the intervention group and fourteen to the control group. Of those who were allocated to the intervention group, ten were provided with an iPod touch and four used their own equipment.

At 3 months, ten participants from the intervention group completed the end of trial questionnaire as well as thirteen from the control group. Nine participants from the control group and eight from the intervention group completed the follow-up questionnaire after 12 months (n=17).

Of the four participants who were lost to the trial from the intervention group, three were in possession of an iPod touch and one used her own phone. At the end of the

trial the iPods were all safely returned but despite this, three of the women did not complete the post-trial questionnaire.

The data suggests that simply being provided with apps or equipment to use the apps cannot be linked to improved levels of participation in the study; the apps did not act as an incentive to continue in the study during the trial period. This suggests that the provision of technology is insufficient in itself to engage with individuals in health behaviour change and, far less to be relied on in isolation to support behaviour change. This has important implications for future service provision.

This section has shown that some participants made little or no use of the apps, the next section examines what they found difficult in using the technology.

4.1.2.2 DIFFICULTIES IN USING THE TECHNOLOGY

In this section, data is presented on attitudes about the usefulness of the apps in relation to adherence to exercise and the difficulties experienced by trial participants in the intervention group are discussed.

In the following paragraphs, it is possible to develop a more detailed picture of the experience of participants in the intervention group of the trial (those who were provided with apps). From previous sections in this chapter, it is clear that not all participants who had apps used them and that app usage varied throughout the trial period.

Some trial participants and those in the older women's focus group simply did not feel comfortable with the technology and instead of finding it helpful, they found it a hindrance to exercise:

'Well, I have a smart phone but I wouldn't sit with this (Participant from Nairn focus group with older women NO1).'

'I am not an iPod person so unsure of using it. Feel at moment it is a hindrance to doing exercises. Very restrictive. Far easier to remember the exercises from the sheet than mess about with an app (Trial participant 14 TP14.1).'

Touch screens were identified by many of the focus group participants who were unfamiliar with smart phones as being difficult to use. They were unsure which buttons to press and how to navigate through the apps. Some were confused by the appearance of the keyboard on screen and found the keys too small to type on:

'Are you just supposed to click on it (Participant from Nairn focus group with mothers of young children NM2)?'

'How do you move along from one page (Participant from Nairn focus group with mothers of young children NM3)?'

'Why has it all disappeared, what did I do (Participant from Nairn focus group with mothers of young children NM4)?'

Where apps had a section of audio or video, some women in the focus group found this difficult to stop. The comment below was made with some amusement:

'How do you turn it off (Participant from Nairn focus group with older women NO2)!'

In connection with specific apps and how useful they may be, as opposed to the notion of apps in general, participants commented on simplicity and the time the app took to navigate to the actual exercise stage. Although participants appreciated access to information, especially when the app was used for the first time, they wanted information about exercises as an option they could select rather having to

opt out of. In addition to this, some participants never got to the stage of actually choosing the settings they wanted as it seemed too complicated or time consuming:

'I like the second one where you can just get straight into it, you know you can just click on and the lights are there. But you'd probably need somewhere in there that you could read it all if you wanted to. Whereas in this one it's the first thing you come to and you feel you have to read it all before you start (Participant from Nairn focus group with mothers of young children NM5).'

One participant (14) went as far as saying that the apps (in respect of trying to choose one and set it up) were a hindrance to exercising. This would suggest that simplicity and ease of use should be a priority for all PFME app features. In considering the development of apps for PFME, it would be important to avoid the temptation to include features which are considered innovative and which fit with theoretical approaches about what helps to change health behaviour unless they can be incorporated in a simple and easy to use manner. Otherwise, their value may never be materialised. This is also true of health information; the benefit of quality health information will not be enjoyed if the information is difficult to access in the app or if it is in an app which is not easy to use.

Although the apps used in this study were provided free to the participants, some offered in-app purchases or included adverts for products, such as incontinence pads. These were described by some of the focus group participants as annoying or distracting. When the topic was discussed further, focus group participants agreed that, if placed discreetly within the app, an advert could be acceptable, especially if the app was very cheap or free. However, they specified that adverts 'popping up' throughout the app would not be acceptable and would distract from the exercises:

'I wouldn't want an advert (Participant from Nairn focus group with older women NO3).'

'That would really annoy me, definitely (Participant from Hilton focus group with mothers of young children HM2).'

In considering the financing of the development of apps for PFME, if advertising of products or services were to be incorporated into an app, these views and attitudes should be considered. The consequence of including an irritating or distracting advert in an app could mean it is never used and would therefore be ineffective.

The data presented above, identifies difficulties in the use of the technology encountered by participants in this study. For some, the difficulties arose out of lack of familiarity with the technology in general. As suggested in section 4.1.1, these difficulties may be less common as the technology becomes more ubiquitous in use. For others, the layout of the apps or the inclusion of adverts were problematic and discouraged use. The practice of co-production and co-design would be useful in removing some of the difficulties in app use caused by the design elements of the apps.

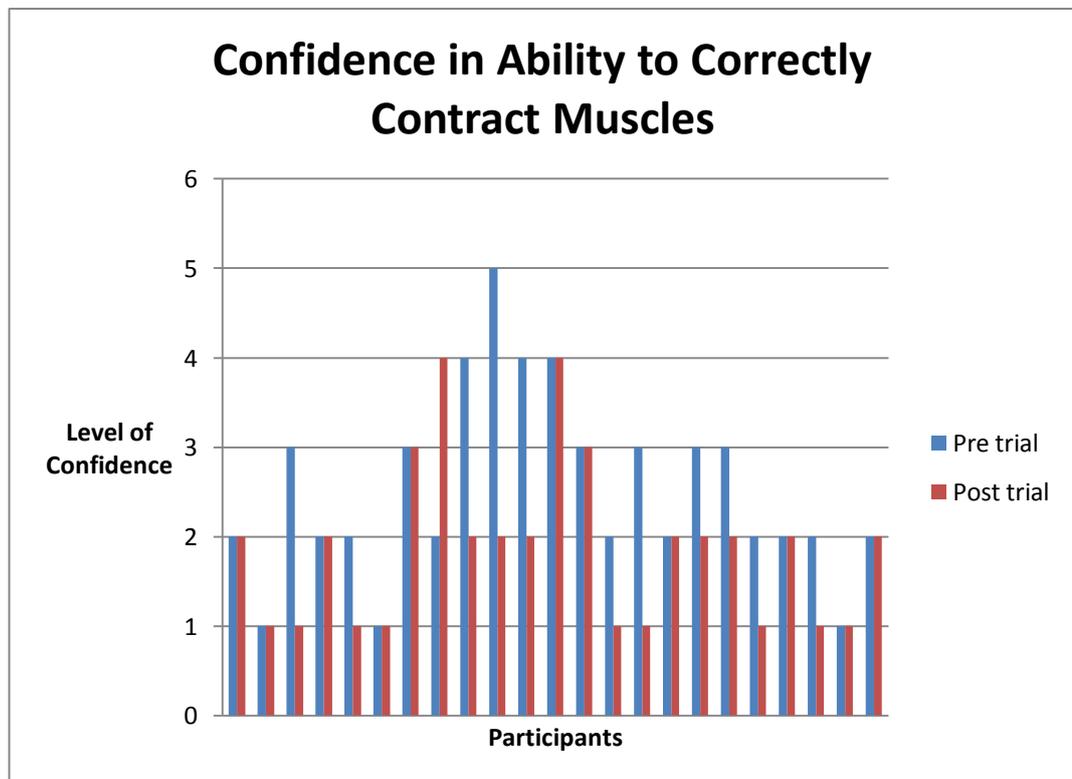
4.2 HOW DOES KNOWLEDGE AND ABILITY TO EXERCISE INFLUENCE ADHERENCE?

The main barrier to exercise is if women are unaware of PFME as a treatment option for UI and of the benefit of lifelong exercise as a prevention measure (Melville *et al*, 2006). Once women are aware of the exercises, the ability to correctly identify and contract muscles is very important and there is evidence that many women do not exercise correctly (Dolman, 2007; Burgio, 2004). Furthermore, there is some debate about the optimal exercise regimen (Hay-Smith *et al*, 2008). This section will examine these issues and will report findings from the experiences of women in the North of Scotland.

4.2.1 SELF-EFFICACY AND ADHERENCE TO PFME?

In this section of the thesis, the term 'self-efficacy' is used to describe confidence in the ability to correctly identify and contract pelvic floor muscles, as described in section 2.2.2.3. The influence of self-efficacy on adherence is discussed and data from the trial and telephone interviews are presented. The section will end by presenting some of the difficulties experienced by participants in exercising their pelvic floor muscles.

Figure 14 showing the level of confidence of participants in their ability to contract their pelvic floor muscles correctly pre- and post-trial



During the trial, eleven participants (n=11/23) became more confident in their ability to correctly identify muscles and eleven women maintained the level of confidence. Eight of the women (n=8/23) who maintained their level of confidence either agreed or strongly agreed that they could correctly identify muscles. One woman (n=1/23) became less confident in her ability to correctly identify her pelvic floor muscles

during the trial. This is illustrated in Figure 14 where '1' represents 'strongly agree' and '5' represents 'strongly disagree'.

Four participants were not confident in their ability to correctly identify and contract their pelvic floor muscles prior to starting the trial. Three out of these four participants grew in confidence by the end of the trial and one did not (Trial participant 15).

Of the four participants who were not confident at the start of the trial, two increased their level of exercise to daily exercise by the end of the trial. Neither of these participants maintained this level of exercise in the longer term; one returned to never exercising and one exercised weekly. In the telephone interview, one participant talked about a lack of confidence in her ability to identify and contract the muscles correctly (Trial participant 9):

'I don't always feel I have the right muscles (Trial participant 9 TP9.2).'

Interestingly, participant 15 who was not confident at the start and who did not increase in confidence throughout the trial did not exercise throughout the trial.

Therefore, of the four participants who lacked confidence in their ability to correctly identify and contract their muscles at the start of the trial, none managed to change their behaviour to daily exercise in the longer term and the others failed to complete the trial.

This suggests that the negative perception or lack of confidence in women in relation to their ability to correctly exercise may be a predictor of lack of adherence. This is consistent with the research findings of Alewijnse *et al* (2001) and the view of Dolman (2007).

The challenge, therefore, is to promote the confidence of women in their ability to correctly identify their pelvic floor muscles in order to support adherence to exercise. If, as discussed in sections 2.2.2.3 and 3.3.2.3, it is neither feasible nor desirable for health professionals to routinely digitally assess pelvic floor muscle contraction (NICE, 2006) for every community dwelling woman, there is a need to find an alternative approached to address the issue of self-efficacy. Smart phone technology may help to meet this challenge.

It is clear that adherence to PFME is increased by women's sense of mastery that they are exercising correctly and hence, efforts should be made to increase confidence in women. In the next section, the difficulties experienced by women in exercising are reviewed.

4.2.2 KNOWLEDGE AND AWARENESS

At this point it is important to recognise that some women have little or no knowledge of PFME and are unaware of the need to exercise or of its benefits. Indeed, in the focus group with mothers of young children in Hilton, one teenage mother seemed totally unaware of the exercises. It was not clear if this was because she hadn't participated in antenatal classes and had never been taught about the exercise or if the information had been lost amongst everything else she had to take in around her pregnancy and the birth. The dimension of awareness is discussed in more detail in the following two chapters about the characteristics of women and their environment.

The NICE Public Health Guidance 6 about the principles for effective behaviour change notes that the relationships between knowledge, attitude and behaviour can be too complex for simple behaviour change models to capture (2007, p.10). However, in the review of behaviour change models commissioned by NICE to inform this guidance, Taylor *et al* (2006) were clear that changes in health knowledge contribute to behaviour change (p.14). In this section, the data about knowledge of

PFME as a mechanism for change is briefly presented but, as the NICE guidance suggests, because of the complexity of its relationships with other aspects of behaviour change, the topic is referred to throughout the thesis.

Knowledge about PFME, including how and why they should be done, may be acquired in different ways but in this section the focus is on formal teaching of exercise. Dolman (2007) suggests that there is need for education for women which “*must include the reasons for why the exercises need to be done, not only during and after childbirth, but as a life-long activity*” (p.68). The need for education was also identified by Whitford & Jones (2011) on finding that women in her study ‘did not regard PFE as personally relevant due to lack of perceived risk of incontinence’ (p.7). They went on to argue that future compliance with pelvic floor exercises may be promoted by effective instruction to enhance confidence in ability to contract the correct muscles and promotion of measures to help establish a habit of exercising the pelvic floor muscles (Whitford & Jones, 2011). These authors highlight the need for women to know about PFME and how the exercises should be done. Furthermore, Dumoulin *et al* (2011) found that there was a higher rate of improvement in UI symptoms in women who had been taught exercises as part of their treatment than those who were not.

4.2.2.1 INFORMATION ON APPS

The subject of knowledge about PFME and its influence in adherence to PFME was discussed in *Chapter 4.2*. In this section, the role of apps in communicating information about PFME is discussed.

The quality of health information in this context relates to the fit of PFME advice with current guidelines. Participants commented on the quality of health information in PFME apps and, particularly, when considering if they would prescribe apps to patients or recommend apps for use by others.

'I'd like to know where it has information about 'how to locate (participant in focus group with women's health professionals WH1).'

'It's vitally important that they actually know what they're looking for and what they've actually got to do (participant in focus group with women's health professionals WH2).'

'I don't think that fits with present guidelines or physiology (participant in focus group with women's health professionals WH3).'

Participants of focus groups found it confusing when they found an app less than satisfactory in relation to the quality of health information but very good in relation to other features. Their lack of satisfaction related to either when there was too much information or when the content did not fit with what they had been taught by a health professional. Some participants discussed how it might be possible to use the useful features and functions of an app and to disregard the information and advice given; they would fall back on advice they had been given by their local midwife, health visitor, continence nurse or gynaecologist. This approach replicated the trial protocol which provided participants with an information and advice sheet about PFME and clearly asked participants to read these.

However, this approach relies on the influence of the 'approved' information and advice being greater than that provided in an app. There is a risk of confusion and misinformation. However in a real life setting, individuals are exposed to a range of information and influences (Griffiths *et al*, 2012) which are not easy to separate and measure.

Participants valued having quality information on the app but suggested that it should be a menu option. They found that too much information on an app was off putting, especially if it appeared with the exercise directions. Various comments from focus group participants are presented below to illustrate these discussions.

'It's good that all the information is there, its bold, it's just not so much fun (Participant from Nairn focus group with mothers of young children NM6).'

'It's quite long winded that one isn't it (Participant from Nairn focus group with mothers of young children NM7).'

'Yeah, it's not laid out very well ... the information and exercises are shoved in together (Participant from Nairn focus group with mothers of young children NM8).'

'Yeah but even when you get on the exercises it starts telling you stuff you know, there's a whole lot of stuff to read before you start (Participant from Nairn focus group with mothers of young children NM9).'

Participants valued being able to access quality information and advice but this was distracting if it was positioned alongside exercise directions. When a simple menu was used to separate information from the exercise directions, participants could have more control over the level of information they access at different times.

The Nairn mothers discussed the fonts used in the apps and expressed a preference for clear, simple fonts as opposed to the handwriting style used in one of the apps. This reiterated a preference in all the focus groups for simplicity and ease of use over individual features, attractive as they may be.

'It's like straight to the point, it's bold (Participant from Nairn focus group with mothers of young children NM10).'

As the use of technology and the internet is increasingly becoming the norm in the education of young people, it would seem appropriate that programmes to teach PFME utilise internet based technology platforms. As mHealth is harnessed for teaching and promoting health behaviour, expertise will be required on the structure of apps and the layout of information and advice. This study has found that

seemingly innocuous features can act as a barrier to the use of apps and individuals can vary in the features they find helpful. This means that testing of new apps over time with a range of women for use in their daily lives is crucial for understanding what works best and for whom.

In relation to the quality of health information, if this is to be checked before being authorised to be recommended by health professionals there are considerable resource implications. This would involve initial benchmarking of quality and the vetting of apps and also in the on-going supervision of apps as they change with upgrades.

As with aspects of functionality in apps, even if the content of apps is of a high quality and the information has been approved, the app will not be useful in promoting adherence to exercise if it is dull and not fun to use. Clearly, health service systems are not currently geared to measure fun in apps and this may lead to interesting debate about what the role of the health service is in respect of mHealth.

4.2.3 PREVIOUSLY TAUGHT EXERCISE

In this study, twenty out of the twenty eight participants who started the trial had been taught how to do PFME (Figure 15). Four participants who had previously exercised regularly had never been taught how to do the exercises and seven participants had not ever exercised regularly, despite having been taught how to exercise. Five of the women who had never been taught how to exercise stated that they had incontinence symptoms.

Of those who completed the trial, three out of the seven participants who had never been taught PFME either maintained daily exercise or increased their level of exercise to daily in the trial; twelve out of the fifteen participants who had previously been taught PFME managed to maintain or increase to daily exercise (Figure 16). Of

the three participants who did not exercise or barely exercised in the trial, one had previously been taught PFME.

Figure 15 showing the numbers of participants taught or not taught PFME

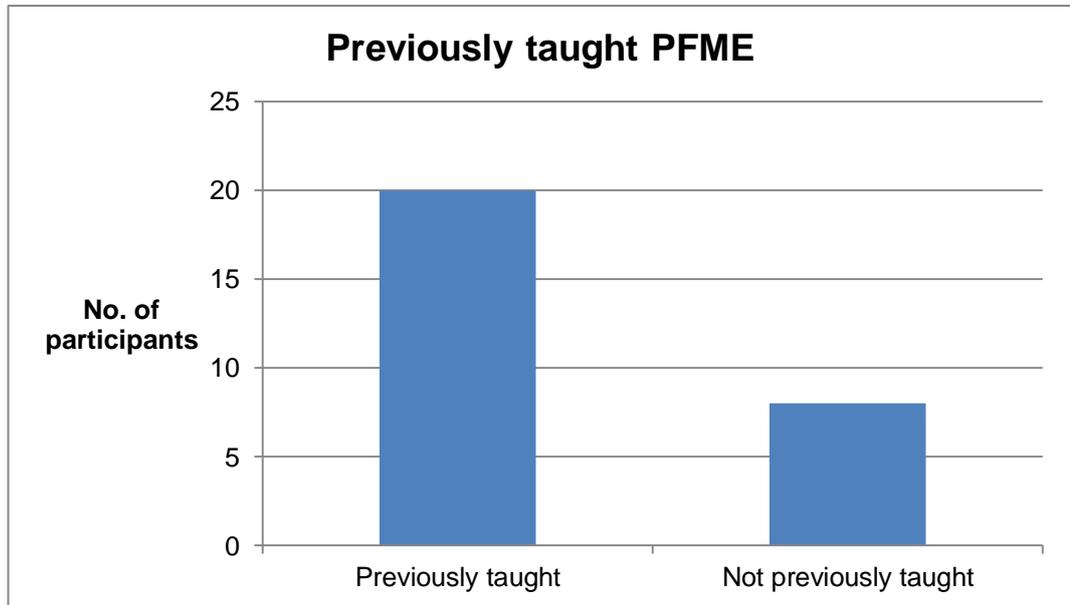


Figure 16 showing experience of being taught PFME with adherence to daily exercise



These findings suggest that the education of PFME is not universal; almost thirty per cent of participants had never been taught. This finding reflects research by Whitford *et al* in 2006 amongst pregnant women in the North-East of Scotland. In their study, most women obtained information about exercises from books but almost a quarter of the participants had neither been given nor had obtained information during their pregnancy.

The majority of participants in the trial were taught PFME around the time of pregnancy and childbirth. Of the twenty participants who had been taught PFME, fourteen had been taught by a health visitor or a midwife. Of the others, four participants had been taught by a physiotherapist, one was taught by an incontinence nurse, and one participant had been taught in a gym class. Interestingly, the participant who had been taught how to exercise by an incontinence nurse had no UI symptoms in the month before the start of the trial.

Participants in the focus groups identified that being taught and reminded to exercise by health professionals around the time of child birth had a positive impact on their adherence to exercise. However, they felt that this positive effect diminished over time. The aspect of the duration of time since childbirth is discussed in more detail in section 6.1.

In addition to the experiences of women in both focus groups and in the trial, the wider PFME literature also suggests that education about the exercises is mainly provided around the time of child birth (Fine *et al*, 2007). As well as those who 'fall through the net' at this point, there is a gap in education of women who are not and have never been pregnant.

Education of young women might help to provide more comprehensive knowledge about PFME over time in the female population. Where this would be useful in raising the level of awareness of the exercises and its benefits, this strategy in isolation is insufficient to increase levels of adherence to exercise over time for all

women as the positive influence on adherence is likely to diminish as the duration since being taught exercises increases. However, the strategy when combined with other efforts to prompt and encourage exercise is likely to result in improved adherence.

However, where it is possible to identify a positive influence of the teaching of PFME, it is important not to assume that just because women know about the exercises that they will actually adhere to the exercises. Even in the study by Fine *et al* (2007) where 68% of women who were taught to exercise during pregnancy continued to exercise after the birth and 63% of those were still exercising six months later, there remained 32% who were not exercising after birth and 37% in the longer term. This illustrates the principles for effective behaviour change in NICE's guidance where there are complex links between knowledge and other aspects of behaviour change.

There is potential for smart phone technology to be used teaching PFME as was shown by the experience of Participant 18 who described the audio instructions of the app she used in the trial as useful in helping her with "*which muscles to focus on*". Having information about the exercises and instructions on how they should be done on a smart phone app can allow women to access the information in a discreet way, when and where they want it. The aspect of information on apps was discussed in section 4.2.2.1 and the discreet nature of apps in overcoming embarrassment is discussed in section 5.2.3. A discussion about who should teach PFME and where this should take place is included in section 6.6 which examines the role of the health and social environment.

This study has shown that women who have been taught PFME are more likely to adhere to daily exercise during the trial. However, three participants who had previously been taught PFME (n=15) did not achieve daily exercise and three participants who had never been taught (n=8) did achieve daily exercise. This indicates that influences other than having been previously taught about the exercise also exist. In the next section (4.2.4), the influence of the practice of previous PFME is considered.

4.2.4 PREVIOUS EXERCISE

Prior to the start of the trial, participants were asked if they had regularly exercised their pelvic floor muscles in the past (Appendix XII). Sixteen out of the twenty eight participants had previously regularly exercised and the relationship between this and their adherence, including longer term adherence, is discussed in this section.

Out of the twenty three participants who completed the trial, thirteen had previously exercised regularly. Of these twenty three, eighteen participants increased the amount of exercise they undertook in the duration of the trial. However, previous regular exercise was not found to predict an increase in exercise in the trial as the number of those who increased exercise who had previously exercised (n=9) was the same as the number of participants who increased exercise whilst not ever exercising regularly in the past (n=9).

During the telephone interviews some of the participants mentioned their previous exercise. Some participants had specifically exercised their pelvic floor muscles while others only exercised because they had been incorporated into more general exercise classes:

'I was somebody that had always done PFME. And after an operation. And I'd go through phases previously where I forgot about them and maybe pick them up again about a week later (Trial participant 6 TP6.2).'

'I've done yoga and Pilates for 20 odd years and so we do a little bit there, but that was it ... I had, obviously when I had my children 30 odd years ago, been given these exercises and I'd done a few to start with but, it's the same with everything, you get away from it (Trial participant 18 TP18.3).'

Previous lack of adherence to exercise was mentioned when one participant commented on her lack of adherence in the trial:

'When I think back and my kids are 41 and 47, I think I got told off by the midwife after the first one was born for not doing the exercises (Trial participant 9 TP9.3).'

As can be seen in Figure 8 in section 4.1, Participant 9 indicated on the post-trial questionnaire (Appendix XII) that she had increased her level of exercise to weekly during the trial period but this did not continue at the longer term follow up stage (12 months). During the telephone interview, she linked her lack of adherence with her personality:

'I'm basically lazy. I am. I know I am ... I'm just not a disciplined enough person (Trial participant 9 TP9.4).'

The notion that adherence may be linked to personality traits is discussed in section 6.4.

Of the fifteen women who had maintained or increased to daily exercise by the end of the trial, eight had previously exercised and seven had not. Five women who had previously exercised failed to adhere to daily exercise by the end of the trial. Of the five that maintained or increased to daily exercise after a year, four had previously exercised. This data suggests that previous exercise is not likely to be a predictor of adherence to a treatment programme of PFME but that the establishment of habitual exercise in the longer term may be more likely among women who had regularly exercised in the past.

This finding supports the recommendation of Dolman (2007) and Whitford & Jones (2011) that if women are encouraged to exercise at school, before or during pregnancy, this will increase "*the chance of continuation of the exercises in the future*" (p.16).

For the purposes of promoting successful adherence in a time limited programme of PFME, results from this study suggest that adherence can be high in both women who have and have not previously exercised. At the start of the trial, only two participants were exercising daily. By the end of the trial period, thirteen more participants were exercising daily. Nine of these participants had increased from never exercising or very rarely exercising to daily exercise and three of them continued daily exercise a year later.

This is an indication that low cost, community based interventions can be successful in helping women to change behaviour; for some women, the behaviour change can be maintained in the longer term. The development of habitual behaviour in PFME over the longer term appears to be more likely when the exercises had been done in the past.

The next section will discuss exercise regimens (4.2.5) and will include the benefits of being able to individually tailor exercises can help women to engage in exercising as was suggested by Neumann *et al* (2006) as important in promoting the efficacy of exercises.

4.2.5 EXERCISE REGIMENS

In the previous section about knowledge, the influences on participants of having previously been taught how to exercise (4.2.3) and of having previously undertaken exercise (4.2.4) were considered in respect to adherence to PFME. In this section the focus is on the exercise regimen.

There is on-going discussion about the optimal regimen and the best or most sustainable way of teaching PFME but no real consensus has been reached (Hay-Smith *et al*, 2008; Buckley *et al*, 2009). Indeed, in the study by Dumoulin *et al* (2011), there were “*only limited indications as to which type of pelvic floor muscle*

training is the most effective” (p.752). They go as far as saying “PFM training programmes work but the how and for whom is still ill understood” (p.753).

Morin *et al* (2004) state the functions of the pelvic floor musculature can be assessed in different ways: passive force; maximal strength; rate and endurance of contractions. They found that passive force was higher in continent women and pelvic floor laxity was found in women with stress incontinence. This reinforces the notion expressed above that different exercise regimens help to improve different elements of muscle function and it is inappropriate to expect women with pelvic floor laxity to follow the same regimen as women whose muscles are in better condition.

In their paper “*Determining the Optimal Pelvic Floor Muscle Training Regimen for Women with Stress Urinary Incontinence*”, suggestions by Dumoulin *et al* (2011) include that “*the number of repetitions should be gradually increased throughout the exercise programme*” (p.752). Furthermore, they indicate that ultimately the optimal programme would involve matching the regimen to individuals based on assessment of their current muscle strength and condition, similar to the training described by Reilly (2002) for individuals who were unable to follow the set exercise protocol. This would suggest that one set PFME regimen for all women is inappropriate and exercise should be tailored to current muscle fitness. Indeed, this fits with the broader recommendations by Neumann *et al* (2006) that different regimens are required for older women, women with different severity of symptoms, and to fit with other individual characteristics of women.

In the trial, each participant was given an instruction sheet (Appendix XI). This sheet encouraged an assessment of current muscle strength, “*Squeeze and lift your muscles. How long can you hold? How many times can you repeat this?*”, and suggested that this would “*be your starting point for your exercise routine*”. The instruction sheet went on to suggest that the optimal exercise regimen would be ten second contractions broken by ten second rests, repeated ten times in a session, with three sessions each day and that women could build up to this.

From this context, participants in the trial were asked to “*think about how many*” they wanted to do each day and write this in the adherence chart. This allowed participants to set their own targets and exercise at their own pace.

Without professional assessment of muscle function, in this study it was up to participants to self-assess and self-regulate. They were asked to choose their own level of exercise; a mix of fast and slow contractions. This fitted with the literature around individual choice (Taylor *et al*, 2006) and a personalised approach (Neumann *et al*, 2006) and allowed participants to set their level of exercise at, or just above, their current practice or level of ability.

In trial notes, participant 18 commented specifically on her goal setting and both she and participant 13 described the influence this had on their adherence:

‘I did aim to do the exercises regularly and expect to continue doing them for many years which is why I set targets for myself that were realistic to fit in with the time I could allocate to them. I prefer to do little and continue for years than try to do large amounts and give up after a few weeks (Trial participant 18 TP18.4).’

‘I was a bit half-hearted till about 4-5 weeks when it suddenly dawned on me that they were working. I increased number of contractions for a few days then I decided that if I have to do these exercises for the rest of my life and 10 / day worked, then 10 is enough for me (Trial participant 13 TP13.1).’

This data resonates with evidence in the literature that allowing patients to choose their treatment regimen has a positive influence on their adherence to that regimen (Rennie *et al*, 2007, Neumann *et al*, 2006). As well as the self-setting of exercise goals, this study also incorporated self-monitoring (section 4.3) and self-regulation in the fulfilment of these goals (section 4.4).

4.2.5.1 APPS AND EXERCISE REGIMENS

Apps for PFME used in this study allowed participants to choose either from a range of set exercise regimens or to set up their own exercise regimen. There was flexibility in the number and duration of contractions and in the mix of long and quick contractions. Participants had the opportunity to start out at a level of exercise that suited their muscle strength and stamina. This would allow them to feel a sense of achievement, as opposed to a potentially disheartening sense of failure if the level was too difficult for them.

Participant 26 did not master the settings of the apps sufficiently to set the exercises at a level she could manage as described below:

'I mostly struggled with all of them because they immediately gave instructions to hold several seconds during the long squeezes and to do them slowly. That was not possible for me at the beginning. It would have been more useful to start with slower, easier squeezes and then extend slowly (Trial participant 26 TP26.3).'

This would suggest that ease of setting up and using the app is a crucial element if personalisation of health information is to be effective. This resonates with the findings discussed in previous sections which found the usability of apps as the most vital element if it is to be successful in positively influencing adherence to PFME.

As well as features in apps which allow choice in exercise regimen, choice over other features was also possible. The motivation to use an app was dependent on the participants not just finding a helpful element in the app but finding that it 'suited' them in some way. Elements such as the audio used in the app were mentioned by participants:

'I like the app that I'd chosen. It was just like the yoga that I do, so it suited me. I felt very comfortable with it ...The calm voice talked me through the

exercises making them simple and relaxing as well as reminding me of important things and which muscles to focus on. As the app counted each set for me, I carried on and did more than if I am doing the exercises without the app (Trial participant 18 TP18.5).'

This suggests that the process of finding an optimal app for any individual is not simply based on elements of the app which have been shown to support adherence in others. There are less obvious elements which individuals may choose because of reasons which are less easy to predict, such as 'calm voice'.

Again, this reiterates the argument that the reasons an individual may choose an app and enjoy using it may be related to usability and fun or individual preferences on the font or audio voice. The influence of affect management on adherence to PFME is considered in section 4.4.3. Choice over these 'fun' elements would be difficult to predict and thus the notion of predicting which app may suit individuals is problematic. To avoid the necessity of predicting which apps would suit prior to prescribing apps, this process may be easier if individuals could choose from a suite of apps which had been authorised as suitable for use by the NHS.

There are opportunities for mHealth communication about PFME to be provided in an accessible, convenient format and to be personalised to support adherence to exercise. This fits with Neuhauser & Kreps (2010) who found that eHealth information which is tailored to individuals and context is better than traditional health information. They suggest traditional health information is "*static and one-size-fits-all*" but when it is personalised it is more effective in motivating and supporting people to make better decisions (Neuhauser & Kreps, 2010, p21). Not only does the choice in exercise regimen allow women to match exercise goals to their level of muscle strength, but it would also positively influence adherence (Rennie *et al*, 2007).

This section has focused on the exercise regimen for PFME; how important it is for exercises to be set at a level that matches an individual's muscle strength and how

personalisation and choice can have a positive influence on adherence. In the next section the role of the 'self' is examined in relation to self-monitoring of exercise.

4.3 HOW DOES SELF-MONITORING INFLUENCE ADHERENCE ON PFME?

In this section, the aspect of self-monitoring of PFME by participants is examined in relation to its role in supporting adherence to exercise. Two main tools were used in this study for measuring and recording adherence to PFME; a survey question at 0, 3 and 12 months (Appendix XII) and an adherence chart (Appendix XIII).

The first and principle tool used to measure behaviour change was the survey question, "*On average, how often do you do Pelvic Floor Exercise?*" This question was asked before the trial began, three months later at the end of the trial and again approximately twelve months after the trial began. Results from these questionnaires are presented in Figure 8 in and have already been discussed in section 4.1.

The second tool for measuring and recording adherence was the adherence chart. For the duration of the trial, each participant was provided with an adherence chart to mark how many fast contractions and slow contractions they planned to do and how many they actually did. This technique is similar to the diary used by Williams *et al* (2006) "*where the content of the diary indicated the degree of adherence*" (p.1045).

These measurement tools used data which participants provided through recall, self-monitoring and recording. The Whitford study in 2007 (p.305) took the same approach where "*the number of daily contractions, the number of sessions per day and the type of contraction (fast or sustained) were not confirmed*". Below, the reliability of measurement tools which rely on this type of self-reported data is discussed.

The reliability of self-reported data is difficult to determine and results must be considered from this perspective as outlined by Jordon *et al*, (2010, p.23). Schmidt *et al* (2009) agree that exercise adherence is “*usually monitored based on the patient’s own records or reports during consultation, which are not always reliable*” (p.218). Chiarelli & Cockburn (2002) state that “*there are, however, few, if any, alternatives for monitoring the performance of this type of exercise accurately*” (p.324).

It is important, therefore, that results presented here and elsewhere in the thesis are considered in the context of the self-reporting of data and from the perspective that reliability cannot be guaranteed.

Caution must be taken when interpreting the quantitative data from the trial as a result of recall bias. However, as additional qualitative data was obtained through participants’ trial notes and telephone interviews, this allowed data from different methods to be consolidated and analysed which helps to mitigate against the weakness of any one method.

4.3.1 ADHERENCE CHART

Trial participants were provided with an adherence chart (Appendix XIII) to record planned and actual, fast and slow contractions on a daily basis for 12 weeks. They were also provided with blue tack to allow it to be placed on a wall where it would be easily visible and could act as a prompt for exercise, should participants choose so to do.

Seventeen adherence charts (n=17/23) were returned and of these, one was blank and nine were fully completed. The remaining 7 charts were partially completed. Visual observation of the returned charts revealed differences in the way the charts appeared to have been completed. Some charts were ‘pristine’ and looked to have been completed in one sitting with the same pen. Others showed two or three days

being reported in a batch. This indicated that the charts were not being completed on a daily basis and some may even have been completed in one go at the end of the trial. It is not realistic to expect accuracy in memory recall of individual sessions of PFME at the end of a twelve week period, especially if exercises were *ad hoc* and not uniform or routine.

Although data cannot, therefore, be analysed statistically, useful qualitative data was collected on the perceived role of adherence charts in promoting adherence to PFME. This data about how the exercise charts acted as a mechanism of change is presented and discussed in the following paragraphs.

Some participants in the trial stated that the adherence chart provided a visual cue which helped them to adhere to exercise. Participant 27 put the chart on her bathroom wall and Participant 2 kept moving it to the most current page in her diary. Even after the trial when the chart had been returned, Participant 24 said that she visualised it and imagined herself writing in the number of exercises she completed. The paperwork provided to trial participants, and specifically the adherence chart, was mentioned by six participants as having a positive influence on their adherence.

Three participants identified the adherence chart as a key component of their behaviour change:

'What helped, and so far has continued to keep me exercising, was having the form to truthfully fill in. It became a habit that, even now I don't have the form, I can visualise the number of exercises I want to do and imaging writing them in ... Exercises are now part of my routine, 1st thing in morning – after a pee I go back to bed for 5 minutes and do these (and lower back curls) exercises every day (Trial participant 24 TP24.1).'

'Thank you very much for letting me participate in this study. Although the apps didn't really help me a lot, the protocol & writing down what I had done on every given day enabled me to remember and get into a routine. I will continue (Trial participant 26 TP26.1)!

'Chart on bathroom wall helped me to develop habit (Trial participant 27 TP27.1).'

It is clear from the statements of participants that the adherence chart acted as a prompt or reminder for exercise. Some of the participants recognised that the discipline of writing down the number of exercises as a factor in influencing their adherence. Participants used the adherence chart and the other written materials provided for the trial to remind them to exercise:

'Just trying to remember by moving sheets to new pages in my diary (Trial participant 2 TP2.1).'

'Having the questionnaire in my desk as a reminder (Trial participant 4 TP4.1).'

Participant 18 described in detail how monitoring and recording her behaviour had a positive influence as a reminder, a record and an encouragement:

'The record was very, very good. That was very important for me to be able to look back on the record. I do forget things. I have a lot going on and I forget from minute to minute sometimes. You know that was very good, "I've done a lot this week" and you'd feel good about yourself. So the record was quite important (Trial participant 18 TP18.7).'

Participant 24 indicated that the adherence chart was useful in establishing a daily routine of exercise.

'I found it very useful actually. It's good for me having something that I need to tick every day (Trial participant 24 TP24.2).'

It is clear from this data that participants found the adherence chart useful as a mechanism of change. There are two aspects of particular interest which will now be discussed. The first is the relative usefulness of the paper adherence chart and the iPod Touch. The second aspect of interest is around the difference between adherence to completing the adherence chart and adherence to the PFME.

Some of the participants in the intervention group indicated that they barely took the iPod they were provided with out of the box and others only looked at the apps briefly in the first few days of the trial. Of these participants, some specifically commented on the usefulness of the paper chart they were provided with to record their adherence.

The iPod Touch used in the trial cost approximately £100 each whereas the paper chart cost in the region of 10p. This would suggest that, in some situations, a simple, cheap solution can be more effective than one which involves expensive technology. Furthermore, it indicates that the provision of attractive, desirable technology should not be assumed to have an incentivising effect on the health behaviour or adherence of all individuals, as suggested in section 4.1.2.

The finding may reflect the priorities and lifestyles of the community dwelling women in the North of Scotland which may not be replicated elsewhere. It may reflect that they are less likely to routinely use iPods or smart phone technology. In future or with different geographical or age cohorts, the devices may have been more desirable.

As well as the unexpected lack of influence that the provision of the technology had on the behaviour change of some of the participants in the intervention group, there was an unexpected distinction between the adherence to the study protocol, i.e. completion of adherence chart, and adherence to the exercise protocol. This reflects findings about app use (section 4.1.2) and is discussed in the following paragraphs.

As outlined previously, it is evident that some participants found the adherence chart useful, others did not seem to use it at all; some were not returned and others only partially completed. There is a difference between adherence of participants to filling out their adherence chart and their adherence to the exercises the chart was designed to record. Although adherence to completing the exercise chart was low and inconsistent, some participants who did not fully complete or return their charts did change behaviour, according to their questionnaire responses. This suggests that the lack of adherence of participants to the recording mechanism they were provided with did not equate to lack of adherence to the exercises they were designed to measure.

The lack of consistency between results from the two measures of adherence used in this study has implications for the interpretation of other studies where a similar, single method was used by women to record their contractions. As far as this study is concerned, the lack of consistency between these measures is of interest inasmuch as it contributes to knowledge about research methods (and methods of attempting to promote adherence by healthcare professionals).

In this study, the main interest lay in how women might be motivated to exercise and to sustain habitual exercise; it was not in finding tools to accurately record the number of contractions. Testing of different methods of recording adherence would be useful in informing the design of future studies about adherence to PFME.

4.3.2 APPS AND SELF-MONITORING

PFME apps provided a visual focus and an interactive component which allowed participants to monitor the exercises as they did them. In addition, some apps kept a history of exercise activity which helped participants remember if they had exercised and how much. These two elements of apps are discussed below.

Participant 23 simply suggested that using the app kept her focussed and specifically mentioned the timing of muscle contractions:

'They also made me think about the timing (Trial participant 23 TP23.1).'

Others, such as Participant 28 agreed that the visual images on the app could be useful in helping women exercise but she found them too small to be useful for her own exercise:

'There were visual images, I know, but they were too small for me I think (Trial participant 28 TP28.2).'

Participant 18 explained in more detail how she found the app helped her to focus on exercising:

'As the app counted each set for me, I carried on and did more than if I am doing the exercises without the app ... I just forget what I'm doing half the time, so with the app counting it, and even when I got distracted, I could go back and count it and remember what I was doing (Trial participant 18 TP18.8).'

In this way, the apps helped participants to focus on the exercises and to be aware of the length of contractions and the number of repetitions they were doing. The app helped participant 18 to return to the exercises when she was distracted.

To avoid distractions, focus group participants suggested that the apps would be a useful visual indicator to discourage other people from interrupting their exercise, as illustrated by the comments from a Nairn mother (NM1 p.97).

As well as being useful in helping women to keep track of exercising in real time, the apps can be useful in keeping track of exercising over time. When interviewed, Participant 18 described her experience of this:

'I'll start doing something and something happens and I get distracted and forget what I was doing and I do it all the time, and so the app reminded me what I was doing and what I was on and if I'd even done it that day. I'd think "did I do them today or not" and I'd just go and have a look at the list of how many you did and what you've done, and which one you'd done, fast or slow or whatever, yes, it just reminded me and just someone telling me to do things, I find that really beneficial ... and reminding you what you're doing (Trial participant 18 TP18.6).'

Thus, apps were found to positively influence adherence in acting as a visual focus that helped concentration and avoided distraction. In addition, the record of exercises in the apps history helped to remind participants of how many repetitions they had done and if, in fact, they had exercised that day.

In section 4.3, the role of individuals in monitoring their exercise and the positive influence this can have on adherence was discussed. In the next section 4.4, self-regulation for PFME is examined and at the end of the section the role of apps is considered.

4.4 HOW DOES SELF-REGULATION INFLUENCE ADHERENCE TO PFME?

If, as Knight *et al* (1998) suggest, exercises must be "*diligently performed*" (p.61) this requires self-regulation on the part of the women exercising (Bandura, 1991). Different aspects of self-regulation are considered in this section with the main focus on the development of routine behaviour and habit formation. The section ends by considering aspects of self-regulation in relation to competition (4.4.2) and affect management (4.4.3).

4.4.1 ROUTINE AND SITUATIONAL CUES

Previous research has concluded that habitually exercising pelvic floor muscles throughout the life course should be encouraged in order to prevent incontinence in women and that this is best achieved when exercise is incorporated into routine, daily activities (Whitford *et al*, 2007; Whitford & Jones, 2011; Dolman, 2007; Borello-France *et al*, 2010; Hines *et al*, 2007). Aarts *et al* (1997) argued that, “*it is important to promote and (re)establish exercise habits early in life so that they may persist into adult years*” (p.364). In the study by Hines *et al* (2007), the PFME interventions focussed on the teaching of techniques to establish a routine of exercise. It is clear that routine and habit formation are positive influences in PFME.

In the advice note for PFME provided to participants of the trial, “*Personal Training for your Pelvic Floor Muscles*”, the notion of routine was reinforced (Chartered Society of Physiotherapists, 2010). However, participants were not explicitly asked to exercise on a routine basis.

Participants were asked to make notes about what helped them and what hindered them throughout the trial and in these a number of participants referred to their development of PFME as a habit and how they built the exercises into their routine. Data gathered from these notes, from telephone interviews and from focus groups is presented below.

In her notes from the trial, Participant 26 described how she aimed to develop a routine:

‘My aim is to establish certain connections not to forget, i.e. remember to either do the exercises at a certain time in a given day or in certain situation which are suitable (Trial participant 26).’

Participant 5 reported that she found that the exercises had become part of her daily routine after she had started to set aside time for them each day. Similarly, Participant 7 was delighted to find that a few weeks into the trial she had got into the habit of exercising:

'But by that time I had got the habit of doing exercises on my own everyday ☺ [smiley face] (Trial participant 7 TP7.2).'

This sense of gratitude at being helped to develop the habit of exercise was shared by Participant 27:

'Thank you so much for helping me to learn to include the exercises in my daily routine (Trial participant 27 TP27.2)!

The positive feedback from participants indicates that the support they received in developing a routine of PFME was useful. In sections 4.4.1.1 to 4.4.1.3, the factors which contributed to the development of habitual exercise and the barriers to the establishment of routine exercise are examined in more detail.

4.4.1.1 FORGETTING TO EXERCISE AND LACK OF ROUTINE

Forgetting to exercise was frequently and repeatedly identified by participants from both the focus groups and the trial as a barrier to exercise. In *section 6.1*, forgetting to exercise as a result of the duration of time since exercises were encouraged during pregnancy is discussed in more detail. Here, the focus is on shorter term forgetfulness.

Participants described different aspects of their forgetfulness. For some, they forgot about the exercises completely over days where for others this involved forgetting how many contractions were done on a particular day:

'I was terrible at it. I knew how to do it and everything, but remembering to do it. I was just a nightmare (Trial participant 1 TP1.1).'

'I didn't even remember if I'd done it, some days (Trial participant 18).'

'And then something would happen and I'd forget (Trial participant 20 TP20.1).'

Participant 9 suggested that a timer would be useful in reminding her to exercise. Ironically, this facility was available on some of the apps installed in the iPod Touch provided to her as part of the trial but she did not use the iPod Touch at all:

'Sometimes I think having a timer: 'Do It Now! I think that's what I need, a timer that says 'Now!' But I do need a push or a reminder... This is really what I would need, a recorded message that said "You've got to do your exercises in the next half hour", something like that (Trial participant 9 TP9.5).'

Participant 4 also suggested that she would have benefited from a trigger for her exercise which would have helped her develop the habit. Participant 4 was in the control group and therefore did not have the benefit of the reminders in the PFME apps.

Seventeen of the women who started the trial said at the beginning that forgetting was a factor which made it difficult for them to exercise. When asked what had helped them to exercise at the end of the trial, the adherence chart was identified by many participants as being very useful in helping to remind them and, specifically, Participant 24 described the adherence chart as a physical reminder:

'If I hadn't done the exercises in the morning and then I saw the form sitting there on the bedside table, I'd think, "Oh, I must do those, I must ..." so it was really quite helpful, having a physical reminder (Trial participant 24 TP24.3).'

As a mechanism of change, the adherence chart is discussed in greater detail in section 4.3.1.

As far back as 1993, Burns *et al* incorporated reminder telephone calls and cards into their study to enhance the adherence of participants. However, few PFME studies have included reminders to participants to exercise since then. Of the 141 studies reviewed in the systematic review by Imamura *et al* (2010), only three were found to have prompts or reminders (Burns *et al*, 1993; Gallo & Staskin, 1997, Sugaya, 2003). Where Burns *et al* (1993) used cards and phone calls, Gallo & Staskin (1997) provided an audio tape, and Sugaya *et al* (2003) used a hand held device which had a cartoon character or avatar to remind participants to exercise.

Given the widespread consensus that forgetfulness is a barrier commonly faced by women in adhering to PFME and in developing a habit of exercise (Alewijanse *et al*, 2007; Fine *et al*, 2007; and Borello-France *et al*, 2010), it is surprising that there is so little research around prompts and reminders. As the proliferation of apps for PFME increases and their usefulness in providing prompts and reminders, hopefully this gap in the research will be filled. This thesis has taken the first, exploratory steps to this end.

Some participants identified circumstances where their daily routine was changed or disrupted and this had a negative influence on their behaviour change. Travel, holidays, days off and weekends were all identified as having a negative influence on adherence:

'The times where I might have lost it, where I went on holiday (Trial participant 6 TP6.3).'

'And then I went on holiday and that really put me off – although I took my forms with me and I took my knitting with me but it wasn't conducive in India (Trial participant 9 TP9.6)!

'And you'll probably see from my forms that I forgot to do it at weekends, frequently... I had a little schedule when I was working, my day had a little more routine, but at weekends I frequently forgo (Trial participant 18 TP18.9).'

Participants also cited disruptions to work or domestic routines, family commitments and ill health as factors which were detrimental to adherence and which made it difficult for them to develop habitual exercise. The role of others, including spouses and family, is discussed further in section 6.6.2.

'It didn't take a huge amount out of my day ... it's remembering to do it, that ... wooshing about (Trial participant 20 TP20.2)!

'Interruptions from small children (Trial participant 25 TP25.1).'

'Had to go into hospital in November for a colonoscopy which diagnosed diverticulosis - was in severe pain leading up to this and until changed diet kicked in. Can't remember all the figures, sorry (Trial participant 29 TP29.1).'

This would suggest that women who have a stable daily routine would be more likely to incorporate PFME into that routine than those whose routine is disrupted or who have no stable daily routine. In addition, it helps to explain why behavioural UI interventions can be particularly challenging with women who have chronic health conditions, as was found by (Sells & McDonagh, 1999), where other considerations have a higher priority.

In supporting women with disorderly or disjointed lifestyles to adhere to PFME and to develop habitual exercise the first step would be to support them to develop some consistency in their daily routines. Once a stable routine was developed, PFME

could be incorporated into it and associated with fixed times or other routine behaviours.

In the wider context of health inequalities, if this finding was applied, health promotion activity would focus initially on supporting individuals to establish daily routines which would then act as the infrastructure into which disease and condition specific health behaviours could be supported.

4.4.1.2 SITUATIONAL CUES TO DEVELOP HABITUAL EXERCISE

In endeavouring to exercise on a routine basis, some participants used situational cues to prompt them. Participants 18 and 24 referred to specific times of the day or days of the week which influenced the establishment of routine:

'I do exercise by routine and did find I settled into a routine on work days but found weekends difficult (Trial participant 18 TP18.10).'

'Difficult to set aside time to do exercises, but now I do them first thing they are built into my routine (Trial participant 24 TP24.4).'

Participants spoke about the positive influence of routine and habit during their telephone interviews. The comments presented below from participants 6 and 26 illustrate the role of routine:

'I'd found it was a good time to do them when I woke up in the morning it was just as habit rather than lying down in the middle of the day or ... cause you're on a roller aren't you. It might be like taking a tablet; people take them first thing in the morning or maybe last thing at night. It gets it out of the way and you know that that's part of your routine (Trial participant 6 TP6.4).'

'My aim is to establish certain connections not to forget, i.e. remember to either do the exercises at a certain time in a given day or in certain situation which are suitable ... What helped me was how in the same situation, usually

in the evening, I would remember 'Oh, I haven't done it' so it became kind of like a habit ... To do it at a certain time actually and integrated into everyday life. Like anytime I'm sitting somewhere waiting to, I think, oh, I can do this now. Or like when its, to find a space in the day that I do it and I just do it and do it and I will remember because it is the same time, after dinner or when I go to bed (Trial participant 26 TP26.4).'

Participant 5 used the same approach and said once she had made a specific time to exercise it then became part of her daily routine. Similarly, participant 24 initially found it hard to set aside time for the exercises but once she started to do them first thing in the morning she was able to stick to the routine. Borello-France *et al* (2010, p1493) and Hines *et al* (2007) also found that identifying a set time of day to exercise was useful in promoting adherence.

Aarts *et al* (1997) suggest that situational cues and satisfactory experiences enhance the formation and strength of habit. The role of satisfactory experiences is discussed in section 4.4.3 about affect management. In terms of situational cues, Borello-France *et al* (2010) suggested that “*integrating exercises with other well established daily activities*” such as washing dishes, waiting at traffic lights or watching TV news could be useful in promoting adherence (p.1501). Dolman (2007) recommended teeth brushing as a daily activity which could act as a cue to exercise (p.67). Participant 26 described most explicitly during her telephone interview how she consciously aimed to use situational cues to help her exercise (TP26.4 p.137).

The role of associating PFME with a particular situation was also mentioned by participant 24 during her telephone interview:

'Quite often now I'll do them when I'm driving along in the car when there's an easy stretch of road, um, and sometimes when I get into the car I think about them. So it's having, it's to do with association, isn't it, that helps to remind us (Trial participant 24 TP24.5).'

Where routine has been found to promote adherence to PFME, breaches in or absence of routine can negatively influence adherence. Hines *et al* (2007, p.48)

found that women who had adopted a routine approach to their exercise at the outset “*were likely to continue to use that approach and were significantly more likely to have high adherence than those who started out using the ad hoc or unknown approaches*”. Their finding corresponds with the experience of participant 17 who used the ad hoc activity of going to the toilet as a prompt for exercise but then found that she would forget.

In the instruction sheet provided for use in the trial “*Personal Training for your Pelvic Floor Muscles*” (Chartered Society of Physiotherapists, 2010), incorporated advice about both routine and ad hoc exercise. Participant 14 reported her use of a combination of ad hoc and routine approaches to help her achieve her target of 30 contractions each day:

‘It is easier doing exercises in blocks at set times with odd ones through the day which I tend not to count (Trial participant 14 TP14.3).’

This would suggest that although incorporating exercises into a fixed routine, often promoted by situational cues, ad hoc exercises are useful in supplementing routine exercise. In addition, ad hoc contractions are useful in what is described as a ‘knack’ (Alewijns *et al*, 2007; Price *et al*, 2010). The ‘knack’ is a contraction aimed at preventing episodes of stress UI leakage, i.e. prior to lifting heavy items, coughing and sneezing. Where women are unable to undertake their routine exercise, *ad hoc* exercises undertaken on a frequent basis are preferential to no exercise.

From the evidence presented in section 4.4.1 so far, it is clear that the development of routine can act as a positive mechanism for change. External cues are most useful when used in a routine situation or when linked to another routine behaviour. When exercise is routinely undertaken, habit is formed and reliance on external cues is diminished. In the next section, the role of apps in habit formation are investigated.

4.4.1.3 APPS AND HABIT FORMATION

In section 4.4.1.2, where women have tried to regulate their exercise the role of cues has been considered. In this section, the focus is on the role of apps in acting as an external cue to support habit formation and data from participants presented.

Gallo & Statskin (1997) used the external cue of an audio tape in their study. The tape, which reinforced instructions about PFME from a nurse, was supplied to participants in the intervention group. Those participants exercised “*more diligently*” than participants in the control group; more frequently and for longer (Gallo & Statskin, 1997, p.169).

Caution is required in generalising the results of the Gallo & Statskin (1997) study because analysis of the effectiveness of an audio tape, similar to that of smart phone apps used in this study, depends on the accuracy of self-reported use of the equipment by participants (section 4.3). As was discussed in section 4.3.2, it is possible for participants to exercise diligently without using the audio tape or app. Unless it is possible to accurately and separately measure adherence to exercise and the level of use of the technology, it is difficult to be confident that the intervention is in fact the factor which promotes the behaviour change.

In the study by Schmidt *et al* (2009), the technology was used as an external cue for the promotion of adherence to PFME and was able to measure and record use. However, levels of adherence were similar in the intervention group as in the two other groups in the trial. This indicates that technology as a single external cue should not be assumed to be effective as a mechanism of change.

Although caution is required in general assumptions about the effectiveness of apps, data presented in the following paragraphs illustrate that elements of the apps can be useful in helping women to remember to exercise.

Forgetfulness has been identified as a barrier commonly faced by women in adhering to PFME and in developing a habit of exercise (Alewijanse *et al*, 2007; Fine *et al*, 2007; and Borello-France *et al*, 2010). Participant 1, from the control group, thought that seeing the app on the phone would have acted to support her adherence. In addition, she thought that the reminders on the apps would also have helped. Participant 20 expressed a similar view:

'Because it's there I would have seen it all the time and I'd have gone "oh yeah, I need to do that today" ... That would have been perfect ... reminding me to do it. That would have been good, for me anyway (Trial participant 1 TP1.2).'

'Some form of a reminder to do it. A lot of the time I just did forget (Trial participant 20 TP20.3).'

Similarly, participants in the focus groups said that they liked the ability to set reminders at times which suited. In addition, they liked the flexibility of choosing combinations of audio, vibrate and text message reminders.

However, when the use of apps was tested in the explanatory trial, there was a more mixed response from participants. Some participants never got to the stage of actually choosing the settings they wanted as it seemed too complicated or time consuming, such as Participant 6 who suggested that she had not been motivated to spend time looking at the apps or to find out how they worked despite having found them interesting. At one point in the trial she did choose an app which sent reminders of when to exercise but she found this irritating after a short while:

'The one I picked on was the one that reminded me to do it and I actually got really fed up with being reminded! I got a bit frustrated and in the end I deleted it... I think perhaps because it came at a time that I wasn't doing it. Maybe if you could set - but then again, I tend to do them when I wake up in the morning or if I really can't get to sleep at night I might do them then. But otherwise it's the morning because my head normally hits the pillow and then

you wouldn't want the app ringing while you were in bed, would you (Trial participant 6 TP6.5)?'

This suggests that although an element of an app may be considered in theory to be useful in promoting adherence, it is not until it is tried out by the user in their everyday lives over time that it is possible to be confident that the app does in fact serve that purpose. The everyday experience of trial participants showed that the apps were less effective when reminders came at times when their phones or iPods were not at hand such as at home during the weekend when the technology was not being used as much as it was during the working week or first thing in the morning or last thing at night. In addition, the audio reminders could cause awkwardness or embarrassment if they went off in the hearing of other people (such as partners, family members or strangers at a bus stop).

As an alternative to a reminder on a smart phone app, participants in the older women's focus group suggested the use of texts as a reminder for PFME:

'I think getting a text, once a week, or something like that. Remind me, once a week; 'have you done your pelvic floor exercises (Participant from Nairn focus group with older women NO4)?'

'Just like normal, on your phone (Participant from Nairn focus group with older women NO5).'

'A reminder, not them telling you what to do (Participant from Nairn focus group with older women NO6).'

'I wouldn't want an advert or anything with the text, just a reminder (Participant from Nairn focus group with older women NO3).'

It is clear from their comments that there is potential for irritation if the text included additional directions or adverts. If individuals were able to set the wording of their

own text, as it is possible to set the wording of the reminder from the smart phone app, this may help to avoid irritation and cessation of use of the service.

The notion of personalisation of the wording of texts or reminders links with the recommendation by Neumann *et al* (2006, p.24) that a personalised approach should be taken so that the choice of treatment reflects individual patient's characteristics.

So far in this section about self-regulation, the focus has been on routine and habit formation. In sections 4.4.2 and 4.4.3, some consideration is made to the influence of competition and fun in adherence to PFME.

4.4.2 COMPETITION

In this section, the role of competition in relation to the self-setting of goals for exercise is considered. Two different types of competition are discussed; intrinsic and extrinsic competition. A comparison will be made between literature around exercise psychology and the field of PFME.

Competition is not an aspect commonly found in the PFME literature. Rivalta *et al* (2010) discuss the link between UI and sport and refer to competition in their case study paper. However, they use the term to refer to formal sporting events as opposed to the act of trying to be better than something or someone else. Of more interest in this context is the competition described by Paepe *et al* (2002) where children with lower urinary tract dysfunction were encouraged to compete against a wetting alarm.

Given the lack of consideration of competition in the PFME literature, it is surprising that the topic was mentioned to the extent it was by participants in this study. The following discussion has been prompted by their comments.

4.4.2.1 COMPETITION WITH SELF

Participants suggested that apps which allowed individuals to set goals and challenges would be useful to promote adherence; this fits with notion of self-competition as outlined by Weinberg & Gould (2011):

'I think the one that gets you at different levels is good, trying to encourage you to do more. It increases the intensity and duration of the next time. I can see some element of competition in it (Participant from Nairn focus group with older women NO7).'

'I think it's because it's a bit of a challenge and you think 'can I do it?' and if I can't then I'll try again (Participant from Hilton focus group with mothers of young children HM3).'

The solitary nature of PFME means that it is not surprising that intrinsic competition was described in relation to the aspects of setting goals to strive towards and achieve.

The sense of achievement from meeting personal goals was expressed by a young mother in Hilton, for example. She described to the group how she had been doing the exercising since the birth of her first child:

'I've been doing them for a while now, like. I'm quite good, I do them a lot. Even after the other two, I never found that I was weaker than before (Participant from Hilton focus group with mothers of young children HM4).'

In trial notes, participant 18 commented specifically on her goal setting. When interviewed she commented on the benefit of being able to progress to different levels in that it acts as evidence of improvement and achievement:

'Yes, a progression, cause once you've done it you think 'that's quite easy and I'm doing it and that's fine' and then you might slide back a bit, so if

there's another progression that you're aiming for, you might see yourself improving, and that's quite good, I do like the different levels (Trial participant 18)'

The adherence chart encouraged participants to state how many exercises they planned to undertake and to record how many they did. The role of the adherence chart as a mechanism of change is discussed in section 4.3.1. This element of the study design helped to facilitate self-competition.

There are some interesting similarities between PFME and sports which are undertaken in remote, wild or natural environments, described as remote sports (Krein, 2007). Howe (2008) describes the “*contest of self*” which involves an internal sense of competition in participants of remote sport as opposed to the “*contest of selves in conventional urban sport*” (p.364). This mirrors the discussion above about self-competition and resonates with the argument around autonomous motivation discussed earlier in this chapter.

In considering future research into adherence to PFME, it would be useful to draw on knowledge about remote sport and to investigate what factors help people to keep going when there is no-one around to either encourage or to compete against and to evaluate how these factors might apply to PFME. Egli *et al* (2011) identified differences between genders in terms of the influence of competition with regard to physical activity and therefore it would be important to account for differences in gender in these factors.

4.4.2.2 COMPETITION WITH OTHERS

Focus group participants also raised the notion of competition with other people. They thought it might be fun to see how others were doing and that this might encourage them to do better than others. Competition between women was suggested to have the potential to add a social dimension to the exercises. Although a competitive element was viewed positively by the mothers of young children, they

did suggest that only some women would choose it. The comments below are from a conversation between mothers of young children in Nairn:

'I think it (knowing how many exercises others were doing) would be a good thing. It would be good to get to know other people as well and to have it like a little bit of banter (Participant from Nairn focus group with mothers of young children NM11).'

'You don't know if other people are really doing it, they could be cheating (Participant from Nairn focus group with mothers of young children NM22)'

'Oh, that (other people knowing that you were exercising) wouldn't bother me, I think that's quite fun (Participant from Nairn focus group with mothers of young children NM23).'

'Yeah cause you could opt in if you wanted to, you wouldn't have to would you (Participant from Nairn focus group with mothers of young children NM24).'

Belisle & Levesque (1987) suggest the possibilities of competition between group members as a factor which could positively influence adherence to exercise. It is unlikely however, that their findings apply to this study as, although participants were aware of being part of a group of women undertaking PFME, they had no way of comparing their performance to that of others. The idea of being part of a group of women all exercising together was identified as a motivating factor but there is no indication that it had much of an influence on the actual adherence to exercise.

It may be that, as with the personality traits discussed in section 6.4, some women may have traits which respond more positively than others towards competitive challenges, whether intrinsic or extrinsic.

Despite research which suggests that women were less likely than men to be motivated by competition (Egli *et al*, 2011) and despite the lack of research about the

role of competition in PFME research, in this study both focus group and trial participants identified competition as a potential mechanism of change and as an element which could contribute to their exercise adherence. The findings from this study about competition are unique and novel in PFME research and this suggests that using qualitative research methods, it is possible to uncover previously undiscovered factors, in this case around competition.

4.4.2.3 APPS AND COMPETITION

In addition to links with remote sports, other important links to consider are the elements of competition incorporated into smart phone apps. Both external and intrinsic competition is possible using smart phone technology; social media can be used to create virtual competitors and goal setting is possible to facilitate the “*contest with self*” (Howe, 2008).

Participant 18 explained on the telephone how the notion of competing against oneself using the different levels on the apps positively influenced her exercise adherence.

‘That sort of grading yourself, cause I knew early on, I tried it and I thought “I can’t do that” and then grading, that was good, so you could do fast slow and then there was more advanced ... so you could feel that you were making a difference. I think that’s quite good. Yes, a progression. ‘Cause once you’ve done it you think, ‘that’s quite easy and I’m doing it’ and that’s fine. And then you might slide back a bit. So if there’s another progression that you’re aiming for you might see yourself improving, and that’s quite good. I do like the different levels (Trial participant 18 TP18.11).’

None of the other participants in the intervention group specifically identified this element of the apps as being useful in supporting their adherence. However, two participants in the focus groups identified the aspect of setting goals and competing with oneself to achieve them as an aspect of the apps which they thought would encourage them to exercise more.

One older woman from the Nairn focus group explicitly identified her competitive nature in enjoying the challenge of an app which allowed different levels to be set. A Nairn mother positively linked the setting of more difficult exercise levels on an app with health improvement.

'I think the one that gets you at different levels is good. Trying to encourage you to do more... It increases the intensity and duration of the next time. ... I can see some element of competition in it. Rather than this 'God, here's a woman droning on about it. (Participant from Nairn focus group with older women).'

'That would be good because there was this kind of thing of getting better, improving (Participant from Nairn focus group with mothers of young children NM12).'

The notion of competing with others, such as peers from antenatal classes, in terms of the number of contractions and the number of exercise sessions undertaken was considered in the Nairn focus group. One young mother suggested that this would be “*quite fun*”. Although the use of social networks to communicate exercise achievement is commonly found in apps for cycling and running, it was not a feature of any of the apps used in this study for PFME.

Generally, the setting of increasingly demanding goals and the sense of competing with oneself is linked to the intrinsic motivation discussed in section 4.4.2. There is potential for competitive elements of PFME apps to positively influence motivation and adherence to exercise in some women.

Data gathered in this research illustrates the importance of person-centred services and the risks around making assumptions about individuals based on gender or age; competitive traits are not just found in young, athletic males but can also be found in older women, as discussed by participants in the Nairn focus group with older women. The facility of setting levels for exercise (including frequency of exercise,

number of contractions and duration of contractions) allows app users to self-set goals, to start at a level which reflects their ability, and provides them with an incentive to improve. The popularity of apps for mapping routes and recording times for walking, cycling and running (Prindle, 2014) suggests that this technology is being harnessed for remote sports; further reason to investigate common factors between adherence to remote sports and adherence to PFME.

4.4.3 AFFECT MANAGEMENT

In this final section about self-regulation in supporting PFME, the influence of affect and affect management is investigated. Affect is defined as, “*the manner in which one is inclined or disposed*” or, “*a feeling, desire, intention*” in the Oxford Dictionary of English (2010). Some of the associated words to describe affect are dull/interesting, unpleasant/pleasant, boring/stimulating (Skar, 2011).

Nelissen *et al* (2011, p.201) found that “*an increasing body of research shows that anticipated emotions affect decisions about preventative health behaviour*” Where ‘fear messages’ produce negative emotions, attempts at behaviour change are often unsuccessful (NICE, 2007, p.13). In comparison, some studies have shown that enjoyment of the health behaviour is strongly linked to adherence in the longer term (Huberty *et al*, 2008; Thirlaway & Upton, 2009). As Silje Skår summarised in her PhD thesis, “*participants who are more congruent of their affective (i.e. feelings) and cognitive (i.e. thoughts) attitudes to their behaviour (e.g. physical activity) are more likely to be physically active*” (Skar, 2011, p.25).

In the field of PFME research it is likely that, as with some other health behaviour interventions, changing current behaviour “*may not be a priority for the individuals being targeted. People do not necessarily make their own long-term health a priority and may want to focus on other, more immediate needs and goals*” (NICE, 2007, p.13). This is especially relevant where the benefit of exercising may be prevention of incontinence symptoms in twenty or thirty years’ time. In terms of longer term adherence, such as that required if PFME are to be undertaken throughout the life

course, Huberty *et al* (2008, p.374) recommend the strategy of “*increasing motivation and enjoyment relative to activity*” as useful in increasing long-term adherence.

Therefore, in health behaviour change generally, affect management can act as a mechanism of change and can promote longer term adherence. In the following paragraphs, attitudes around affect management and the experience of participants with PFME are presented and discussed.

In the focus groups, the aspect of apps being fun to use and how this may promote exercise was a topic of discussion. Broadly, all of the focus groups included moments of fun and laughter as participants tried to operate the iPod Touch and navigate different apps. In addition to this general sense of fun, some of the participants specifically mentioned fun as an element which would help them adhere to exercise.

‘You miss doing your pelvic floor exercises but with something like this, like a fun app, it would be just like nothing too serious. And you wouldn’t really think that this is boring. It would be like ‘oh yeah’, like make it like a bit of a game really (Participant from Nairn focus group with mothers of young children NM13).’

In discussions about the role of fun in the Nairn focus group with young mothers, there was a consensus that making the exercises fun would help participants to do them and keep doing them. However, focus group participants were critical of dull apps. It was generally suggested by some of the older participants in the focus groups that younger women would find the apps fun to use but that they didn’t think older women would be so appreciative.

Participant 6 suggested that the apps were fun initially but that she soon got bored of them. Participant 7 also stated that the apps were fun initially (TP7.1 p. 98) but also

identified this as helping with longer term adherence to the exercises, although she stopped using the apps themselves.

In the end I stopped using the app and just did the exercises myself (Trial participant 7 TP7.3).'

When interviewed, participant 9 was asked what she thought would help her and others to adhere to PFME. She answered by suggesting that something fun and memorable like *The Poo Song* (Scottish Government, 2013) would be have a positive impact.

'The poo song, I don't know if you've heard it, it's fun (Trial participant 9 TP9.7).'

The Poo Song (Scottish Government, 2013) is a health promotion video from NHS Scotland which has a funny 'ditty' and illustrations about bowel cancer screening. It encourages individuals to complete the bowel cancer test and family members to encourage their older relatives to complete the test. Participant 9 was conscious that urinary incontinence was similar to bowel cancer in that it was a potentially embarrassing topic to discuss and that fun was a useful factor in making it easier to talk about.

In addition to the value of fun in reaching individuals with unmet need in incontinence services, there may also be value for health practitioners themselves. The literature includes data around the reluctance of some health practitioners to speak about and address continence issues (Sells & McDonagh, 1999; Wagg, 2002). As with bowel cancer screening, UI is a subject about which it can be difficult to initiate and engage in discussion and may therefore benefit from a completely different approach which uses humour and fun to diffuse awkwardness and tension.

It is therefore perhaps unsurprising that there is a lack of focus on fun in the promotion of PFME. However, whether a fun element can relate to motivation around sexual benefits of exercise, competition and gaming through apps, or the ability to diffuse an awkward discussion topic and reach the millions of individuals who suffer in silence, it would appear from this research that fun is an influence on motivation and adherence to PFME which warrants more attention.

The reluctance for women to seek medical help for incontinence and the embarrassment felt by individuals in relation to symptoms is well documented (Lucas *et al*, 2012; Hagglund *et al*, 2003). And yet, there is a remarkable lack of attention paid to the millions of silent sufferers in the literature around PFME; the majority of PFME studies are clinical and as such do not include the undiagnosed. Participant 9, quoted above, is one of these undiagnosed women who have never mentioned their symptoms to any health professional and that is why her views are of particular interest and her suggestions may be of particular relevance for continence promotion to the wider population.

In the trial, once PFME became habitual and were incorporated into participant's routines, individuals were positive and expressed appreciation for the help they received by participating in the study (Trial participants 7, 24, 26 & 27). Although this positivity and appreciation may, for some participants, be linked to a decrease in incontinence symptoms, this was evidently not the case for those who had no symptoms. This suggests that health behaviour adherence affect is not contingent on condition improvement or the health benefit which is the purpose of that behaviour; some women just felt good about the fact they were exercising more.

The term "*fed up*" and "*frustrated*" and "*not sure*" were used by many participants. For some, these negative experiences were overcome, the participants persisted and a habit was eventually formed. Others did not persist and no habit was formed. Further research into the feelings and experiences of women as they undertake a course of PFME would help to increase understanding of the role of affect in exercise

adherence. Aspects of their experience which result in negative affect and act as barriers to adherence of exercise could then be mitigated against.

4.4.3.1 APPS AND AFFECT

So far in this section about affect management, it is clear from the literature and from the data that there is an opportunity for fun and positive experiences to motivate and promote adherence to PFME. The main focus of the data is around the way apps helped to make PFME fun.

Participants from all age groups suggested that fun was an important part of apps for PFME. The fun element was useful in generating motivation to exercise as well as in supporting adherence to exercise. Different participants identified different elements of the apps as fun; some included the element of competition whilst others suggested that the visual aids used and interactive elements helped the apps to be fun:

'Attention grabbing type things, so some things could be quite good (Trial participant 18 TP18.12).'

'Liked the elevator one (Trial participant 19 TP19.1).'

In terms of motivation to use the apps, and to do the PFME, one participant said she thought that she would have a lot of fun using the apps and that her partner could also join in. The Nairn group of mothers agreed that fun would be a factor in motivating them to exercise:

'That's what people get out of using these apps. I know it's like, always like these games, seeing them and that. So, it's like a fun element. You've got to keep it updated (Participant from Nairn focus group with mothers of young children NM14).'

The elements of the apps which were considered fun to use included interactive buttons, colourful graphics to show progress and an element of challenge and competition. Some sounds and feedback comments produced by the apps caused amusement but as these could be turned off, they were not integral to the fun of using the app. Participant 7 identified the fun nature of the apps in general as positively influencing not just her adherence to exercise but to her habit formation:

Two aspects are of particular interest in this section: the first is that fun and enjoyment can positively influence adherence to health behaviour; the second is that apps can be fun to use. It is clear, therefore, that there are opportunities for fun apps for PFME to support adherence to exercise.

When this is considered in relation to the comments from participants elsewhere in the chapter in relation to apps being unhelpful, an important nuance becomes apparent. Apps are not inherently useful, despite the fact that they may contain functions which have been identified as supporting adherence. The critical factor in apps being useful is that users enjoy using them. If using the apps feels good and is fun, women are more likely to both use the apps and adhere to the exercises. This would suggest that considering whether or not a patient may find an app fun should be a factor when health professionals recommend app use for PFME.

4.5 CONCLUSIONS

The aim of this chapter was to identify aspects about PFME which influence adherence. It reported on adherence to exercises reported by participants in the trial and discussed aspects of the exercises that influenced their adherence which are summarised below.

In this study, women found it difficult to do their PFME. More than half of the participants who completed the trial (n=13/23) said they forgot to exercise. Participants commonly identified lack of time and tiredness as barriers to exercise.

The distinction between adherence to PFME and adherence to, or use of apps became apparent in this study. Indeed, the use of apps was variable with some women depending on the app for adherence to exercise with others no recognising any benefit of the apps in supporting their exercise adherence. The 'factor' of being provided with apps or equipment to use the apps was not found to improve levels of participation in the study; the apps did not act as an incentive to continue in the study during the trial period. So, although apps can be useful in supporting some women with adherence to exercise the provision of technology is insufficient in itself to engage with individuals in health behaviour change and, furthermore, cannot be relied on in isolation to support behaviour change.

Almost thirty per cent of participants (n=8/28) had never been taught PFME. Of those who had been taught, the majority of participants in the trial were taught PFME around the time of pregnancy and childbirth (n=14/20). This study has shown that women who have been taught PFME are more likely to adhere to daily exercise during the trial. Previous regular exercise was not found to predict an increase in exercise in the trial as the number of those who increased exercise who had previously exercised (n=9) was the same as the number of participants who increased exercise whilst not ever exercising regularly in the past (n=9).

Lack of confidence in women in relation to their ability to correctly exercise can act as a predictor of lower adherence and, conversely, adherence to PFME is increased by women's sense of mastery that they are exercising correctly.

Data from this study suggests that allowing patients to choose their treatment regimen can have a positive influence on their adherence to that regimen. Apps can support choice of exercise regimen, and other features of the apps can be personalised to suit individual taste to make their use more enjoyable. Apps can also be useful as a source of information about PFME but too much text and dull presentation can be off-putting and make the information less accessible.

Although the reliability of self-reported data is not consistent, the process of self-monitoring was found by participants to support their adherence. Not all the participants wholly completed or returned the adherence chart but many of them mentioned it as a useful tool in prompting, reminding and monitoring their exercise. One participant found the apps she used useful in recording her frequency and level of exercise.

The formation of habitual exercise based on regular daily routine was key to successful adherence for participants. Ad hoc situational cues were less useful in supporting adherence than routine cues.

Some participants found it useful to set their own level of exercise and to 'compete' with themselves to improve. There are similarities between the intrinsic motivation required for remote sports and the skills required for PFME. Although participants did not directly compete with each other, some suggested that an element of competition of this nature would support their exercise adherence. Fun and enjoyment (whether with others or with apps) were recognised as factors which would support exercise.

Self-monitoring and fun are previously unrecognised aspects of PFME which can positively influence adherence. There are opportunities with apps to harness these aspects for the promotion of PFME.

CHAPTER 5: HOW DO URINARY INCONTINENCE SYMPTOMS, BELIEFS, AND MOTIVATION INFLUENCE ADHERENCE TO PFME?

In the previous chapter, the focus was around aspects of PFME which can influence adherence. This chapter concentrates on three areas which have been highlighted in the literature as influential on adherence. The first area is urinary incontinence symptoms (5.1), the second area is beliefs and attitudes to incontinence and PFME

as a treatment (5.2), and the third area is motivation to PFME (5.3) where three main motivations are examined in relation to their influence on adherence by participants in this study.

5.1 HOW DO UI SYMPTOMS INFLUENCE ADHERENCE TO PFME?

A lay observer may assume that women who have incontinence symptoms are more likely to adhere to PFME in an effort to reduce or stop leakage than those with no symptoms. Evidence from the explanatory trial presented in Figure 17 below suggests that this is not the case and that participants with no symptoms were as likely to adhere to exercise at both 3 months and 12 months.

Of the women who entered the trial (n=28), sixteen had incontinence symptoms. Of the twenty three women who completed the trial, eight reported no leakage while fifteen reported symptoms ranging from once a week or less often to several times a day before the trial started.

As illustrated by the table in Figure 17 below, of the fifteen participants who increased their level of exercise to daily or maintained daily exercise at the end of the trial, seven experienced UI no symptoms. Six of these women experienced leakage about once a week or less often, one experienced leakage two or three times a week and one several times a day.

Of the eight participants who did not adhere to exercise daily on average throughout the trial, one had no symptoms. Four of the others experienced leakage about once a week or less often, one experienced leakage two or three times a week, one about once a day, and one several times a day.

Figure 17 Table showing UI symptoms and adherence

Participants who increased their level of exercise to daily or maintained daily exercise at the end of the trial with UI symptoms	n=7
Participants who increased their level of exercise to daily or maintained daily exercise at the end of the trial with no symptoms	n=8
Participants who maintained daily exercise at follow up with UI symptoms	n=4
Participants who maintained daily exercise at follow up with no symptoms	n=1
Participants who did not adhere to daily exercise in the trial with UI symptoms	n=7
Participants who did not adhere to daily exercise in the trial with no symptoms	n=1

Of the five participants who maintained daily exercise at the follow up stage, one had no symptoms. The four other participants experienced mild symptoms (leakage about once a week or less often), as presented on in Figure 17.

In the trial notes, participant 5 who had no symptoms specified prevention as a factor influencing her adherence. Participant 24 identified an improvement in her urge incontinence symptoms influenced her adherence:

'Knowing that I was strengthening my pelvic floor muscles thus hopefully delaying incontinence (Trial participant 5 TP5.1).'

'I feel that my urgent need to use the toilet has diminish(ed) quite a lot and intend continuing doing the exercises (Trial participant 24 TP24.6).'

The opposite was found by participant 9 who linked deterioration in her symptoms with adhering to the exercises:

'Well, I started off with good intentions I will admit. And then I felt I was probably leaking more, I don't know, and it kind of put me off (Trial participant 9 TP9.8).'

Participant 26 indicated that she had tolerated her symptoms before the trial but that having done PFME she was now more conscious of how much they had previously affected her quality of life. Participant 24 also noted that her quality of life had improved in relation to improvement of symptoms as a result of adhering to exercise:

'Thank you. My life quality has improved (Trial participant 24 TP24.7)!'

'Thank you very much for offering this opportunity to doing something practical that helped me a lot to improve a situation / a condition, which bothered me more than I was aware of. Warmest regards (Trial participant 26 TP26.5).'

This data suggests that although UI is the context for many women undertaking PFME, the presentation and severity of symptoms are not accurate predictors of

adherence to exercise. Participant 20 was quite surprised that the acute awareness she had of her symptoms did not make her adhere to PFME to the level she had hoped. She talked about how strange it was that although she thought about her bladder problems all the time, this did not translate into actually doing the exercises.

In the PFME literature, there is a mix of views on the influence of symptoms. Cammu *et al* (2004) found that severe symptoms were likely to result in better outcomes. Alewijnse *et al* (2003) found that severe symptoms were linked with poorer outcomes. Finally, Glazener *et al* (2001) suggested that neither symptom type nor severity predicted outcome, as discussed below.

Glazener *et al* (2001) found that neither symptom type nor severity predicted outcome either immediately after the programme of PFME or six years later. The primary outcome measured was “*persistence of any UI*” and the secondary outcomes included severity of symptoms (Glazener *et al*, 2001, p. 2). However, Cammu *et al* (2004) found that the severity of the symptoms expressed by a greater number of leakages, a greater number of pads used, and a leakage on first cough, was a significant predictor of a poor outcome of PFME. Their study, however, included participants who would go on to have surgery, suggesting more complex cases of UI and not a general population sample. Both of these studies focussed on the outcome of UI symptoms and not adherence to PFME.

Alewijnse *et al* (2003) identified symptoms as having a positive influence on longer term adherence to PFME. The increased adherence of women who had more frequent leakage was based on the benefits they experienced from adhering well to the exercises in terms of reduced leakage. Alewijnse *et al* (2003) suggest that increased levels of leakage mean that women are more aware of the problem and are more likely to persist with exercise. Burns *et al* (1993) agree with Alewijnse *et al* (2003) that the severity of symptoms influences adherence. They suggest that “*those women with mild symptoms may not perceive their incontinence as a problem warranting sustained effort*” whereas women with more severe symptoms “*recognize it as a problem and put forth persistent effort*” (Burns *et al*, 1993, p.173).

Where the symptoms of UI are the outcome measured, as opposed to adherence to exercise, the PFME literature lacks consensus about the influence of the symptoms. Based on this lack of consensus, caution should be taken in the use of severity of symptoms to predict outcomes from PFME in terms of improvements in symptoms.

The data previously presented from the explanatory controlled trial is based on adherence to exercise as the main outcome measure. UI symptoms were also measured but, as it was a population based study, some of the participants had no incontinence symptoms. This difference means that direct comparison between the data presented and the literature described above is not possible.

However, it is possible to draw out some similarities between this new study and those described above. The trial data suggests that women respond to UI symptoms in different ways and caution should be taken in trying to predict adherence to PFME on the basis of the presence or severity of symptoms.

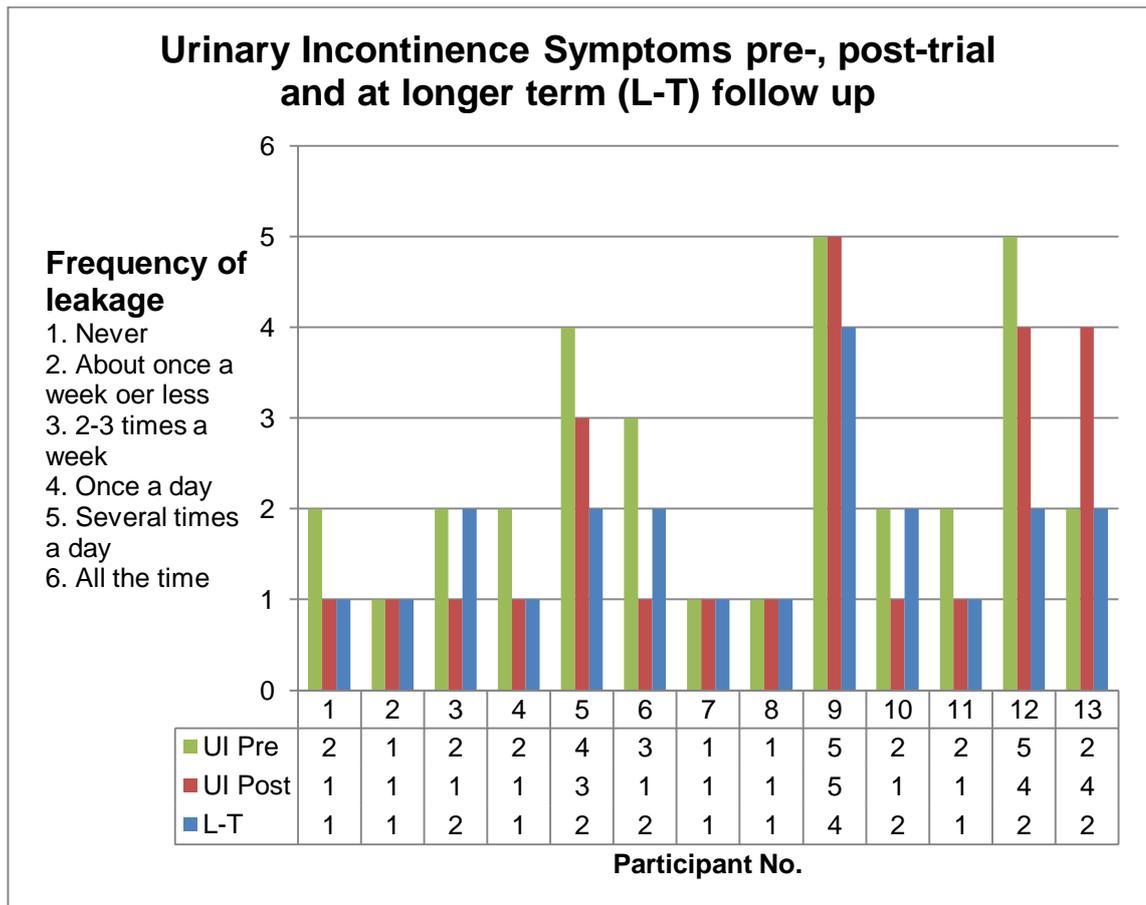
It is therefore possible to conclude that the presence and severity of symptoms can predict the outcome in PFME research, whether that is in terms of either adherence to exercise or improvement in symptoms.

As the vast majority of PFME research involves participants with UI symptoms and the remainder of research involves participants who are or have been pregnant (Hay-Smith *et al*, 2008), there is a paucity of evidence about women with no symptoms to compare with results from this study. Indeed, one of the only population based trials of PFME is by Diokno *et al* (2004). All of their participants over 55 years and undertook clinical assessment as part of the study.

The lack of population based studies would indicate, as indeed suggested by Hay-Smith *et al* (2008), that there is a need for further PFME research which would

include a sample of women from the general population which would likely include women both with and without incontinence. As such, the data presented in this thesis will go some way towards filling this gap in the literature.

Figure 18 showing UI Symptoms pre- and post-trial and at follow up

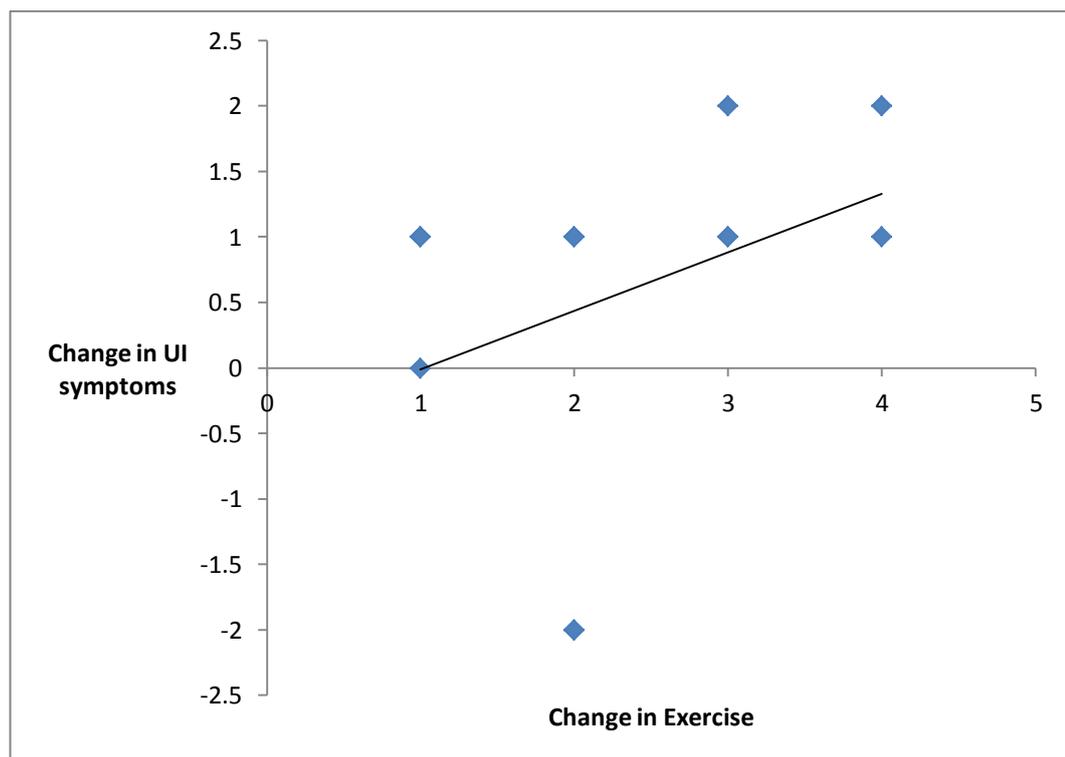


Although neither the presence nor severity of symptoms was found to predict adherence to PFME, the influence on motivation to exercise is described in the following section. In the following paragraphs, data from the trial is presented in relation to changes in severity of symptoms during the trial period and at the longer term follow up.

Fifteen of the participants in the trial had UI symptoms and 73.3% of them (n=11) experienced a decrease in symptoms by the end of the trial, as illustrated in Figure

18 above. One of the participants with incontinence who did not experienced a decrease in symptoms explained that she had suffered from a chest infection which had caused persistent coughing and she identified this as the reason why her symptoms had not improved.

Figure 19 showing change in UI Symptoms (for participants who had symptoms) with increase in PFME



Of the participants who had UI symptoms, 87% maintained regular exercise or increased to a frequency of at least once a week (n=13). Of these thirteen, six were in the control group and seven in the intervention group. And, again of these thirteen, ten women experienced an improvement in symptoms. As can be seen from the Figure 19 below, the women who had the biggest increase in exercise had the biggest improvement in UI symptoms.

Evidence from this trial adds to the consensus that PFME are effective in alleviating UI symptoms. In addition, the evidence reinforces the notion that diligent performance of exercise positively influences efficacy.

Despite the consensus around the efficacy of PFME in alleviating UI symptoms, aspects around the beliefs and attitudes of individuals can influence adherence to exercise. These aspects are considered in section 5.2. In the following section (5.1.1) the role of apps for PFME for use by women with incontinence symptoms is discussed.

5.1.1 APPS FOR UI

Urinary incontinence is a condition characterised by under reporting of symptoms where women have reported that they feel too embarrassed to talk about it (section 5.2.3). In this section there is a discussion about the role PFME apps can play in supporting these women.

Hand held devices, such as smart phones, to provide discreet and handy support for women to improve or prevent UI symptoms. Smart phone apps may provide a means of support which bypassed the need to present with or speak about symptoms and that this may be useful in reaching the silent millions of women with unreported symptoms. This is discussed in more detail in section 5.2.3.1.

Figure 20 below, presents a further breakdown of the six participants who found the apps unhelpful and the four participants who found the apps helpful according to whether or not they had UI symptoms. Of the ten participants from the intervention group who completed the trial, seven experienced leakage. Four leaked urine about once a week or less often and the other three experienced daily leakage. Only two of the participants with incontinence in the intervention group found the apps helpful.

Figure 20 showing helpfulness of apps with UI symptoms

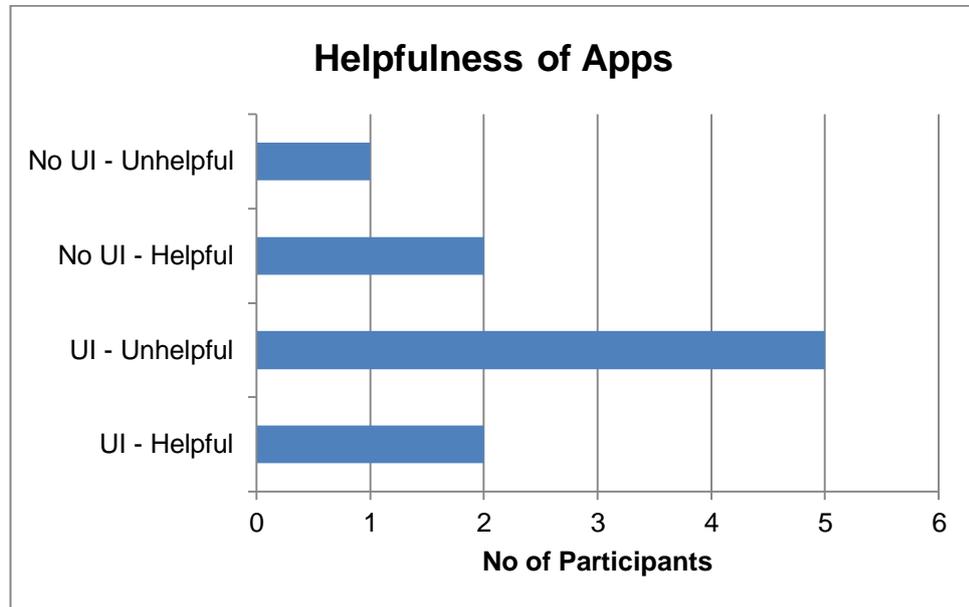


Figure 20 suggests that whether or not an individual finds the apps useful or not does not depend upon their experience of incontinence. Of the four participants who found the apps helpful, two had symptoms and two had no symptoms.

Participant 9 experienced leakage of urine on average about once a day in the four weeks prior to the start of the trial. It transpired through the telephone interview, that she had not mentioned her symptoms to any other person prior to the interview. She was exactly the type of person considered to potentially benefit from the discreet nature of the PFME app. Interestingly, although she was provided with an iPod touch and a selection of apps to choose from, she did not use the device.

'Could not get to grips with it (Trial participant 9 TP9.9).'

'Did not understand how to work it properly. Not used to such modern technology (Trial participant 9).'

This suggests that in order for women with unreported UI symptoms to benefit from the features in apps which could support their adherence to PFME, their general level of mobile digital literacy would have to increase as opposed to specific training in the use of PFME apps, as they would be unlikely to participate in these. The implications of this finding is that there is untapped potential for smart phone apps to meet the needs of individuals with UI and the most effective way of unlocking this potential is by raising mobile digital literacy.

5.2 HOW DO BELIEFS AND ATTITUDES INFLUENCE ADHERENCE TO PFME?

So far in chapter 5, the focus has been on the influence of symptoms of incontinence on adherence. In investigating the role of UI symptoms, it is clear that the beliefs and attitudes of participants towards their symptoms have influenced their adherence to exercise. In this section, this influence is discussed and data is presented about how these beliefs and attitudes have impacted on the behaviour change of participants.

Bowling (2009), in discussing the Theory of Planned Behaviour, suggests that *“it is not the circumstances of the individual that predict what they can do, but their attitude toward these”* (p.41). In application of the Theory of Planned Behaviour to PFME, Whitford & Jones (2011) recommend that *“the beneficial effect of PFE should be emphasized in order to improve attitudes to the exercises”* and that this would be *“likely to influence intention to practise the exercises”* (p.15).

When describing the lessons learned from continence promotion activity with community dwelling continent women, Tannenbaum *et al* (2010) suggest that *“the recognition that behavior change is a function of beliefs, attitudes and intentions”* is important (p.540). They further suggest that continence promotion activity should include the dispelling of false beliefs about the inevitability of incontinence and the changing of attitudes towards incontinence treatments.

The frequency of leakage and the severity of symptoms have been found to influence attitudes of women towards UI. Teleman *et al* (2005) found that “*attitude towards urinary leakage varied more widely in women with infrequent leakage compared to those with more frequent symptoms*” (p.1111). They suggested that information about what was considered ‘normality’ in connection with symptomatology would be helpful.

Beliefs in the effectiveness of PFME in treating and preventing incontinence symptoms are discussed in section 5.2.1. The attitude that incontinence is an inevitable part of ageing or consequence of childbirth is discussed in the following section (5.2.2). Notions of normalcy and embarrassment are considered in section 5.2.3 and illness identity for incontinence is discussed in section 5.2.4.

5.2.1 BELIEF IN EFFECTIVENESS OF PFME IN ALLEVIATING OR PREVENTING INCONTINENCE.

As mentioned in the review of literature earlier in this thesis (Chapter 2), based on the Health Belief Model of health behaviour change, belief in the effectiveness of an intervention has been shown to predict adherence. Indeed, Thirlaway & Upton (2009) suggest that “*belief in efficacy of the proposed behavioural change and the self-efficacy of the individual contemplating the change are postulated to increase the likelihood of the response*” (p.34-35).

In relation to PFME, Laycock (2008) suggests that the success of exercise programmes depend on the patient’s beliefs and understanding both the benefits of exercising and the consequences of not exercising. This would suggest that as well as belief in the efficacy of exercises there should also be belief in the “*sequelae of noncompliance*” (Laycock, 2008, p.181).

Skår (2011) suggested that a person’s beliefs may be based in part on their past experience of the behaviour and that they will also be influenced by second-hand

information such as the “*experiences of acquaintances and friends*”. Her thinking was based on the 1986 work of Ajzen and Madden.

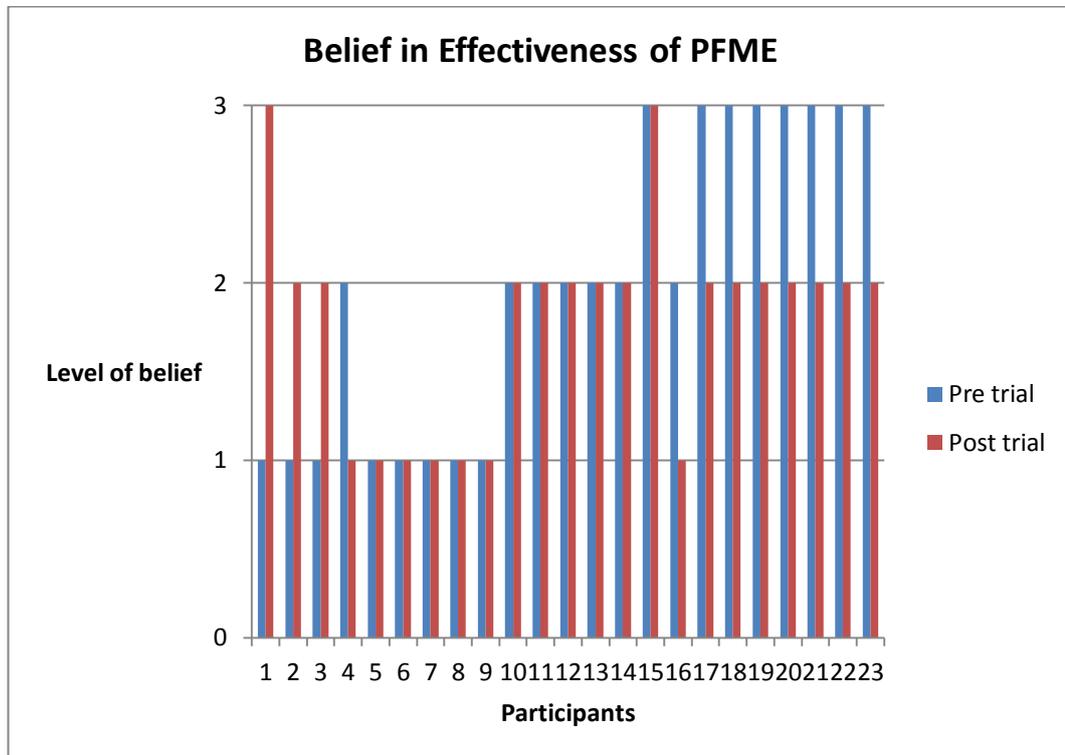
When Whitford *et al* (2007) investigated the past behaviour of participants in their study they found that it was associated with intention to exercise. Whitford and Jones (2007) suggest that promoting the benefits of PFME prior to the first pregnancy, even to young women in secondary school, could help to influence beliefs about the exercises and result in increased levels of adherence. This supports the data presented in section 4.2.3 about the teaching of exercise and its influence on adherence.

In the explanatory trial presented in this thesis, in order to find out more about the relationship between belief in efficacy and adherence to exercise, participants were asked if they agreed that PFME were effective in preventing and curing incontinence. This section will discuss the responses of participants to this question and how these related to adherence.

Eighteen out of the twenty eight participants recruited to the trial either agreed or strongly agreed that pelvic floor exercises were effective in preventing and curing incontinence with the remaining ten participants neither agreeing nor disagreeing. By the end of the trial of those who completed (n=23), all but one of those who had been unsure about the effectiveness of exercises became more confident.

Similar to changes in confidence to correctly contract muscles discussed in section 4.2.1., there were shifts in belief about the effectiveness of PFME in preventing and curing incontinence during the trial. Nine participants experienced an increase in belief during the trial. Three participants experienced a decrease in belief. Of those whose level of belief did not change during the trial (n=11), ten either agreed or strongly agreed that PFE were effective. This is illustrated in Figure 21 below where ‘1’ represents ‘strongly agree’ and ‘5’ represents ‘strongly disagree’

Figure 21 showing changes in belief in the effectiveness of PFME



One of the trial participants (Trial participant 13) found that her belief in the effectiveness of the exercises increased as she noticed that they were helping alleviate her incontinence symptoms. This had the effect of inspiring her to increase the amount of exercise she did initially and to develop a sustainable habit of exercise in the longer term (TP13.1 p. 121).

Interestingly, there was a disparity between the written and verbal responses from participant 9 in relation to belief in the effectiveness of the exercises. When asked at the start and the end of the trial, participant 9 agreed that exercises were effective but when interviewed by telephone she indicated that she thought the exercises may have contributed to a decline in her symptoms and that had a negative impact on her adherence:

'And then I felt I was probably leaking more, I don't know, and it kind of put me off (Trial participant 9).'

This suggests that there can be a difference in belief generally that exercises are effective and the belief that they are effective for oneself, personally. To provide increased clarity, future research could include an additional statement framed to gauge personal belief such as "*exercising my pelvic floor muscles will prevent and / or cure my incontinence*".

A study by Borello-France *et al* (2010) found that there was no association between exercise adherence and "*concerns that exercises were not helping incontinence*" (p.1498). Their findings and the fact that participant 9 was the only participant to comment on a lack of improvement in symptoms, indicates that her experience may not be typical of women generally.

Due to the complexity of and difficulty in measuring 'belief', it is clear from this study that a simple statement about the effectiveness of PFME with a likert scale to classify responses is an inadequate tool to accurately reflect the attitudes of participants. There appears to be a difference between belief in the effectiveness of PFME in general and the belief that they will be effective for oneself. In addition, it appears that some women respond differently to written questions than when the topic is discussed verbally.

This illustrates the danger in interpreting quantitative data which has been gathered with inadequate tools and the advantage of triangulating qualitative and quantitative data with the literature. By doing this, this study offers an important contribution to research about PFME and to the debate about the adequacy of tools used to measure aspects which are believed to impact on adherence.

In this section, belief in the effectiveness of PFME has been discussed. In the next section, beliefs and attitudes around inevitability and unavailability of incontinence are examined.

5.2.2 INEVITABILITY AND UNAVOIDABILITY

In this section, the focus is on various attitudes around UI including beliefs about inevitability and unavailability and how these impact on behaviour change in relation to PFME. The focus here is on the belief that these symptoms are a normal consequence of childbirth and an inevitable part of ageing.

There is a commonly held view that incontinence is an inevitable and normal consequence of childbirth “*and that nothing can be done to treat it*” (Mason *et al*, 2010, p.2778; Saleh *et al*, 2005; Bradway *et al*, 2010). Fine *et al* (2007) suggested that this attitude influenced mothers’ views that PFME were futile (p.107e4).

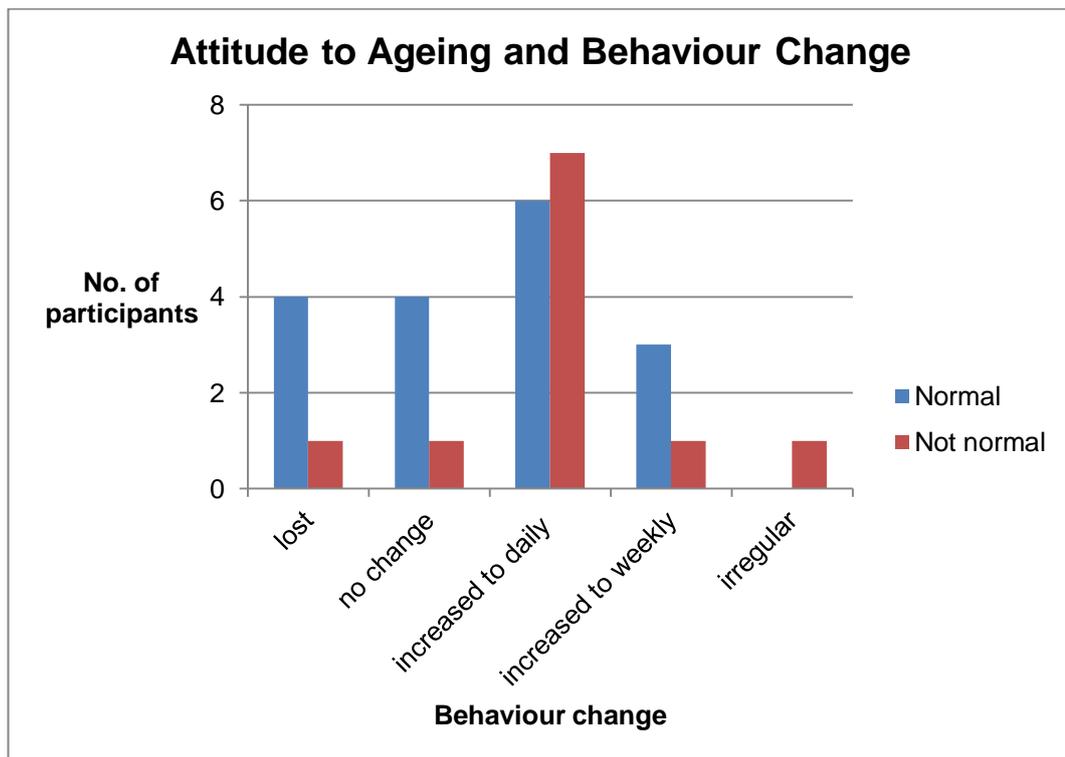
In the explanatory controlled trial conducted as part of this doctoral research, described in Chapter 3, participants were not asked about parity. However, the subject was raised in the focus groups with mothers of young children in Nairn and Hilton. There, mothers of young children seemed conscious of the potential negative effect of parity and the importance of exercising their pelvic floor muscles during and after pregnancy. However, some were quite surprised at the suggestion that they should continue to exercise in the longer term. This aspect is discussed in more detail in section 6.1 about age and duration since childbirth.

The attitude that UI symptoms are “*an inevitable consequence of the ageing process*” has been found to negatively influence help seeking behaviour (Basu & Duckett, 2009, p.727; Dugan *et al*, 2001, Roe *et al*, 1999, Bradway *et al*, 2010) and the reporting of symptoms (Shah & Badlani (2002).

Seventeen of the participants who were recruited to the trial stated that they considered incontinence a normal part of ageing; their ages ranged from 21 to 67 years. One participant did not know and ten said that it was not a normal part of ageing.

Of the five who did not complete the trial, four believed that incontinence problems were a normal part of ageing. Of the twenty three women who completed the trial, thirteen said they thought UI was a normal part of ageing, nine believed it was not and one did not know. The change in the frequency of their exercise shown with their attitude to incontinence as a normal part of ageing is illustrated in Figure 22:

Figure 22 showing change in level of exercise with attitude to UI as a normal part of ageing



In this exploratory study, it is clear that both groups of women, those who believed UI was a normal part of ageing and those who either did not or did not know were successful in changing their behaviour. This would suggest that although this

attitude toward UI negatively influences help seeking behaviour it is not a factor which can be assumed to negatively influence adherence to PFME. The evidence presented below in fact suggests the opposite; that thinking of UI symptoms as normal can positively influence adherence to PFME.

Participant 26 indicated that her new understanding that UI was a normal part of ageing positively influenced her adherence. She spoke about how her increased awareness of the weakening of pelvic floor muscles with age and the fact that other women also had symptoms were a positive factor in her adherence:

'I am really grateful that I could participate, it has changed my whole attitude towards this and I'm not so shy about it anymore. I take it more as a part of life of my age. I found it empowering that I can actually do something actively, myself (Trial participant 26 TP26.6).'

The experience of participant 26 is of particular interest as it suggests that by normalising the condition and making more socially acceptable to speak about symptoms, women could be positively influenced and empowered to change their behaviour to improve symptoms.

The reassurance that she was, and her symptoms were, 'normal' helped her to have a positive attitude towards a condition she had previously been embarrassed about and one she felt helpless to do anything about. Her experience and comments challenge the notion that the belief that symptoms were normal would have a negative influence on motivation and adherence and that the attitude would not promote behaviour change.

The findings presented above suggest that reassuring women that incontinence is common and a normal aspect of ageing whilst offering a range of self-management treatments including PFME would be preferable to simply stating that it is not inevitable.

This recommendation challenges the notion commonly found in PFME literature that women should be corrected in assuming that UI is a normal part of ageing. However, in the literature, the negative aspects of the belief that UI is a normal part of ageing mostly relate to the impact on help seeking behaviour and not on adherence (Dugan *et al*, 2001). The intention to change the belief that UI is a normal part of ageing is often with the view of changing attitudes towards it so that individuals feel more able and comfortable speaking about it, as in the following quote by Wagner and Subak (2010); “*Although incontinence is not a normal part of aging, talking about it should be*” (p.2185).

The importance here, perhaps, is the language used. There is a distinction between the term ‘inevitable’ and the term ‘normal’. Where Gibson & Wagg (2014) are justified in recommending efforts which would “*stop accepting incontinence as an inevitable part of ageing*” (p.160), care should be taken not to make women feel that they are abnormal if they have symptoms as this could exacerbate feelings of discomfort and embarrassment, not to mention, negatively influencing adherence to PFME.

Dialogue about incontinence and the language used to describe it reflects societal attitudes about UI. Anders (2002) describes the effect of societal attitudes about UI and the pressure this puts on individuals. He stated “*The social stigma associated with urinary incontinence can put enormous pressure on the individual; yet so many women still accept urinary incontinence as a common female condition that is unavoidable or even inevitable*” (Anders, 2002, p.225). This stigma is linked to feelings of embarrassment, which is discussed in section 5.2.3.

To challenge the stigma around UI, more care to be taken in the language used to describe UI. Where it is important that UI is not believed to be an ‘inevitable’ part of ageing, it may not be helpful for women to be told that it is not a ‘normal’ part of ageing. Indeed, women should be reassured that UI is a normal part of ageing but

that there are a range of treatment options available which could prevent or improve symptoms. This recommendation should be tested in relation to Koch's call for further research to fully understand the "*help-seeking behaviors of women with UI*" (Koch, 2006, e43).

5.2.3 EMBARRASSMENT

Similar to the attitudes around UI as an inevitable part of ageing and its negative influence on help seeking behaviour, embarrassment is also linked to reluctance in women to report their symptoms. In this section, attitudes which result in embarrassment and their implications are examined and discussed.

In the study by Griffiths *et al* (2009), "*all the women interviewed talked about embarrassment related to urinary incontinence*" (p.28) and they surmised that "*women with urinary incontinence tend to be very embarrassed about the condition*" (p.30). There is a consensus that feelings of embarrassment have a negative effect on help seeking behaviour for UI (Price *et al*, 2010).

Colburn (1994) recommended that health practitioners who were promoting continence services should consider the attitudes of individuals which result in feelings of embarrassment. He suggested that "*it must always be borne in mind that a feeling of embarrassment may prompt individuals to minimize their problem and hence reduce the likelihood of their considering outside assistance*" (p.10).

One study found that embarrassment was not an issue for women seeking help with their symptoms (Basu & Duckett, 2009). However, participants in their study previously had treatment for incontinence symptoms and by inference had previously discussed their symptoms when they initially sought help. This means their finding is not replicable to the wider population of women who have not sought help for their symptoms.

Despite the consensus about embarrassment and the recommendations that it is always borne in mind, there is little in the PFME literature to help understand the attitudes on which it is based. Indeed, in the wider context of healthcare, Mitchell *et al* have suggested that “*more research is needed to examine embarrassment*” (Mitchell *et al*, 2011, p.550).

Participant 9 had never spoken about her incontinence prior to being interviewed on the telephone and mentioned aspects of embarrassment in relation to the general population, her friends and her GPs. She suggested women would have difficulties meeting others with symptoms in PFME classes as they might be embarrassed. This view was shared by participant 20:

‘And I think it’s probably quite a difficult subject to ... they could be embarrassed... Em, it’s not a subject I’ve ever brought up with the GP, because again, I find depending who you get varies with reaction to anything. You definitely have to be selective in who you try to get. And I would think other people find that way as well (Trial participant 9 TP9.10).’

‘But I think some people would be embarrassed ... sit there and giggle about it (Trial participant 20 TP20.4).’

Participant 9 described the reluctance of people to think and talk about symptoms and the lack of general awareness and continence promotion as a barrier to adherence to exercise. This lack of openness about UI was also mentioned by participant 20 who used her experience of working with incontinent elderly people as an example:

‘It’s not a fashionable thing to talk about ... People don’t like to think of that, that they’ll wet themselves, I suppose. But they don’t think “I could do something about it” because its, you don’t pick up many magazines and read about it (Trial participant 9 TP9.11).’

'But I used to work with the elderly and they didn't talk about it at all (Trial participant 20 TP20.5).'

'Raising the profile of them, especially in magazines for people who've just had a baby because that would have been the best time for me to do them (Trial participant 24 TP24.8).'

Participants 9 and 24 thought that public promotion of the subject would help as a prompt to exercise and to help people realise that there was “nothing to be ashamed of”. She identified the Scottish bowel screening awareness campaign that incorporated “the poo song” as being a good approach to a sensitive subject.

The experience of participant 26 was that her embarrassment about her incontinence symptoms and the role of PFME in alleviating symptoms was reduced as a result of participating in this study.

'It has changed my whole attitude towards this and I'm not so shy about it anymore (Trial participant 26 TP26.8).'

The views of participants 9 and 26 suggest that feelings of embarrassment can be reduced by increasing levels of acceptability of UI as a topic. Her views fit with Anders (2002) in terms of the influence of societal attitudes to incontinence on individuals. If UI was discussed more openly and frequently, this may act as a prompt for help-seeking behaviour, self-help, and self-management. This fits with the recommendation made in the previous section that the notion that UI symptoms are ‘normal’ can positively influence adherence. In *Chapter 6*, the influence of other people, the media and wider society in relation to PFME will be further examined.

5.2.3.1 APPS AND EMBARRASSMENT

The potential for hand held devices, such as smart phones, to provide discreet and handy support has been recommended in recent mHealth research (Perry *et al*,

2012; Rosser *et al*, 2011). As part of this study, evidence was gathered around the use of apps for PFME and the potential for women to improve or prevent UI symptoms was investigated. It was proposed that smart phone apps may provide a means of support which bypassed the need to present with or speak about symptoms and that this may be useful in reaching the silent millions of women with unreported UI who were too embarrassed to talk about their symptoms. One of these women took part in the trial, was allocated to the intervention group and was interviewed about her experiences and data around her experience is discussed in the following paragraphs.

Participant 9 experienced leakage of urine on average about once a day in the four weeks prior to the start of the trial but, it transpired through the telephone interview, that she had not mentioned her symptoms to any other person prior to the interview. She was the type of person considered to potentially benefit from the discreet nature of the PFME app but, although she was provided with an iPod touch and a selection of apps to choose from, she did not use the device. She noted that she could not get grips with the iPod, she did not understand how to work it properly and she was not used to such modern technology.

Data about this participant shows that she found it difficult to adhere to PFME; dialogue during the telephone interview focussed more on this difficulty and what might have helped to resolve it. Interestingly, participant 9 suggested mechanisms which were available in some of the apps such as timers, reminders and 'push' messages. This suggests that, if she had been supported in learning to use the device she may have been able to benefit from these features. It is not clear how this support might be provided without direct human interaction.

In order for women with unreported UI symptoms to benefit from the features in apps which could support their adherence to PFME, it is likely that improvement in general levels of mobile digital literacy would be beneficial. The increased digital literacy would allow women to discreetly download and use apps without any face-to-face contact. The implications of this finding is that there is untapped potential for smart

phone apps to meet the needs of individuals with UI and the most effective way of unlocking this potential is by raising mobile digital literacy.

As well as being embarrassed about symptoms, the notion that symptoms are unimportant and the lack of illness identity can also influence help seeking behaviour. This is discussed in the following section (5.2.4).

5.2.4 ILLNESS IDENTITY AND AWARENESS OF TREATMENTS

There can be a lack of illness identity in relation to incontinence (Getliffe & Dolman, 2007). Some women may not rate the perceived bother of symptoms highly if they have co-morbidities that are perceived as being more serious (Sells & McDonagh, 1999; Teleman *et al*, 2005). This was confirmed by Basu & Duckett (2009, p.727) who found that *“a common reason given for not seeking treatment was the belief that incontinence was a condition of relatively little importance when compared with other medical problems”*.

Taunenbaum *et al* (2010) found that women imagined that there was nothing that could be done to treat their symptoms and Basu & Duckett (2009) found that attitudes to the availability of treatments were a barrier to seeking treatment.

As reviewed in the previous section about inevitability (section 5.2.2), if women do not recognise their symptoms as a problem and if they are unaware of how the problem may be solved, this will contribute to the lack of help-seeking behaviour in UI. This can become a ‘vicious cycle’ as by not seeking help for their condition, women are not aware of the range of treatments which are available, including PFME. There are obvious barriers to behaviour change, if women are not aware of the benefits of exercising; of sequelae of not exercising; or if they have never heard about the exercises.

Linked to the lack of illness identity and the lack of awareness of treatment options is an attitude that PFME are unnecessary. One of the mothers of young children from Hilton asked in surprise “*So is this something you should do all your life?*” This attitude was found by Fine *et al* (2007). In their study “*most women indicated that the pelvic floor muscle exercises seemed unnecessary in the absence of incontinence symptoms*” (Fine *et al*, 2007, p107e3).

So far in this chapter about the characteristics of women and how these impact on PFME, the focus has been around incontinence. The remaining subchapters examine the influence of a range of other characteristics.

5.3 HOW DOES MOTIVATION INFLUENCE ADHERENCE TO PFME?

As PFME requires the active participation of women, a key success factor is motivation (Borello-France *et al*, 2010; Dolman, 2007). Burgio (2004) suggests that women will “*require a great deal of encouragement and motivation*” (p.4).

There is, therefore, a consensus that motivation is associated with a positive outcome for PFME (Williams *et al*, 2006; Freeman, 2002) and recommendations for research into factors influencing motivation and adherence (Paddison, 2002; Dolman, 2007; Borello-France *et al*, 2010) have been made by a range of experts in the field. Paddison (2002) suggested that ‘health professionals develop an understanding of factors that can influence motivation’ (p.37) as well as exploring with patients the factors which might influence their lack of motivation. Borello-France *et al* (2010) state that addressing motivation is of central importance to continence promotion (p.1500). Despite these recommendations, Laycock (2008) states that “*the evidence supporting factors that influence motivation to an exercise program for incontinence is scant*” (p.181).

Studies about PFME commonly involve participants who have incontinence symptoms (Brubaker *et al*, 2008) and who have some contact with a continence

service (Dumoulin & Hay-Smith, 2010). This would indicate that motivation to improve continence is a common factor influencing the participants in these studies about PFME.

Research presented in this thesis is one of only a few studies where participants were community dwelling women who were recruited directly from the community and not through a clinical or health setting. In other community based PFME studies that have been published, participants are normally either pregnant or have incontinence symptoms (Hay-Smith *et al*, 2008; Dumoulin, 2010).

In this thesis, the community based recruitment process facilitated participation of women who had no symptoms and those who may have undiagnosed incontinence. This study therefore contributes to the gap in knowledge about motivation from a general population perspective. In addition, as the reluctance to report symptoms to health professionals has been identified in the literature (Sells & McDonagh, 1999) and experts have suggested that the wider population includes many women who suffer symptoms in silence (Basu & Duckett, 2009), this study contributes to understanding about this hard to reach population of which little is known. The focus of the study is, therefore, uncommon and the population studied in this context is unique.

Although motivation has been identified as a factor which should be considered in the promotion of and adherence to PFME, there is very little in the literature about what is specifically meant when the term is used. Ryan & Deci (2000) argue that *“motivation is often treated as a singular construct”* and that *“people are moved to act by very different types of factors with highly varied experiences and consequences”* (p.69). Indeed, Cammu *et al* (2004) found a lack of detail about motivation in the PFME literature. This included the lack of *“any validated measure of motivation”* (p.1156). They point to complexities around motivation for PFME and the influence of wishes such as *“desire of future childbirth, rejection of surgery, or the ability to cope with a certain degree of incontinence”* (p.1156).

This gap in the literature would suggest that there is a lack of understanding about motivation for PFME but clearly, it is both multifaceted and multidimensional. In addition, there also appears to be some cross over and confusion in the use of the term 'motivation' with the terms 'adherence' and 'compliance' (Delamater, 2006, Chao *et al*, 2000, p.S215) as discussed in section 2.2.3.1. There is further confusion by their use in the various disciplines within health and sports psychology, as discussed in section 4.4.2.

Unusually, Cammu *et al* (2004) have been more explicit about the difference between the terms by stating that “*adherence to therapy is not synonymous with motivation*” (p.1156). There is, therefore, a need for common understanding of the use of terms so that confusion can be avoided.

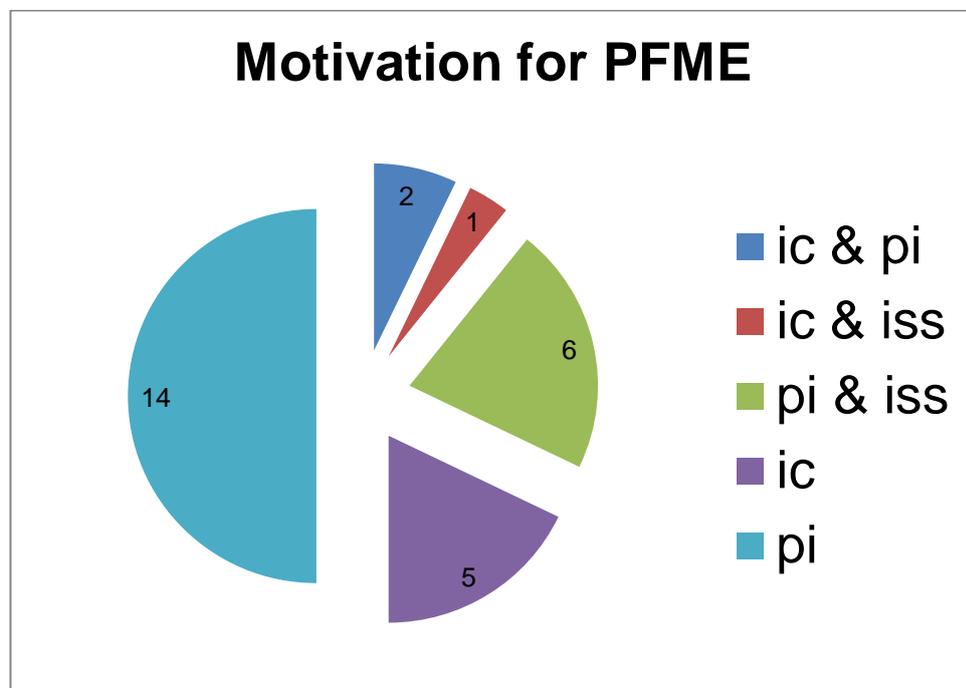
As outlined in section 2.2.3.1, to avoid duplication in meaning between the definitions of motivation and adherence, for the purposes of this thesis the term 'motivation' has been used to refer to the desire to start and to initially set out to exercise. The term 'adherence' refers to maintenance or an increase in the amount of exercise undertaken over a period of time.

In this section, motivation is considered in its capacity as a mechanism for behaviour change. Findings will be presented around factors which might help women start to exercise and initially set out to strengthen their pelvic floor muscles. Links between motivation and adherence to exercise will also be discussed.

Baseline data gathered prior to the start of the trial included responses to a question about motivation to exercise. The question was “*which of the reasons, if any, make you want to strengthen your pelvic floor muscles?*” Answer options included; to improve continence, to prevent incontinence, and to improve sexual sensation.

The term ‘improving continence’ indicates that a level of incontinence is present and the participant is motivated to reduce symptoms by exercising their pelvic floor muscles. The term ‘preventing incontinence’ indicates that the participant currently has no incontinence symptoms but is motivated to exercise in order to prevent symptoms occurring in future. The term ‘improving sexual sensation’ indicates the participant is motivated to exercise because of the benefits of increased muscle strength during sexual intercourse for both partners.

Figure 23 showing motivations for PFME



ic	Improving continence
pi	Preventing incontinence
iss	Improving sexual sensation

As illustrated in Figure 23, eight participants said they wanted to strengthen their pelvic floor muscles in order to improve continence (ic). Of these, two also indicated that they wanted to prevent incontinence (pi) and one participant also indicated that she wanted to improve sexual sensation (iss).

Altogether, twenty two participants said that they wanted to prevent incontinence. Of these, six also wanted to improve sexual sensation and two others also want to improve continence.

The three motivations described above are discussed in the following sections in relation to adherence to exercise. Other influences on motivation are also discussed.

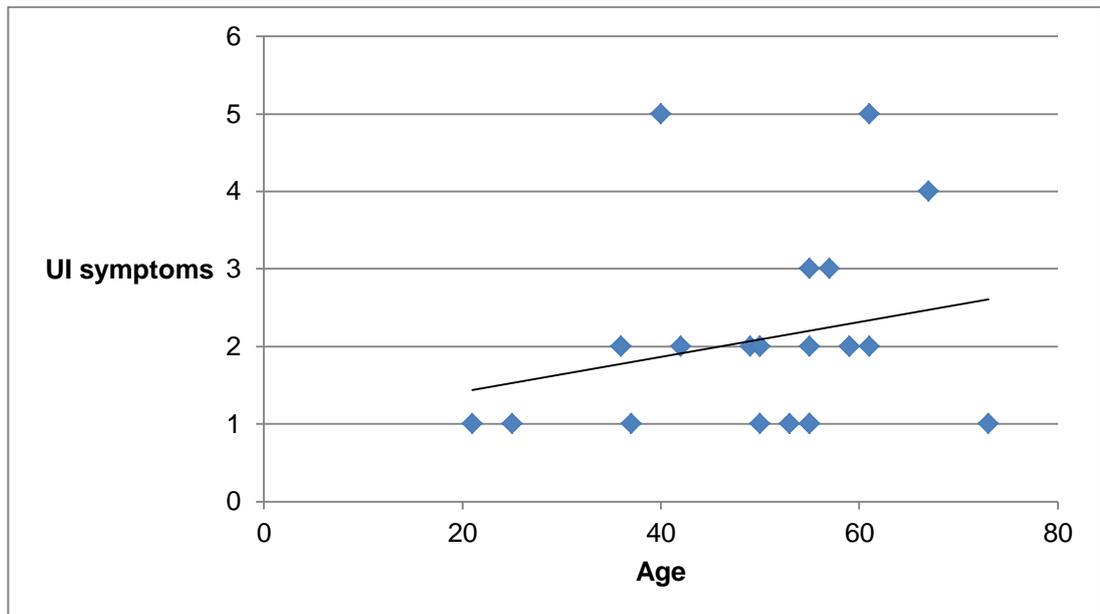
5.3.1 MOTIVATION TO IMPROVE CONTINENCE

In this section, the motivation to improve continence is examined. Data from the explanatory trial is presented and this is supplemented by data from focus groups and telephone interviews where motivation was mentioned.

In the trial, eight of the participants recruited to the trial (n = 28) stated that they wanted to exercise to improve continence, two of whom also stated they wanted to prevent incontinence. Of these, all but one had UI symptoms; the level of symptoms ranged from involuntary leakage of urine about once a week or less often to leakage several times a day. Three of the participants said they were unsure if exercising was effective in preventing and curing incontinence. Two of the participants, both with mild symptoms, also selected 'preventing incontinence' as a motivation to exercise. The one participant who wanted to improve continence and sexual sensation did not have any incontinence symptoms.

The age of the women who said they wanted to improve continence ranged from 36 to 67 years. The median age was 47 years. Figure 24 below represents the ages of participants with UI symptoms.

Figure 24 showing UI symptoms with age (linear trend line)



One participant (22) who had no UI symptoms selected improving continence as a motivation for exercising. She did not select the option, 'preventing incontinence' as a motivation. This may be an indication that there was a lack of understanding about the language used and that some confusion resulted. This indicates a lack of robustness in the questionnaire as a measurement tool.

When the questionnaire was being piloted, there were no queries about the language used and hence the categories were assumed to be self-explanatory. However, as the informal piloting process involved friends and family of rural health researcher completing the draft questionnaire, this small sample population is unlikely to reflect the wider population, and the assumption that the categories about motivation were self-explanatory may have been incorrectly made.

An explanation of the terms or the use of different wording may have helped to avoid any misunderstanding between the terms 'improving continence' and 'preventing incontinence'. In future research about motivation for PFME, it would be worthwhile

including a larger sample of the population to pilot the questionnaire and to include more careful consideration of the terminology used.

5.3.1.1 MIXED MOTIVES AROUND INCONTINENCE

In this section, some of the influences on motivation around incontinence are discussed. In a study by Borello-France *et al* (2010) it was suggested that participants may have been motivated to exercise to please their continence clinicians who conducted the study and to whom the participants reported adherence. In addition, they identified a potential influence of the co-administration of antimuscarinic medication on the motivation to exercise (p.1493).

NICE identified the potential influence of biofeedback and the information and support from health professionals received as part of the service on the motivation of patients to exercise. Williams *et al* (2006) identified the frequent contact with a health professional from a continence service and the support and encouragement which they provided as having a positive influence on motivation (although, using the working definitions used in this thesis, Williams *et al* (2006) are referring to adherence as opposed to motivation).

Where Williams *et al* (2006) describe the positive influence of health professionals, Paddison (2002) suggests that the influence can be demotivating with women wanting to avoid the need to confess to the health professional if they have failed to adhere to the exercise regimen. The role of others, including health professionals, is discussed further in chapter 6, *The Characteristics of their Environment*.

Participant 26 found that by participating in the study she started to understand that by exercising she could be proactive in improving her incontinence. The opportunity of participating in the study acted as a motivation and she found it empowering (TP26.6 p.173).

Participant 20 talked about the impact of incontinence on her daily life and how she was constantly aware of it. The severity of her symptoms (leaking several times a day) was the main motivating factor for her to want to strengthen her pelvic floor muscles by exercise.

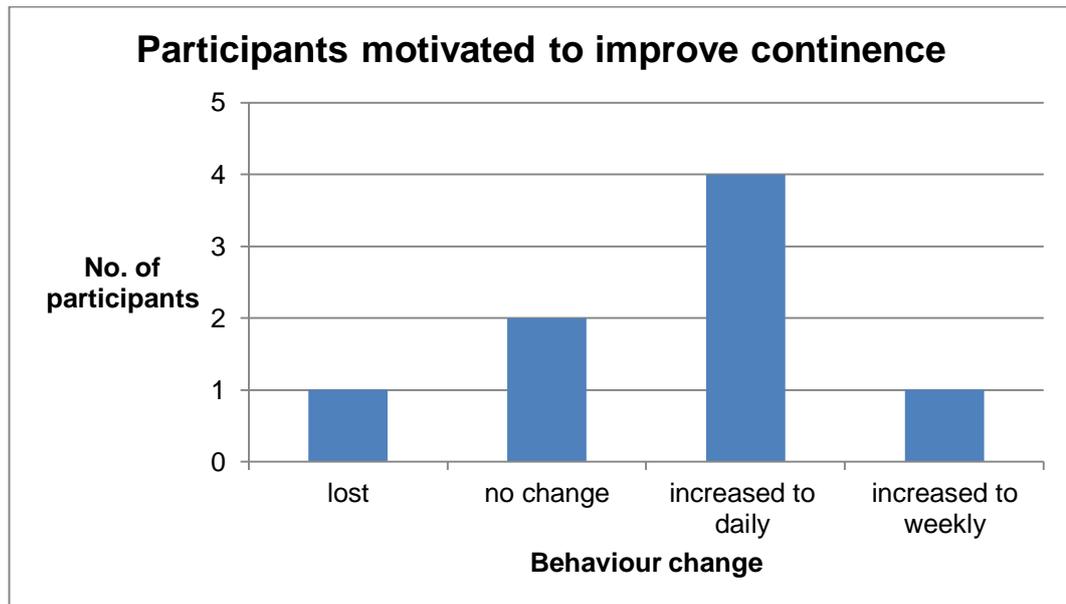
Participant 9 mentioned that she “*started off with good intentions*” in trying both to manage symptoms and prevent deterioration but added that going on holiday, other distractions and a feeling that symptoms were deteriorating acted to reduce her motivation. During the interview with participant 9, it became apparent that this was the first time she had discussed her incontinence with anybody. Her experience as an older woman experiencing daily leakage of urine but with no diagnosis of incontinence is an example of the hard to reach population of women who suffer in silence.

In this section, the motivating factor of improving continence has been explored. It is clear that the opportunity to improve the symptoms of incontinence is a positive influence in motivating women to exercise. Now, the link between improving continence as a motivation to exercise and exercise adherence will be investigated.

5.3.1.2 ADHERENCE AND IMPROVING CONTINENCE

Of the eight participants who stated that they were motivated to exercise to improve continence, seven completed the trial. Of these seven, four participants increased their level of exercise to at least once a day and one participant increased to weekly exercise. The two remaining participants did not change their level of exercise. These results are illustrated in Figure 25 below and would indicate that although the motivation to improve continence can have a positive influence on adherence, it is still possible that some women who have symptoms and want to exercise to improve symptoms will not be successful in adhering to the exercise.

Figure 25 showing change in level of exercise with motivation to improve continence



The implications from these results are that, for many women with incontinence symptoms, the possibility of improving their symptoms with PFME is a motivating factor in starting out with the exercises. For some of these women, the possibility of improving symptoms and some signs that symptoms are in fact improving, will also be positively linked to exercise adherence. However, for some women with incontinence, although they want to exercise to improve their symptoms, this may not be sufficient to actually change their behaviour.

This means that in the promotion of continence, there is much benefit from harnessing the motivating factor of symptom improvement but this alone should not be relied on to be an effective mechanism for behaviour change for all women with symptoms. For women for whom the improvement of continence is insufficient to support their adherence to PFME, it is important to consider what other factors have impacted on their adherence such as the “*desire for a normal daily lifestyle*” and “*the ability to visualize progress*” (Milne & Moore, 2006, p.41).

5.3.2 MOTIVATION TO PREVENT INCONTINENCE

In the previous section, the focus was on the motivation to improve the symptoms of incontinence; here the focus is on prevention of symptoms. Trial results about motivation for PFME for incontinence prevention are presented and discussed along with qualitative data from participants' notes and interviews and from focus group discussions. The section will conclude by examining links between the motivation to prevent incontinence and adherence to PFME.

Participants in the focus groups were not asked directly if they had incontinence symptoms but the topic was used as the broader context for the discussion about PFME and the apps for PFME. Participants discussed role of exercise in preventing and controlling symptoms. One mother spoke about her enthusiasm for exercise not simply to prevent incontinence symptoms but to avoid surgery if her prolapse worsened.

'I don't have any incontinence problems, touch wood, as yet, but I mean the chances are, if I don't do anything they'll probably operate but, I mean, I'd love to not have that done. I'd love to sort it out just through exercise (Participant from Nairn focus group with mothers of young children NM15).'

In the explanatory trial, twenty two participants said that they were motivated by wanting to prevent incontinence. Interestingly, half of these women experienced leakage but only two of them also stated that improving continence was also a reason for exercising; nine of the eleven women who experienced leakage did not select improving continence as an additional reason for exercising (despite being told that they could choose more than one option).

This may illustrate a lack of understanding of the terms. Alternatively, it may be an indication that they accepted their current levels of incontinence and although they thought it was possible to prevent deterioration, they did not believe or were unaware that they could improve their symptoms by exercise.

Bowling (2009) suggests that “*people’s behaviour in relation to health is related to their perceptions of the severity of an illness, their susceptibility it ...*” (p.39) and notion of illness identify is discussed in section 5.2.4. It may be the case that women who have light bladder leakage do not associate these symptoms with the word incontinence, which would be associated with more severe symptoms. Indeed, much of the advertising of products for women with mild symptoms does not include the word incontinence. Future community based studies should include more questions about motivation using different terminology to avoid misunderstanding around the term incontinence.

Not only was there some misunderstanding about the term incontinence, there was a lack of awareness of the role of PFME in preventing incontinence and of the benefits of exercising throughout the lifespan. This lack of awareness meant that women are less likely to be motivated to exercise. As described in the earlier section about knowledge (4.5), when women did become aware of the benefits of exercise they indicated they were more likely to exercise, as suggested by the experiences of focus group participants presented below.

The mothers of young children seemed conscious of the potential negative effect of parity and the importance of exercising their pelvic floor muscles during and after pregnancy. However, some were quite surprised at the suggestion that they should continue to exercise in the longer term. There was a sense that motivation to exercise was higher in women who received health promotion messages delivered as part of pre- and post-natal care. However, when these messages were no longer given, women forgot all about it.

But you’ve just had a baby and that means you’re hearing all about it ... when, once they stop doing all that (post-natal care) you forget all about it. (Participant from Hilton focus group with mothers of young children HM5’).

Women in the focus groups who had multiple births or high parity spoke convincingly about the need to exercise. In particular, a woman who suffered from a prolapsed bladder was strongly motivated to exercise in an effort to avoid future surgery.

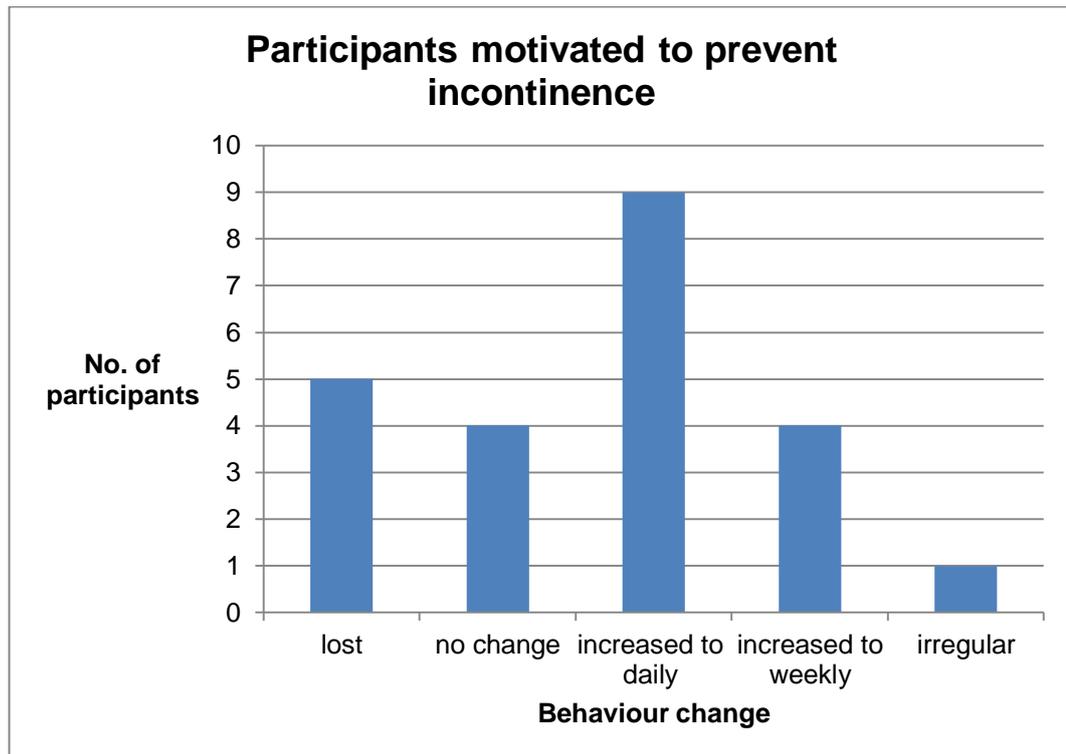
5.3.2.1 ADHERENCE AND PREVENTING INCONTINENCE

Of the twenty two participants who stated that they were motivated to exercise to prevent incontinence, eighteen completed the trial. Of these eighteen, nine participants increased their level of exercise to at least once a day, two maintained daily exercise, and four participants increased to weekly exercise. The two remaining participants did not change their level of exercise. These results are illustrated in Figure 26 below and would indicate that although the motivation to prevent incontinence can have a positive influence on adherence, for some women this is insufficient to sustain behaviour change.

The motivation to exercise pelvic floor muscles in order to prevent incontinence has been shown in this section to be effective in prompting behaviour change and as a mechanism for change with fifteen trial participants exercising daily or weekly by the end of the trial. For the three trial participants who did not change their behaviour to exercise any more regularly than at the start of the trial or whose change was negligible, the motivation was insufficient to effect behaviour change. Raising awareness of the role of PFME in preventing incontinence is likely to increase levels of motivation for exercise; in turn, this is likely to positively influence adherence.

In terms of the self-management agenda and promotion of preventative health behaviour, it is encouraging that in this trial, 43% of women (n=12/28) who participated had no symptoms but were sufficiently motivated by the prospect of prevention of incontinence to engage in the study.

Figure 26 showing change in level of exercise with motivation to prevent incontinence



The words 'continence' and 'incontinence' may be confusing to individuals who are unfamiliar with them and data from the trial indicates that this may have been the case with some of the participants. Instead of just giving three options as potential reasons to motivate exercise, an open question could have been included in the questionnaire to allow participants to use their own words to describe their motivation. Despite potential confusion over terms, it is clear that women are motivated to exercise for both the prevention and treatment of continence.

Given the complexity of trying to understand, and furthermore to measure 'inner prompts' within individual women, it is clear that motivation for PFME is a subject on which we have barely scratched the surface. Further research into this field would be useful in informing the promotion of PFME to prevent incontinence and to treat symptoms.

5.3.3 MOTIVATION TO IMPROVE SEXUAL SENSATION

Previously in this chapter motivations to exercise of women around the prevention and treatment of UI were discussed and findings from the trial presented. This section discusses the aspect of PFME in improving sexual sensation as a motivation for exercise.

Baseline data gathered prior to the start of the trial included responses to a question about motivation to exercise. The question was “*which of the reasons, if any, make you want to strengthen your pelvic floor muscles?*” Answer options included to improve sexual sensation and participants were encouraged to choose more than one option if it applied. The term ‘improving sexual sensation’ indicates the participant is motivated to exercise because of the benefits for both partners of increased muscle strength during sexual intercourse.

Thirty years ago, Colburn (1994) proffered the notion that sexual contact was an “*extremely good opportunity for a woman to determine whether or not she is using the correct muscles when exercising her pelvic floor*” and that sexual pleasure was a factor which could motivate women to exercise and to “*persevere with a programme of pelvic floor exercises*” (p.80). Years later, Dolman (2007) suggested that the sexual benefits of pelvic floor muscles should be promoted to encourage women to exercise throughout their life course. Getliffe & Thomas (2007) found that “*professionals rarely initiate advice on sexual activity*” (p.8). There are sensitivities and barriers faced by health professionals in talking about sex to patients in a primary care type setting (Gott *et al*, 2004), and these will impact on the promotion of PFME for sexual benefits. Consequently, the opportunity to harness sexual sensation as a motivation for PFME appears to be missed.

In focus groups, where the topic of sexual sensation was considered in a general sense, there was some amusement and fun among participants. However, once individuals considered having an app which promoted the sexual benefits on their own phone, some participants spoke about how uncomfortable they would be with

the prospect. One participant specifically mentioned that the sexual implication of undertaking PFME would be off putting and made it clear that her motivation was purely for health.

None of the women in the focus groups spontaneously mentioned the benefits of PFME for sexual sensation and the topic only arose when the app which had an explicit sexual theme was looked at. On the whole, the response from most women was to laugh and joke about it:

'Is it 'x' rated', 'We don't mind (Participants from Nairn focus group with older women NO8).

'Bit late for us I'm afraid!', 'Especially the sex (Participants from Nairn focus group with older women NO9).

Whereas, two of the more mature mothers of young children were uncomfortable about the sexual theme:

'I don't like the sexual implication of it. That would put me off to be honest with you ... I don't know why, it just would. But you're doing it for your health really ... Yeah, personally, that would put me off (Participant from Nairn focus group with mothers of young children NM16).'

The mature mother from Hilton mentioned her embarrassment at the thought of others being aware of a sexual motivation for exercising:

'Oh, I wouldn't want that on my phone, if anyone picked it up [laughing] (Participant from Hilton focus group with mothers of young children HM6)!'

Because of the hilarity and negative comments about the sexual theme during the focus groups, it is difficult to gauge whether some of the other focus group

participants may have been motivated by sexual sensation but were just not comfortable in acknowledging that to the group. This may be especially true for the younger mothers who were not so confident in speaking out. One of the younger mothers from Nairn suggested that she and her partner could have fun using some of the apps together but it was not explicit that this would be of a sexual nature.

Similarly, although seven trial participants indicated that they were motivated to increase pelvic muscle strength to improve sexual sensation, none of these women referred to it again in the trial material they returned. Two of these women were subsequently interviewed but, again, neither mentioned it.

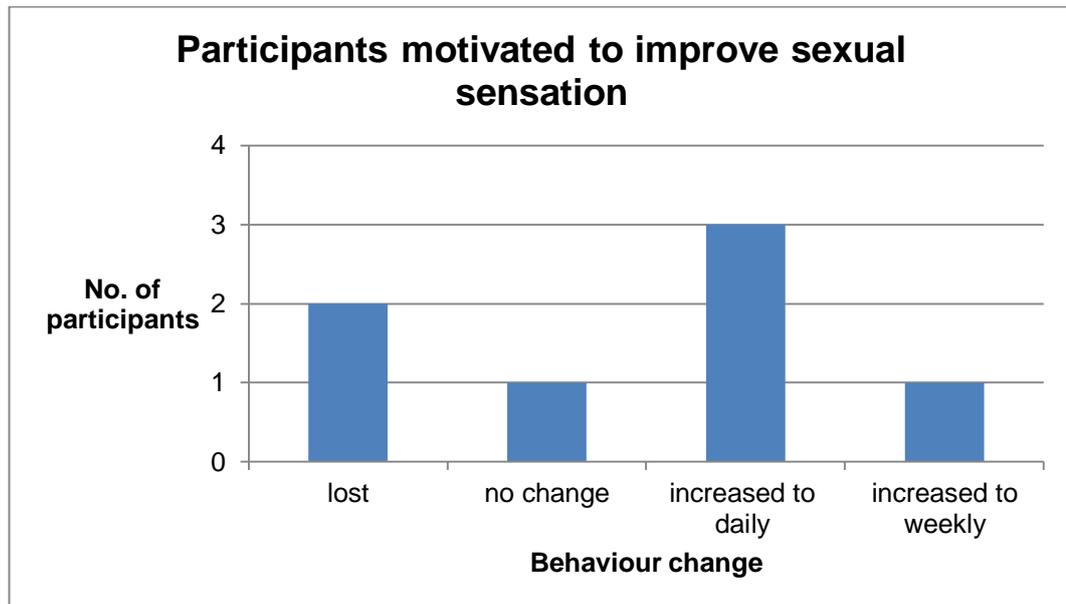
Two of the women who indicated that improving sexual sensation was a reason for exercising experienced the leakage of urine once a week or less often. The five others did not have incontinence symptoms. The age of the women who identified the improvement of sexual sensation as a reason for exercising ranged from early twenties to late fifties. The median age was 45 years. None of the women gave sexual sensation as their only reason for wanting to strengthen their PFM.

5.3.3.1 ADHERENCE AND SEXUAL SENSATION

Of the seven participants who were motivated to improve sexual sensation, two did not complete the trial. Three out of five of those who completed the trial increased their level of exercise to daily, one maintained daily exercise and the final participant increased to weekly exercise (Figure 27).

This data must be considered in the context of small participant numbers. In addition, none of the participants chose improving sexual sensation as their only motivation and, therefore, it is not possible to separate the influence of motivations related to incontinence.

Figure 27 showing change in level of exercise with motivation to improve sexual sensation



As mentioned previously, the complex nature of motivation, combined with the small numbers involved in the trial, mean that it is not possible to use sexual motivation, as a single factor, to predict adherence. It is undeniable, however, that the motivation to improve sexual sensation can be useful in supporting adherence.

Although these findings indicate that improving sexual sensation can act as a motivation to exercise, there is a reticence among women to discuss this in anything other than the most general terms. It suggests that if Dolman's recommendations (that sexual benefits of PFME should be promoted) are to be implemented, some sensitivity would be required (Dolman, 2007).

Findings suggest that women may not be comfortable talking directly about having a sexual motivation to exercise but raising awareness of the sexual benefits of exercise and the role muscles play in sensation of both partners may be useful in increasing levels of exercise for some women.

A study by Griffiths *et al* (2010) found that although women may initially be embarrassed by talking about sensitive issues around UI in a group setting and patients indicated a preference for individual sessions with a physiotherapist, there was potential for group sessions to be effective in helping patients. They suggest that providing information about content prior to the group sessions is helpful and account should be taken of the potential embarrassment. This approach may be useful for awareness raising sessions about the sexual benefits of PFME.

The sexual element of one of the apps shown to participants in focus groups initiated some discussion about the topic. Some participants made it clear they would not want PFME to be associated with sexual sensation nor would they want an app which had sexual content on their phone. However, evidence from the trial would indicate that some women are indeed motivated to exercise to improve sexual sensation. The discreet and fun nature of PFME apps which include a sexual theme may allow these women to access support for exercise without the embarrassment of talking about sexual motivation in a face-to-face setting.

In addition to embarrassment around incontinence as described previously, it is clear that embarrassment around sexual sensation also negatively impacts on access to information and support for PFME.

5.3.3.2 SEXUAL CONTENT OF APPS

In this next section, sexual content of PFME apps is presented and discussed. Similar to the embarrassment felt by talking about UI, sex can also be a sensitive subject to discuss and is rarely initiated as a topic by health professionals in relation to PFME (Getliffe & Dolman, 2007). A study with adolescents found that text messages sent to a mobile phone was an effective means of promoting and communicating sexual health information and education in a way that offered a high level of privacy (Perry *et al*, 2012).

If the “*one phone: one person*” nature of mobile phone use and penetration (Partick *et al*, 2008, p.177) provides opportunities for increased use in the communication of “*sensitive topics like sexual health*” (Perry *et al*, 2012, p.223), it should also provide opportunities for the communication of the sexual benefits of PFME as Colburn (1994) recommended.

When it came to discussing the app which had some sexual content, one mother in particular was very clear that she found it off putting. She disliked it and there seemed to be a consensus in the group that this app was not so acceptable. This reaction was replicated in the Hilton group where one woman was clear that she would not want the app on her phone in case anyone else saw it. However, some of the younger women seemed more accepting of the app and of recognising the sex related benefits of doing the exercises:

‘I don’t want to have sex with Emily. Yeah, personally, that would put me off (Participant from Nairn focus group with mothers of young children NM17).’

The older women’s group in Nairn said they didn’t mind the app with sexual content, and indeed had quite a laugh about it, but suggested that it was a bit late for them!

Perry *et al* (2012) found that some of the adolescent participants in their study were embarrassed at the thought of their parents or peers seeing text messages about sexual health on their mobile phones.

As some mothers give their mobile phones to their children to play games, they may be uncomfortable at having content of a sexual nature which might be inadvertently discovered. The “*one phone: one person*” nature of mobile phones means that any age restriction only applies when the app is purchased and not when the app is used (when the assumption is made that the purchaser is the user). If a smart phone is shared, there is a loss of privacy which may impact on the use of PFME apps which are geared at improvement of sexual sensation.

In the trial, participants did not initiate discussion about the role of PFME in improving sexual sensation, despite the fact that seven participants identified it as one of their motivations to exercise. In the telephone interviews, the topic was not discussed.

It is clear that women can be motivated to exercise to improve sexual sensation and that there is potential for smart phone apps to be useful and fun in supporting this motivation for PFME. This includes games which both partners could be involved with.

However, as with incontinence as a subject, the sexual benefits of PFME are commonly found to be an awkward and embarrassing to discuss. Although there is potential for smart phone apps to facilitate discreet access to information and to support PFME from this perspective, this is not the case when phones are left lying around and can be seen by other people. There are challenges in promoting the sexual benefits of exercise on an app that is not perceived as 'seedy' or that could be interpreted as pornography on first glance.

5.3.4 OTHER FACTORS RELATING TO MOTIVATION

In the focus groups, there was a general consensus that PFME would be a good thing to do and that participants should be doing them. However, some participants acknowledged there was a difference between this general attitude and their motivation to actually exercise. One mother of young children compared this to dental flossing:

'Cause it's the kind of thing you know you should do but you just don't ever bother ... like flossing (Participant from Hilton focus group with mothers of young children HM7)!

In relation to the role of information and the teaching of exercise, different views were expressed on the effect on motivation. The older women did not welcome “*someone telling you what to do*” and said there was no motivation in “*just sitting there getting lectured*”. Whereas, one of the mothers of young children in the Hilton focus group identified the positive effect of being told to exercise by health professionals around the time of childbirth.

The focus groups acted to increase awareness of the risks of developing symptoms in the future and that exercises could help to prevent the onset of symptoms. Menopause was discussed in the Hilton focus group as a risk factor for UI symptoms. This newly acquired awareness resulted in participants wanting to start exercising. This was not just the case for the perimenopausal mother; younger participants seemed also to be prompted by this awareness to start exercising.

One of the Nairn mothers suggested that it would be a good thing to be part of a group of people exercising where it was possible to “*get to know other people*” and to have “*a little bit of banter*”. This indicated that having others to exercise with would have a positive influence on her motivation to exercise. The role of others is discussed in more detail in the section 6.6.

As mentioned previously, the fact that the women were prepared to participate in the trial, and were sufficiently committed to complete the baseline, post-trial and follow-up questionnaires, provided some evidence of motivation to exercise. In addition to this, some of the women referred to their motivation during the telephone interviews:

‘I was really keen to do it (Trial participant 1 TP1.3).’

Other women talked about their motivation being promoted by taking part in a research study (Trial participants 18 and 24). Having a sense of obligation to or connection with the researcher acted to motivate some participants. This is discussed in more detail in section 6.7.4 about the influence of the research

environment. In the next section, the potential influence of apps to motivate exercise is considered.

5.3.5 APPS AS A MOTIVATING FACTOR

In relation to apps for PFME, the notion that the apps would be fun to use was indicated to have a positive influence on motivation for exercise. One of the mothers of young children in Nairn thought that the different levels for exercise on one of the apps could inspire motivation; this is linked to the element of competition which is discussed in the previous chapter.

There may have been a positive impact on motivation from being allocated to the intervention group and being sent a new iPod Touch to use for the duration of the trial. However, as not all participants in the intervention group enjoyed the technology and some barely used the iPod Touch, it is not possible to measure the impact between the intervention group and the control group. However, as can be seen from the comments by Participant 1 below, there can be negative impact on motivation from being allocated to the control group and not getting the apps.

The negative impact from being allocated to the control group and not being sent the iPod Touch or the apps was discussed by Participant 1. She identified 'the app' as a factor which would have helped her to exercise more. Below are her comments about the impact of not having the app:

'I think if I had the app, I think I would have probably been more, way more likely to have done it everyday day, if I'd had the app. Rather than remembering to do it myself ... Yeah, I think that if I'd had the app I would have been more inclined to have done it because there would have been something reminding me to do it (Trial participant 1 TP1.4).'

None of the other participants from the control group expressed disappointment at not receiving the app nor reported that any negative influence on their motivation.

5.4 CONCLUSIONS

Chapter 5 concentrated on the areas of urinary incontinence symptoms (5.1), beliefs and attitudes to incontinence and PFME as a treatment (5.2), and motivation to PFME (5.3).

Of the women recruited to the trial, 57% (n=16/28) experienced symptoms of incontinence. Fifteen out of the sixteen participants with UI completed the three month trial. However, when the adherence of participants is compared, there is very little difference between those with symptoms and those with none and the data suggests that participants with no symptoms were as likely to adhere to exercise at both 3 months and 12 months. Those in the intervention group who had symptoms were not any more likely to find the apps helpful than those in the control group.

Participants who completed the trial became stronger in their belief that PFME were effective in alleviating or preventing UI when this was measured by a question before and after the trial. However, a difference appeared between the questionnaire data and telephone data for participant 9 which suggests that a single question may be a blunt tool for measuring belief. Education that UI is a treatable condition and the promotion of PFME as the first line of treatment is required.

Over 60% of participants agreed that incontinence was a normal part of ageing (n=17/28) but this did not negatively influence their adherence to PFME. Indeed, thinking of UI symptoms as normal was found to positively influence adherence to PFME. Reducing stigma and feelings of embarrassment about incontinence was considered helpful for women both to report symptoms and to adhere to PFME. Although there are opportunities for apps to be accessed without the embarrassment of face-to-face contact with a health professional, evidence from this study would suggest that increased levels of mobile digital literacy would be required.

Results from this study show that although motivation to improve continence can have a positive influence on adherence, it is still possible that some women who have symptoms and want to exercise to improve symptoms will not be successful in adhering to the exercise. Data from this study suggests that for many women with incontinence symptoms, the possibility of improving their symptoms with PFME is a motivating factor in starting out with the exercises; however, this may not be sufficient to actually change their behaviour.

In this trial, 43% of women (n=12/28) who participated had no symptoms but were sufficiently motivated by the prospect of prevention of incontinence to engage in the study. Findings suggest that raising awareness of the role of PFME in preventing incontinence is likely to increase levels of motivation for exercise; in turn, this is likely to positively influence adherence.

Seven trial participants indicated that they were motivated to increase pelvic muscle strength to improve sexual sensation, but all seven also identified either preventing or improving incontinence as a motivation. There are sensitivities around sexual motivation for PFME and some focus group participants expressed uneasiness about the possibility of having apps of a sexual nature on their mobile phone. However, given that a quarter of participants identified the sexual benefits of PFME as a motivating factor for undertaking the exercises, there is potential for the topic to be utilised in the promotion of PFME.

In the next chapter (6), the focus changes to the characteristics of women and their environment and how these can influence adherence to PFME.

CHAPTER 6: HOW DO THE CHARACTERISTICS OF WOMEN AND THEIR ENVIRONMENT INFLUENCE ADHERENCE TO PFME?

In Chapter 4, the influence of specific exercise factors on adherence were considered and Chapter 5 focused on incontinence, beliefs and attitudes, and motivation. Chapter 6 opens up to view broader influences on PFME. Initially, the influences of age (section 6.1), lifestyle (section 6.2) and socio-economic status (section 6.3) are considered. Thereafter the role of personality (section 6.4) and previous experience of changing health behaviour (section 6.5) are investigated. The final two sections of the chapter focus on the health and social environment of women (section 6.6) and the influence of wider society (section 6.7).

6.1 WHAT IS THE INFLUENCE OF AGE ON PFME?

In the literature, it is well established that prevalence of UI increases with age and risk factors include pregnancy, parity and menopause (NICE, 2006). In this section, findings from the research study are presented on the influence of age, the onset of menopause and the length of time since the birth of the last child.

In relation to age, it has been suggested that a “*subtle ageism*” exists not only amongst healthcare professionals but amongst older people themselves (Palmer, 2002, p.396). This ageism can be connected to beliefs and attitudes around the inevitability and unavailability of incontinence, as discussed previously in section 5.2.2. In this section the focus is on the age of participants to see if age, not simply an attitude about ageing and incontinence, influenced adherence to exercise. The influence of age on the acceptability of apps for PFME will also be discussed.

Participants in the trial ranged in age from 21 years to 73 years. The average age was 48.6 years, the median age was 50 years and the mode age was 55 years. Of the twenty three participants who completed the trial, fifteen increased the frequency of their exercise to at least once a day or maintained daily exercise. The age of these fifteen ranged from 21 to 73 and the age of those who did not exercise daily

was between 25 and 67. Of the five participants who maintained daily exercise at follow up, their ages ranged from 50 to 61, (Figure 28).

Figure 28 Table showing ages of participants in relation to adherence

Age range of participants who increased the frequency of their exercise to a least once a day or maintained daily exercise in the trial	21, 36, 37, 42, 50, 50, 53, 55, 55, 55, 57, 59, 61, 61, 73
Age range of the remaining participants	25, 36, 40, 49, 50, 55, 59, 67
Age range of participants who maintained daily exercise at follow up	50, 55, 55, 59, 61

All of the participants who adhered to daily exercise at follow up were over 50 years but of the ten participants who were regularly exercising at least once a week; their ages ranged from 36 to 61.

A study by Anderson *et al* (2000) found that age in itself did not directly affect adherence. However, in many PFME studies, only younger women are included; such as Dumoulin *et al* (2010) who did not include women over 40 years and Hung *et al* (2012) who did not include women over the age of 65.

Generally, Anderson *et al* (2000) urge that the specific challenges faced by older people, including “*physical or cognitive impairments, advanced disease, social*

isolation, and ageism” be considered in their impact on the adherence of older people to health interventions (p.S179). Furthermore, Culos-Reed *et al* (2000) suggest that “*understanding individual responses to behaviour change*” will have a dramatic effect on adherence of behaviour change interventions with older people (p. S204). Therefore the qualitative data gathered in this study is useful in helping to understand which characteristics of ageing impact on adherence.

Participant 9, for example, mentioned that her friends, aged between sixty and eighty, had never discussed incontinence and were unlikely to do so. Although she herself was in her late sixties, despite having daily leakage of urine, she had never mentioned her symptoms to anyone prior to the telephone interview. Her words link the lack of discussion with age:

‘I don’t know if any of my friends would bring it up, you know, we’re the age of 60 to nearly 80 (Trial participant 9 TP9.12).’

And in the context of technology and using competitive or fun elements of apps to help motivation and adherence to exercise she said, “*I think I am too old to think that way*” (Trial participant 9). This lack of openness in discussing incontinence amongst older people was also identified by a forty year old participant who had previously worked with older people and mentioned that, in her experience, “*they didn’t talk about it at all*” (Trial participant 20).

Some of the younger participants seemed more aware of the symptoms of friends and family members, which suggests that attitudes to speaking about symptoms may be linked to age. When asked if participants knew of other women who had incontinence symptoms, only ten said ‘yes’ with the remaining eighteen saying ‘no’. Half of those who said ‘yes’ were under fifty years old whilst eleven of the eighteen who said ‘no’ were over fifty.

Reluctance by health professionals to talk about UI and sex was discussed in more detail in section 5.2.3 and will be referred to again in section 6.6 in relation to the health service environment. In the following section, participants' views are presented about the effect of the passing of time since childbirth when information about PFME had been given to them.

6.1.1 MENOPAUSE AND CHILDBIRTH

In informal focus group discussions, participants spoke about the increased prevalence of UI with ageing and about menopause as a trigger to the development of symptoms. The mothers of young children seemed conscious of the potential negative effect of parity and the importance of exercising their pelvic floor muscles during and after pregnancy.

There was a sense that motivation to exercise was higher in women who received health promotion messages delivered as part of pre- and post-natal care but that when these messages were no longer given, women forgot all about it (HM5, p.191). One mother expressed regrets that she had not adhered to PFME over the previous years and expressed an intention to start:

'Well that's the kind of age I am (menopause), it's dreadful! So it's worth doing it? I wish I had done it (throughout life) ... so, I could start now' (Participant from Hilton focus group with mothers of young children HM8).'

The length of time since childbirth when information about PFME was given by health professionals meant that women forgot about the exercises. This was compounded by a general lack of awareness of the need to exercise.

Participants in the Hilton focus group with mothers of young children discussed how they used to exercise, most often around the time of childbirth. They suggested that the prompts from health professionals around the time of childbirth had supported

their adherence for a period of time but this diminished when they no longer had that contact:

'After time you stop, you forget (Participant from Hilton focus group with mothers of young children HM9).'

'Cause it might have been a long time since you've heard it if you haven't had a baby recently (Participant from Hilton focus group with mothers of young children HM10).'

This fits with Bo *et al* (2006) who found that over 40% of women either never exercised or exercised less than once a week six months after they gave birth. This reduction in adherence may be linked with all the responsibilities and challenges faced by women when they have a baby, coupled with concurrent physiological changes and a sense that the need to exercise has past.

In an attempt to counteract the negative impact of time elapsing since exercises were taught, the opportunity to remind women about the benefits of PFME when they are invited to and attend child assessments at developmental milestones should be taken. This would help to raise awareness about the benefits of exercising throughout the life course and not just around childbirth. It could also act as a prompt to trigger exercise in women who had forgotten about the exercises in the business of motherhood.

Although the Hilton mother voluntarily described herself as at menopause stage, neither the focus group nor trial participants were asked about this. However, as 51 is the average age for women in the UK to reach menopause (NHS Choices), many of the participants in the trial may have been perimenopausal or menopausal (the average age was 48.6 years, the median age was 50 years and the mode age was 55 years).

Similarly, participants were not asked about parity or how many times they were pregnant but subject was discussed in both focus groups with mothers of young children. Bo *et al* (2006) found that a factor which had a great impact on adherence to PFME related to parity. The inclusion of questions about parity and menopause in the baseline questionnaire would have provided more robust data about these topics.

6.1.2 APPS AND AGE

In this section, the influence of age on adherence to exercise is considered in relation to app use. From the focus group data presented in section 5.3, it was apparent that older participants conceded that the technology was not for their age group whereas younger women were accepting of the technology.

The older women linked their difficulties with the technology to their age and there was a consensus that apps were not suitable for their age group. Even older women who used a smart phone said they wouldn't use it for PFME:

'We're not the right age group for this kind of thing (Participant from Nairn focus group with older women NO10).'

'No use for us old biddies (Participant from Nairn focus group with older women NO11).'

When asked what it was about the technology which was unacceptable, they considered that the size of the screen was too small and not easy to use. It was apparent from observing them that these opinions were likely to be as a result of their experience of having to find their glasses before looking at the apps and of difficulties in simple operational actions such as turning the iPod touch on and reactivating it when it had 'gone to sleep'. Reasons given by participants of all ages for the technology being difficult to use or unhelpful were presented in section 4.1.2.

Some of the participants from the other focus groups also found it difficult to read the information on the screen, especially when the text extended over a number of pages. However, where these younger women thought they might get the hand of the technology if they started using it, the older women rejected it as a technology that did not suit them. As an alternative, the older focus group participants suggested that exercises on the television were good and some suggested that a DVD would be useful as can be seen from the comments below:

'DVD: you choose the time that is best for you (Participant from Nairn focus group with older women NO12).'

'Exercises on the television ...it's very good watching it (Participant from Nairn focus group with older women NO13).'

'I'd prefer a DVD with a larger screen (Participant from Nairn focus group with older women NO14).'

The negative attitudes of older women to smart phone technology and their more positive attitudes towards alternative technology were not simply based around levels of familiarity; they were also based around functionality. As well as expressing a preference for a larger screen, they also expressed a preference for a keyboard or remote control which had bigger buttons or keys than those on the smartphone. The off putting aspects of the technology included the unpredictability of the smartphone screen, the speed at which it could disappear or be 'flicked over' as well as the smallness of the virtual keyboard:

'I'm really into computers, but not this. I use the computer all the time; I love my computer but not this (Participant from Nairn focus group with older women).'

'It's like a Wii (wee) machine ... lots of people our age use a Wii (wee) machine [laugh (Participant from Nairn focus group with older women NO15).'

The trend for mobile phones to become smaller has introduced some disadvantages in their use by individuals with diminished motor functionality, rheumatoid arthritis or poor eyesight. This suggests that smart phones with a larger screen or tablets should be considered if PFME apps were to be recommended for use by older women.

By comparison, the perimenopausal mothers, not all of whom were familiar with the technology, were more accepting of smart phone apps for PFME. One participant specifically mentioned that they would soon get the hang of using the technology despite her unfamiliarity:

'That's good, yeah; it's easy to use for someone who's never done it. It wouldn't take me long to get my head around it (Participant from Nairn focus group with mothers of young children NM18).'

The younger mothers in the focus groups with mothers of young children all appeared to be familiar with smart phones and welcomed the idea of apps for PFME:

'Yes, I definitely would (use the apps) (Participant from Hilton focus group with mothers of young children HM11).'

'I liked that, I really liked the exercise in it (Participant from Nairn focus group with mothers of young children NM19).'

The trend of increasing acceptability of smart phone apps for PFME with decreasing age groups is predictable but, nonetheless, important to recognise. In designing services to raise awareness of PFME and to support women to adhere to the exercises, the difference in attitudes towards the technology used to deliver these services must be considered. Although it could be argued that the older women would become more accepting of the technology the more they were exposed to it, in the short-term its use could act as a barrier for women accessing services. The older women in the focus group and some of the trial participants who were over 50 years

old suggested and favoured the idea of using familiar technology such as televisions, DVDs and desk top computers as a more acceptable platform.

Testing apps for PFME on an iPad or alternative tablet format would be useful in identifying if a larger screen helped to make the technology easier to use and more acceptable for older women. This is an area which would merit further research.

6.2 WHAT IS THE INFLUENCE OF LIFESTYLE, PHYSICAL ACTIVITY AND WEIGHT ON ADHERENCE TO PFME?

Various lifestyle factors can contribute to UI such as smoking and obesity. Maintaining a healthy weight and exercising regularly can help to prevent and improve symptoms. As it is possible for these individual characteristics of women to have the potential to override the benefits of an increase in frequency of PFME, it is important for them to be taken into consideration. This section presents and discusses healthy lifestyle, levels of physical activity and weight.

Other studies have found that constipation, the intake of caffeine or fizzy drinks (Chiarelli, 2007) and smoking (Imamura *et al*, 2010) have also been associated with incontinence. Participants were not asked about these lifestyle factors other than if they had planned to and managed to stop smoking, along with a number of other behaviour changes which are discussed later in this chapter.

The decision not to include these factors in this study was based on the need to limit the number of questions participants were asked in order to avoid the questionnaire being unwieldy and off-putting. Furthermore, the factors chosen for inclusion in the questionnaire (healthy lifestyle, levels of physical activity, and weight) were of additional interest in terms of attitudes and self-efficacy.

All of the participants in the trial described their life as either very healthy or fairly healthy including twelve participants who said that, for their age, they did not do enough physical activity to stay healthy and twelve who said that they are overweight. Nine of the participants said they were both overweight and did not do enough physical activity to stay healthy. Even the participant who described herself as very overweight (Trial participant 16) considered her life to be led in a fairly healthy way. This suggests an interesting dichotomy in the attitudes of participants who on the one hand recognise that they have unhealthy characteristics (in terms of weight or physical activity) whilst at the same time considering themselves to be leading a healthy lifestyle.

This phenomenon, where individuals believe that they are leading a healthy life whilst concurrently acknowledging unhealthy aspects of their lives in terms of weight and activity, may help to explain why individuals persist with unhealthy behaviours; as in the Health Belief Model (Bowling, 2009). However, as will be presented later, the self-reports of general health have not been found to be useful in predicting adherence to PFME.

Of the participants who completed the trial ($n=23/28$) and said they were either overweight or very overweight ($n=12$), nine experienced leakage of urine at the start of the trial. By the end of the trial, five still experienced symptoms and four reported no symptoms. It would be interesting to know if these women also lost weight during this period of time or if the improved symptoms were the result of PFME alone but the question about weight was not repeated in the post-trial questionnaire (as the trial was exploratory in nature). However, the omission of measurements of weight is consistent with much of the PFME research: considering the fact that obesity is a risk factor for UI and symptoms can be improved through weight loss, there appears to be a tendency for studies about PFME to omit measurements of weight.

Seven participants, who said that they did enough physical activity to stay healthy, for their age, maintained daily PFME by the end of the trial. Similarly, eight participants

who said they did not do enough physical activity to stay healthy for their age also managed to maintain daily PFME by the end of the trial.

Of the participants who said they were overweight or very overweight, three said they thought they did enough physical exercise to stay healthy, the remaining nine said they did not do enough exercise. Of these nine who accepted they did not do enough exercise generally, five either increased or maintained their level of PFME to daily and the three others increased to weekly exercise. This suggests that it is possible to target and successfully change individual health behaviours such as PFME and this cannot be predicted by other aspects of health behaviour, such as weight reduction or healthy eating.

In this section, attitudes around general healthy lifestyle, healthy weight and a healthy level of exercise were presented in relation to UI and adherence to PFME. All of the participants indicated they led either a healthy or very healthy life but twelve said they were overweight and twelve said they did not do enough physical activity to stay healthy – these were not the same twelve women. This indicates a mismatch between attitudes to healthy life in a broad sense compared to the specific elements of weight and physical activity. Of those who were overweight, 75% of the participants (n= 9/12) had incontinence symptoms.

Based on the data gathered in this trial and similar to the presentation of UI symptoms, it is clear that it is not possible to predict PFME adherence using neither either the self-reported assessment of weight nor level of physical activity to maintain health.

In the next section, socio-economic status is examined as a characteristic of participants.

6.3 WHAT IS THE INFLUENCE OF SOCIO-ECONOMIC STATUS ON ADHERENCE TO PFME?

Although the finding that socio-economic variables impact on health is ubiquitous (Kamangar, 2013), there is limited understanding about the reasons behind the fact that individuals with lower socio economic status benefit less from health behaviour change interventions than those with higher socio economic status (Mechanic, 1999; Connelly, 2002). In this section, the socio-economic status of participants is outlined and discussed in relation to their adherence to PFME.

Research by Sacomori *et al* (2010) and Whitford & Jones (2011) recognised socio-economic characteristics of women as factors which influenced PFME. Although participants were not asked specific questions about their personal socio-economic status, it is possible to use their post-codes to establish some general socio-economic data based on Scottish Government data zones.

All of the participants in the trial either lived or worked in the region of Moray in the North East of Scotland. The level of income deprivation and unemployment is lower in Moray than in Scotland as a whole. Out of the 28 trial participants, 10 women (35.7%) lived in data zones which have a higher percentage of income deprivation compared to Moray as a whole and 6 (21.4%) of these were in data zones with a higher level of income deprivation compared to Scotland as a whole. Within Moray, 8.8% of the population are employment deprived compared to 12.8% in Scotland as a whole. In the trial, 13 participants (46.4%) came from data zones with levels of unemployment higher than Moray as a whole and of these, 7 (25%) were in data zones with a higher level of unemployment compared to Scotland as a whole.

6.3.1 SOCIO-ECONOMIC STATUS AND ADHERENCE

Of participants who completed the trial (n=23), four participants were from data zones with levels of both employment and income deprivation higher than the Scottish average. One of the four increased the frequency of their exercise to daily. Of the

remaining nineteen participants who were from data zones with levels of income deprivation lower than the Scottish average, two participants were already exercising daily at the beginning of the trial and continued to do so. Of the seventeen participants who had not been exercising daily, twelve participants increased their exercise to daily by the end of the trial.

Figure 29 showing average exercise pre-trial of participants against postcode area percentage of income deprivation (linear trend line)

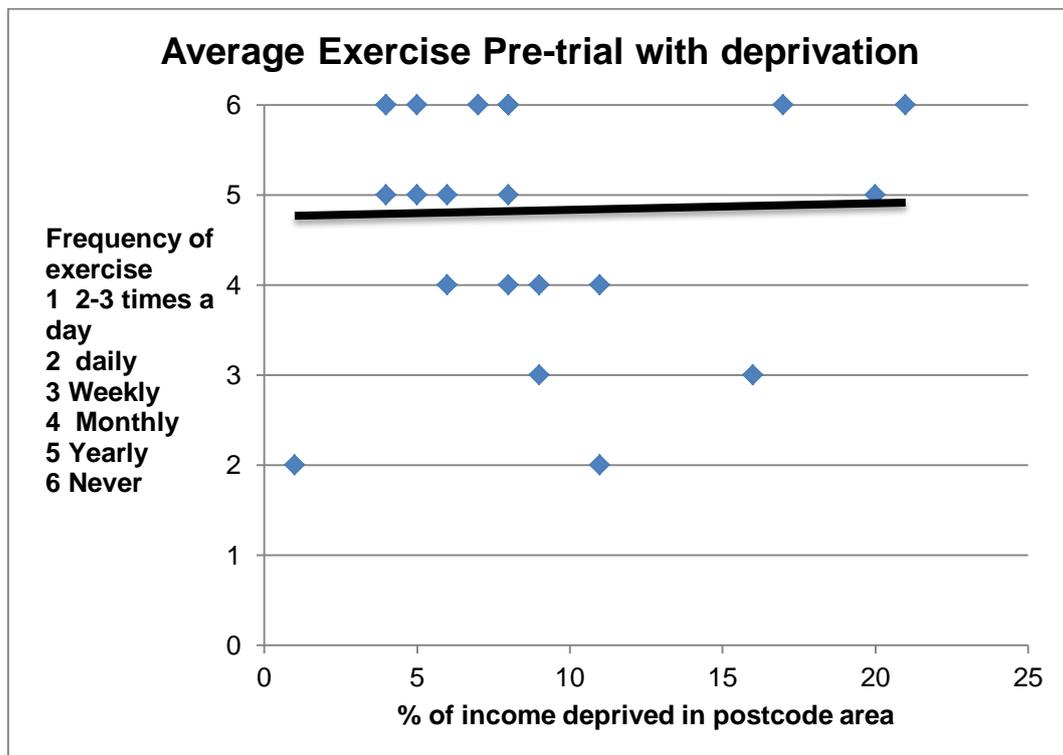
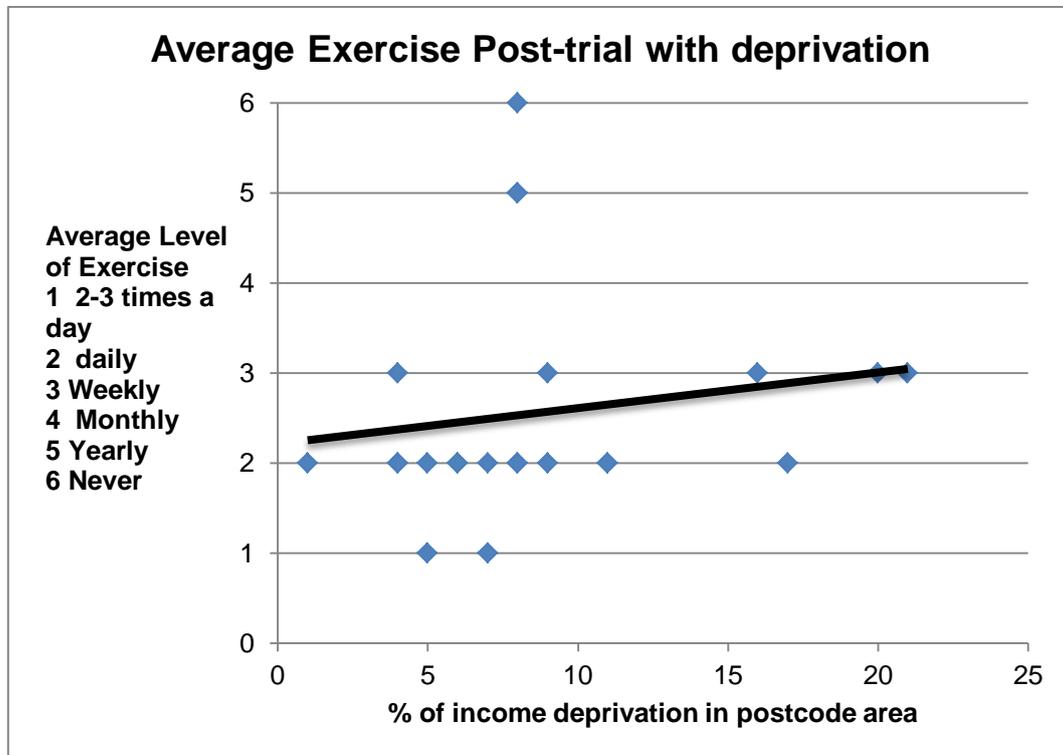


Figure 29 illustrates the trend line of frequency of exercise at the start of the trial and Figure 30 illustrates the trend line at the end of the trial. These graphs must be viewed with caution as the frequency of exercise (1 to 6) responds to non-linear stages, i.e. 1 = three times a day, 2 = daily, 3 = weekly, 4 = monthly, 5 = yearly, and 6 = never. The graphs illustrate the fact that more women from a data zone with higher levels of income increase their exercise more than those from data zones lower levels of income. This finding is consistent with the above mentioned PFME literature.

Figure 30 showing average exercise post-trial of participants against postcode area percentage of income deprivation (linear trend line)



In addition, in relation to continence promotion through PFME, the influence of socio-economic status must be considered if women with lower status are to benefit. The use of the internet and smart phones offers an opportunity to address health disparities (Gibbons *et al*, 2011) and there is clearly potential for apps for PFME to meet the challenge of health inequalities as a behaviour change intervention.

In sections 4.3 and 4.4, the role of self-monitoring and self-regulation of PFME was examined and the benefit of routine was found in relation to adherence to exercise. Further research to investigate if there is a link between socio-economic status and routine may be useful in increasing understanding of the findings above. It is obvious that those with chaotic lifestyles as a result of addiction, for example, will have few daily routines with which to associate health behaviours but little is known about whether or not this a characteristic that decreases as socio-economic status

increases. Previous research found that daily hassles had the highest negative impact on health status (DeLongis *et al*, 1982). Further research is required on the influence of daily hassles in disrupting routine and the consequential negative impact on health behaviours which require to be performed routinely, especially PFME.

In this section, demographic characteristics of women have been presented and discussed. The next section goes on to focus on individual personality traits.

6.4 HOW DO PERSONALITY TRAITS INFLUENCE ADHERENCE TO PFME?

The Ritterband Model (2009) includes *traits* in assessment of user characteristics and for the purposes of this thesis the focus is on personality traits and how these influence adherence to PFME.

As outlined in the methodology chapter, the Ten-Item Personality Inventory (TIPI) prepared by Gosling, Rentfrow & Swann (2003) was used as a brief measure of personality for participants in the trial. In addition, some participants described aspects of their own personality during telephone interview.

Trial participants were asked to complete a TIPI which scored extraversion, conscientiousness, openness to experiences, agreeableness, and emotional stability (Gosling, Rentfrow & Swann, 2003). The table in Figure 31 below gives information about which questions relate to which personality characteristic and what scores indicate.

Scores are calculated by the allocation of a value between 1 and 5 to the Likert scale TIPI responses (1 for disagree strongly to 5 for agree strongly). Scores range between 2 and 10. A low score is <5 and a high score is >5. Scores for participants

are shown in the table in Figure 32. Participant 7 did not complete this section of the questionnaire.

The approach to investigating the influence of personality on adherence is similar to that taken in relation to previous behaviour change which is discussed in section 6.5. It was not feasible or desirable to undertake a full analysis of the personalities of participants but a brief measure was used in order to make an exploratory investigation about the influence of personality on adherence.

The Ten-Item Personality Inventory (TIPI) is a brief measure of personality (Gosling, Rentfrow & Swann, 2003) which has been recommended as effective for use where a limited testing burden would be advantageous (Muck *et al*, 2007). As personality is one of the many factors being considered in relation to adherence and not the primary focus of the research, a brief measure was considered appropriate for use in this study.

Figure 31 Table showing personality traits and explanation of scoring

Characteristic	Question	Score indication
Extraversion	1 + 6	High score indicates extraversion
Agreeableness	2 + 7	Low score indicates agreeableness
Conscientiousness	3 + 8	High score indicates conscientiousness
Emotional Stability	4 + 9	Low score indicates stability
Openness to Experiences	5 + 10	High score indicates openness

As can be seen from Figure 32 below, all but two of the participants had a high score in conscientiousness (n=20). In the trial, 20 participants either maintained or increased the frequency of their exercise to weekly or more. However, these are not the same 20 participants. Six of the participants who had a high score for conscientiousness did not complete the trial.

Figure 32 Table showing TIPI results of participants

Participant Number	Extraversion	Agreeableness	Conscientiousness	Emotional stability	Openness to experiences
1	High	High	High	High	High
2	5	High	5	High	High
4	Low	Low	High	5	Low
5	High	Low	High	Low	High
6	High	Low	High	Low	High
7	---	---	---	---	---
9	High	Low	High	Low	High
10	Low	5	5	High	Low
11	Low	Low	High	Low	5
13	High	5	High	Low	High
14	High	2	High	High	High
15	High	Low	High	Low	High
16	5	5	High	Low	High
17	High	Low	High	5	High
18	High	Low	High	High	High
19	High	Low	High	5	High
20	High	5	High	High	High
23	High	Low	High	High	High
24	High	Low	High	Low	High
25	High	Low	High	Low	High
26	High	High	High	High	High
27	High	High	High	Low	High
29	High	5	High	Low	High

Participants who had high scores in the emotional stability questions (n=8), which indicated they were characterised by emotional instability (as can be seen from Figure 31), all maintained or increased the frequency of their exercise to weekly or more. Of the three who did not maintain or increase the frequency of their exercise to weekly or more (Figure 8, section 4.1), two had a low score of emotional stability and one had a score of '5' which indicated that they were emotionally stable (Table 11).

The aspect of personality which may be considered to be most likely to be linked to adherence, conscientiousness (Bogg & Roberts, 2004), was not found to be linked in this study. In addition, an aspect of personality which may be considered to be linked to low adherence, emotional instability, otherwise referred to as neuroticism, (Terracciano *et al*, 2008), was found in participants who adhered well to PFME throughout the trial. Therefore, as a tool for predicting adherence of PFME, the TIPI has been found ineffective.

Qualitative data about personality was also gained from telephone interviews. As described in the methodology chapter, section 3.4, participants in the telephone interviews were asked to talk about their experiences of trying to do PFME throughout the trial period. This was an opportunity for the women to describe their experiences in their own terms and from their perspective as opposed to answering questionnaires.

Participant 9 described herself as lazy and having a lack of discipline (TP9.4 p.118) . She linked these personality traits to her lack of adherence to PFME:

Participants 9 and 18 talked about being easily distracted and how it influenced their adherence. Although this lack of concentration may be caused by health factors not relating to personality it has been included in this section:

'... and then I'm mentally counting and then something happens (Trial participant 9 TP9.13).'

'I'll start doing something and something happens and I get distracted and forget what I was doing and I do it all the time ... I didn't even remember if I'd done it, some days (Trial participant 18 TP18.6).'

This would suggest that although there may be aspects of personality which influence adherence, it is unlikely that a brief measure can be used to predict adherence. This finding, that TIPI is not useful for understanding and predicting PFME adherence, resonates with the suggestion by Aro & Absetz (2009) that models may be inadequate as a result of the complex nature of the behaviour change.

As highlighted elsewhere in this thesis, there are dangers in overreliance on any one tool to measure complex characteristics of individuals. Use of a mixed methodology for gathering data about the same theme using different methods helps to avoid overreliance on individual measurement tools. Indeed, instead of relying on only one research method and one model of health behaviour change, the mixed methods approach used in this study (which drew from a variety of previous research and findings about health behaviour change) has been robust. Where the TIPI proved to be inadequate, the telephone interviews were more effective in gathering useful data about personality and its influence on adherence.

In the telephone interviews, two participants self-identified aspects of their personality which they related to lack of adherence. Participant 9 described laziness and a lack of discipline which she associated with poor adherence. Participant 18 described herself as being easily distracted which had a detrimental effect on her ability to exercise. The implications of these findings are that in promoting PFME, there is an opportunity for support for adherence to be matched to the aspects of personality identified by individuals as affecting their adherence.

In-depth interviews with women prior to setting out on a programme of exercise would help to match individuals with the support mechanisms best suited for their personalities, likes and dislikes. In a resource limited health service setting, this level of service is unfeasible. Alternative methods using volunteer peer supporters could provide the time and face-to-face contact which may encourage motivation and adherence. The volunteers, trained in the suite of PFME support tools, could suggest the most suitable options.

In future, as technology is increasingly used to replace face-to-face contact and harnessed for health service delivery, an automated method could be built to gather data about individual preferences and personality traits which could be incorporated into a protocol that directs women to a personalised or personally appropriate app for PFME. However, this is likely to require evidence gained from face-to-face research to be most effective.

It is clear from the results of this study that aspects of an individual's personality have influenced their choice, or desired choice of PFME support tool and their adherence of exercise. Although the TIPI has not been successful in measuring personality in a way that can be used to predict adherence, data around personality from interviews could be useful in matching individuals with the tools that would best support their adherence. More research is required on the role of personality in motivation and adherence to exercise with the aim of developing a question protocol which could match tools to individuals based on aspects of their personality, likes and dislikes. Evidence from this research should be incorporated into pilots of automated interview protocols for the recommendation of continence promotion services, including apps for PFME.

So far in this chapter, the characteristics of women which have been examined are around age (6.1), lifestyle (6.2), socio-economic status (6.3) and most recently, personality traits (6.4). In the next section (6.5), the focus shifts to aspects of self-efficacy in relation to previous behaviour change.

6.5 DOES PREVIOUS BEHAVIOUR CHANGE INFLUENCE ADHERENCE TO PFME?

In examining various characteristics of women and how these influence adherence to PFME, the element of previous success at behaviour change is now considered. In the explanatory controlled trial, all the participants were asked about previous behaviour change and each one was given a score based on the information they gave.

Of the eight behaviour changes considered in this study, taken from the Scottish Household Survey (Scottish Government, 2006-2010), seven could be directly linked to incontinence. Success in changing these behaviours could improve incontinence and have been shown to alleviate symptoms in some women (NICE, 2006). Each woman was given a score based on the percentage of successful behaviour changes made as an indicator of their self-efficacy.

Using the self-efficacy score designed for use in this study, five of the six participants who had a self-efficacy score of 100% maintained regular exercise or increased the frequency of their PFME to at least weekly. However, by the follow up stage, of the participants for whom there is data available (n=4), only one had managed to maintain that level of exercise. The three others rarely exercised. This data is illustrated in Figure 33.

Five of the six participants who had a self-efficacy score of 0% maintained regular exercise or increased the frequency of their PFME to at least weekly, similar to the data for participants with a 100% score. Of the participants who had a 0% efficacy score, two completed the longer-term follow up questionnaire and both managed to maintain that level of exercise.

Figure 33 Table showing results of self-efficacy scoring

Self-efficacy score	No of participants	Results
100% (3 months)	N=6	Maintained or increased exercise to at least weekly by end of trial: 5 /6
100% (12 months)	N=4	Maintained or increased exercise to a least weekly at follow-up: 1 /4
33 – 75% (3 months)	N=11	Maintained or increased exercise to at least weekly by end of trial: 10 /11
33 – 75% (12 months)	N=8	Maintained or increased exercise to a least weekly at follow-up: 5 /8
0% (3 months)	N= 6	Maintained or increased exercise to at least weekly by end of trial: 5 /6
0% (12 months)	N=2	Maintained or increased exercise to a least weekly at follow-up: 2 /2

Of the participants whose self-efficacy score was between 33% and 75%, ten out of the eleven maintained regular exercise or increased the frequency of their PFME to at least weekly. At the follow up stage, of the participants for whom there is data available (n=8), five managed to maintain that level of exercise. This data is illustrated in Figure 33 above.

Of those who had the biggest change in the level of exercise in the duration of the trial, two had previously managed to change two or more behaviours, one indicated that she was unsuccessful in maintaining behaviour change, and one participant was successful in one out of two of their desired behaviour change. Data about previous change behaviour was missing for the other two women who had the biggest increase in the frequency of PFME between the start and the end of the trial.

Of the fifteen participants who either maintained or increased their level of exercise to daily, a third had a zero score which indicated they either did not attempt any behaviour change or failed in those attempted. Nine of the participants had a score of 50% or more which meant that they were successful in changing between half or all of the behaviours attempted. Three of those participants had successfully changed all of the behaviours attempted. Of the participants who did not adhere to daily exercise at the end of the trial (n=8), all but one had a self-efficacy score of 50% or more. Three of these participants had successfully changed all of the behaviours attempted.

The most commonly attempted behaviour change was to be more physically active. Thirteen participants attempted this and nine were successful. The most successful change of behaviour was to cut down the amount of alcohol consumed; seven participants attempted this and all said they managed to maintain the change. The behaviour change which most participants managed to maintain in the year prior to the start of the trial, was to eat more healthily (n=10). The lifestyle change which had the highest maintenance failure rate was to reduce the amount of stress in life; only three of the eleven participants who had attempted this managed to maintain it.

The most common number of lifestyle changes attempted during the year before the trial was four; there does not appear to be any link between the number of behaviour changes attempted and adherence. Surprisingly, of the women who maintained or increased to daily exercise throughout the trial, the largest proportion was of

participants who had not successfully achieved any lifestyle changes during the previous year. This suggests that not only is the self-efficacy score ineffective at predicting adherence, even self-reported success at any behaviour change does not predict adherence to PFME. This would suggest that the self-efficacy score used for this trial was not a robust measure to reflect self-efficacy for PFME.

In addition to the self-efficacy score, some of the participants brought up the topic of previous attempts to change behaviour, other than PFME, during their telephone interviews. Participant 1 linked her lack of adherence to PFME to a similar lack of adherence with other forms of exercise. However, data from the trial indicates that Participant 1 did PFME daily before the trial and maintained this during the trial. This indicates a difference in the way she reported her level of exercise as part of the trial and the way she described her level of exercise in conversation:

'I'm rubbish at exercising and things like that. I'll do it for a week or so and then ... I'm terrible though (Trial participant 1 TP1.5).'

Participant 9 indicated that she had previously attempted to lose weight and found that behaviour difficult to sustain. Similarly, she spoke about lack of adherence to physiotherapy exercises for her back. Her attitude seems to suggest that she accepts that is the kind of person she is and describes herself as lazy:

'That's often one of my problems. That's why I'm back at Weight Watchers (Trial participant 9 TP9.14).'

'And I've got back problems at the moment and I'm supposed to do exercises and, I start off and I do them. And I find, that's just the way (stopping exercise). Yeah, I do that (Trial participant 9 TP9.15).'

'I'm basically lazy, I know that (Trial participant 9 TP9.16)!'

Interestingly, Participant 9 had a self-efficacy score of 100% in the trial. She had successfully attempted to stop smoking, to cut down the amount of alcohol she drank and to eat more healthily. Although she started PFME during the trial to the level of exercising once a week on average, at the follow up stage she went back to never exercising.

Participant 18 referred to the fact that she regularly did yoga and Pilates over two decades and she indicated that she wanted PFME to be a regular activity in her life in a similar way. Trial data shows that Participant 18 increased the amount of exercise she did from once a year to once a day during the trial. She did not keep this level of exercise up in the longer term, but has increased the amount of exercise she does compared to before the trial begun.

Thirlaway & Upton (2007) suggest that “*lifestyle behaviours are all under some degree of volitional control, although the amount of control individuals have over their lifestyle choices is contentious and likely to vary widely from context to context*” (p.9). This study was interested in the possibility that if a woman has been able to lose weight or stop smoking, for example, could that suggest they are more likely to adhere to PFME. This is particularly relevant in the context of incontinence because of the links to smoking, obesity, and exercise in general. This single question warrants in depth research and could be the topic of further research.

If failure to successfully change behaviours could predict low adherence to PFME, and vice versa, this knowledge could help health professionals to identify the appropriate level of support for individuals in continence promotion. Due to the complex nature of the behaviour changes and the multiple factors which could affect success and failure, as indicated by Thirlaway & Upton (2007), the self-efficacy score designed for this research project is not useful in predicting adherence to PFME.

When attempts are made to predict adherence to PFME, it is important therefore that individuals are not judged by their previous efforts at changing their lifestyle. In

addition, this evidence indicates that the factors which influence adherence to PFME are not aligned with factors which support other types of behaviour change or change in lifestyle. This fits with the suggestion by Thirlaway & Upton (2007) that individuals respond to different contexts in changing lifestyle behaviours.

6.6 HOW DO HEALTH AND SOCIAL ENVIRONMENTS INFLUENCE ADHERENCE TO PFME?

In this section, various aspects of health and social environments are examined in relation to their influence on adherence to PFME. Initially, the influence of health professionals is examined and then the wider health service is considered in terms of raising awareness of and teaching PFME. Section 6.6.2 will go on to examining the role of other people in the social environment of women. This will include friends and family, spouses and partners.

6.6.1 HEALTH ENVIRONMENT

As well as the embarrassing and negative implications of UI for individuals with symptoms as discussed in sections in 5.1 and 5.2.3, there are also negative implications of the condition for health professionals. As Colburn (1994) surmised “*it is undeniable that a large number of nurses still see incontinence as a problem which is time consuming, unexciting, singularly unromantic and certainly non-life threatening*” (p.1).

Sells & McDonagh (1999) discuss the reluctance of health professionals to bring up the subject of incontinence and suggest that their negative attitudes may be transferred or displaced onto their patients. They also suggest that, especially for patients with co-morbidities, UI symptoms may be ranked “*as less serious or significant*” as the other conditions (p.3) and this may be as true for health professionals as the patients themselves.

Participant 9 had never discussed her symptoms with anyone before speaking on the phone during the telephone interview. She suggested that her reluctance to discuss the subject with a GP was because she was unsure about the response she would get:

'It's not a subject I've ever brought up with the GP, because, again I find depending who you get varies, with reaction to anything. You definitely have to be selective in who you try to get. And I would think other people find that way as well (Trial participant 9).'

This adds a more explicit dimension to the suggestion of transference or displacement discussed by Sells & McDonagh (1999); participant 9 had negative expectations of the reactions of some GPs to patients' UI symptoms. These expectations had a detrimental influence on her willingness to seek help for her symptoms and, as such, she was unaware of the efficacy of PFME in alleviating symptoms.

Sells & McDonagh (1999) also suggest there may be a reluctance to report symptoms because of the perception that it may result in an internal examination or hospital admission. Increased awareness of PFME as the first line in the treatment of UI and the opportunity to self-manage without contact with a health professional may be useful in alleviating concerns (discussed previously) about invasive examinations or the need for clinical care.

Efforts to encourage women to seek help for their UI symptoms should recognise the reluctance of many women to talk about their symptoms in a clinical setting. A proactive response is required to fill this gap in service provision and to ensure those who suffer in silence feel able to access continence services. Alternative provision, as discussed in this chapter, should be considered to meet this need, including the use of lay people in community settings and smart phone apps.

Further research into the attitudes of health professionals in dealing with incontinence, especially in older women with co-morbidities, would be useful in identifying if negative attitudes are in fact a widespread or institutional problem. If so, a systemic approach would be required to address the problem.

The following section goes on to discuss the influence of the health service environment on adherence to PFME and its role in promoting and teaching exercise. The role of community based services to support PFME is also considered.

6.6.1.1 HEALTH SERVICE AND THE COMMUNITY

Some experts believe that a qualified health professional, and preferably a physiotherapist, is required to ensure that exercises are taught correctly (Bo, 2002; Fine *et al*, 2007). Others are pragmatic in accepting that although there is merit in the teaching of PFME by a qualified person, there are insufficient resources to meet the need (Sugaya, 2003). Indeed, Bo & Haakstad (2011) suggested that *“it would be less time-consuming, more cost effective and possibly more motivating if preventative PFME could be taught in a group setting by fitness instructors and without individual clinical assessment”* (p.191) but their study was inconclusive. Therefore, there has been some debate about the role of health professionals in the teaching of PFME (MacLean & Cardozo, 2002).

With current resources available to health services for continence promotion, the proposal that PFME would only be taught in-person by a qualified health professional would limit the size of the cohort of women who would receive the service. Indeed, where health services face increasing budgetary pressures (Audit Scotland, 2014) continence promotion within the health service may face increasing pressure.

Given these current and future constraints, the perspective that PFME belong in the domain of the health service alone is likely to contribute to an increasing gap in awareness of the need for and benefits of the exercise. This lack of awareness contributes to prevalence of incontinence. In this context it is important that the health service does not act as a barrier to women's adherence to PFME by limiting the means by which PFME are taught.

In the explanatory trial conducted as part of this doctoral research, of the twenty participants who had been taught how to exercise in the past, fourteen were taught by a midwife or health visitor and five were taught by a physiotherapist. The focus of teaching of PFME around pregnancy and childbirth may result in reduced awareness of the benefits of exercise amongst nulliparous women.

Some studies have suggested that written information alone may be less effective (Whitford & Jones, 2011) and that contact with a person was preferable (Tsui & Lui, 2009). In this study, some participants missed the idea of an expert or teacher telling them what to do, directing their exercise and reassuring them that they were exercising correctly and believed that this would have made them more confident in exercising and would have encouraged them to exercise more. Fitting with Bo's belief that the role of the expert teacher is important in a programme of PFME, these participants suggested that this role would have a positive influence on adherence.

Tsai and Lui (2009) found that interpersonal support improved adherence; they offered telephone support to participants in the intervention group. This differed from the earlier study by Burns *et al* in 1993 where all the participants were phoned and sent cards; their focus was on prompting exercise as opposed to offering interpersonal support.

Some of the participants reflected on the effect of having someone direct behaviour as opposed to relying on oneself:

'I know it seems really strange but if there's someone telling you to do things, you're more inclined to do it than if you have to go and do it yourself. I rarely go and do yoga myself although I have been doing that a long time and I've sore back, sore neck so I should get up and do some yoga, but I don't. But, I always go to the class and I always do exactly what she tells me (Trial participant 18).'

'It's having the teacher there ... just having someone there telling me to do it. Because I can do all the Pilates classes myself but I rarely do them at home. But because I've paid £7 for the class, I go along and for an hour the teacher tells me what to do ... I like being told what to do, (laugh) (Trial participant 24 TP24.9).'

'This is really what I would need, a recorded message that said "You've got to do your exercises in the next half hour", something like that. I think I probably would (Trial participant 9).'

Whether the other person is a peer (even virtual) or an expert / teacher, data from this study suggests that for some participants exercising in isolation is more challenging than if there is someone else to offer support. It is clear from this that some individuals recognise that the intervention of others can help them to adhere to PFME. For some, as suggested by Participant 9 above, this can be virtual. Participant 18 identified the audio in an app as a virtual class teacher; the role of apps is examined in greater depth in section 6.6.1.2.

Some participants suggested they wanted a teacher or expert to direct their exercise and to ask for reassurance that they are doing it correctly but did not specify that this should be a health professional. This is linked to the self-efficacy described in section 4.2.1 around confidence in the ability to correctly identify and contract muscles.

However, although some of the trial participants identified the role of the expert or teacher as a factor which would support their adherence, this was not the consensus. Indeed, some of the older women in the Nairn focus group did not like the notion of

someone, even a health professional, lecturing to them about exercises which they have been familiar with through their lives. They were happy to receive reminders to exercise but they found the video clips and instructions on the apps to be irrelevant and undesirable for them at their age:

'A reminder, not them telling you what to do (Participant from Nairn focus group with older women).'

'Rather than this, God, here's a woman droning on about it' (Participant from Nairn focus group with older women NO16).'

It is clear that some of the older women in the group found notion of someone else directing their exercise inappropriate whereas other participants expressed a need for this.

These findings imply that when health behaviour is prescribed or recommended for individuals in a domestic setting, there should be some consideration of the challenges this poses. Particular difficulties can arise as a result of the solitary nature of the activity and the lack of available support.

This is an important consideration not only for community dwelling women who are encouraged to undertake PFME as a first line of treatment for incontinence and for the prevention of symptoms, but also for patients who are increasingly required to self-care or undertake preventative health behaviours.

Consideration should also be given to the role of other people in supporting individuals in their health behaviour as well as the role of the health professional as experts and teachers. Indeed, in considering health inequalities generally, the role of 'supportive others' merits more examination in helping community dwelling individuals adhere to health behaviours including PFME. This will be discussed in more detail in the following section about the social environment.

In designing a support service for PFME, it is important to provide a suite of options to suit individuals with a range of preferences in self-management and to respond to the need for support from others. For some women, the role of others whether friends, family, partners or health professionals, will be difficult to access because of their reluctance to talk about symptoms. This would suggest an opportunity for technology to provide a virtual solution and specifically for smart phone apps to be useful in discreetly providing that solution. This opportunity is discussed in the following section.

Finally, it is important to consider the tone and the platform used to support women of all age groups, especially older women. Sensitivity is required around supporting older people in a way that does not come across as patronising or irritating but that takes cognisance of their previous learning and experience.

6.6.1.2 APPS IN PRACTICE IN A HEALTH OR COMMUNITY SETTING

Although it was generally accepted by the women's health professionals in their focus group that the direction of travel in health services will be to include mHealth, there were a number of questions about how this might work. A number of challenges to be considered prior to recommending the use of any particular app were discussed and are summarised in this section.

The first of these challenges related to the quality of health information and advice (as discussed in section 4.2 about knowledge), and the fact that some of the advice given did not seem to fit with the guidelines they used for PFME. There was some reserve about the responsibility of ascertaining if the health information and advice about PFME was appropriate.

This suggests a role for vetting of health apps at a higher level so that health practitioners could be confident that the apps were approved. This role could be undertaken by individual health boards, or at a national level by the Scottish Centre for Telehealth and Telecare, or at a UK level by NICE. This points to a future where an approved list of health apps could be produced and health practitioners could 'prescribe' from this list. However, this vetting process is likely to be resource intensive and would introduce a layer of complex health regulations into the industry which might stymie innovation.

The physiotherapists generally identified patients in their case load who might benefit from some of the apps (no confidential patient details were disclosed). There was a clear sense that the apps may supplement the work of the physiotherapists and that patients could be supported to exercise in between appointments or after antenatal classes had stopped. This was reinforced by the comments of Trial Participant 6 who identified a point in her care pathway where PFME apps would have been useful:

'My thoughts were that if I'd been at the stage where I was at the beginning, when I first started doing them after an operation, I would have found the apps really more useful (Trial participant 6 TP6.6).'

The study by Gallo & Statskin (1997) provided participants in an intervention group with an audio tape to promote adherence of PFME in the six week period after an initial 45 minute appointment with a nurse. These participants reported higher adherence compared to the control group who did not receive that "external cue to action" (p. 167). This is an example of where technology can complement traditional health service delivery.

The NHS Grampian physiotherapists who participated in the focus group grasped the benefit of apps in a strategic sense in relation to meeting future challenges within the health service. They also identified the immediate benefit of apps for current patients on their case load. The challenges identified by health professionals may be

overcome if apps were developed which incorporated NHS Grampian guidelines and which more fitted more closely with local culture:

'That's the reality. There's going to be less of us and more people, so this is really the kind of thing we need to get into. It really is (participant in focus group with women's health professionals WH4).'

In the trial it is apparent that, for at least one participant, the app acted as a virtual teacher or expert. This was in the form of reminding and reassuring that the correct muscles were being used; her comments are below. This links with self-efficacy (confidence in the ability to correctly identify and contract the muscles):

'... and reminding you what you're doing, cause even doing it yourself, you've got to think, which muscle is it that you've got to, alienate the muscle, that can be difficult ... when somebody reminds you while ... that, I really quite liked that... And someone telling you to do things, I know it seems really strange but if there's someone telling you to do things, you're more inclined to do it than if you have to go and do it yourself. I rarely go and do yoga myself although I have been doing that a long time and I've sore back, sore neck so I should get up and do some yoga, but I don't. But I always go to the class and I always do exactly what she tells me (Trial participant 18 TP18.14).'

In addition to the notion of a virtual teacher, there are opportunities for internet based technology, mobile phones and social media to be used to create virtual groups and to make both peer-to-peer and patient-to-health professional communication faster and easier. Boulos *et al* (2011) discuss the benefits of mobile phones and their potential “*for use in education, healthcare and medicine*” (p.3). Indeed, there is potential for technology to be used in the education of PFME in a community setting.

Hui *et al* (2006) used video conferencing as part of “*a continence service to older persons in the community*” and found it to be as effective as conventional management for the management of urinary incontinence in older women (p.347). A

study of You Tube clips around PFME (Stephen & Cumming, 2012) showed that there is a growing demand for internet based health information and advice.

Although there is evidence of successful use of technology in delivering information about PFME, where the app format is used the experience of women in this trial should be considered. Careful consideration is required in relation both to the design and content of the apps in order for the technology to be acceptable and easy to use.

Research is required to gain understanding of the effectiveness of 'apps' in supporting women to exercise when incorporated into a health service.

6.6.2 SOCIAL ENVIRONMENT

So far in this chapter, the focus has been on the influence of health professionals and health services on women's adherence to PFME. Now, the broader social environment is considered.

Even in clinical randomised controlled trials, it is very common for participants in PFME studies to be out-patients or receiving treatment in a primary care setting; thus they undertake treatments and exercises where they live in the community. In the studies which have featured weekly classes or regular visits to a clinic, the effectiveness of others (peers and health professionals) in supporting women to undertake and adhere to exercises has been shown (Dumoulin *et al*, 2005; Parkkinen *et al*, 2004; Bø & Haakstad, 2011; Paddison, 2002; Williams *et al*, 2006). The strength of peer support has also been identified by Getliffe & Thomas (2007, p.19).

In the following section, the influence of friends, family, spouses and partners is reviewed before going on to consider the influence of wider society in section 6.7.

6.6.2.1 FRIENDS AND FAMILY

Burgio (2004) suggests that women will “*require a great deal of encouragement and motivation*” and that maintaining levels of motivation throughout a continence programme is a major challenge (p.4). Encouragement from friends and family is an obvious opportunity for this challenge to be met. However, given the fact that some women are too embarrassed to talk about their symptoms and that “*it is not a fashionable thing to talk about*” (Trial participant 9), this source of support is not readily accessed for all women.

Participant 1 self-reported poor skills at exercising in general if she was alone. She suggested that if she exercised with a friend, she was more likely to adhere to the exercise:

‘I’m one of these people that’s bad at doing it myself but if I’ve got a friend that comes round with a DVD I’m more likely to carry on doing it (Trial participant 1 TP1.6).’

‘Cause I’ve got a lot of young nieces and nephews who have young families and things, and talking to my sisters who are older than me, they do have problems. Well, I spoke to two of them and both of them have real problems with their water works and I have advised them about this, obviously. But I think if they’d had something earlier when they were younger, in their 30’s or something, or even younger, I think it would have made a difference. It is preventable, and we know that but you forget ‘cause we’re so busy (Trial participant 18 TP18.15).’

The comments from participant 18 suggest that families are a social network through which it is possible to raise awareness of PFME. There are opportunities for the extended family to act as a support and for individual family members to be prompted and encouraged to exercise. For some women, this would positively influence their adherence to PFME.

Although friends and family have the potential to positively influence adherence to PFME, in this study participants found that they can also act as a barrier to adherence. This barrier was in relation to distractions or demands from family and friends in daily life as opposed to a negative influence per se. Participant 5 stated that “*work/family*” hindered her exercise. Participant 14 referred to activities with friends and family which she identified as reasons for not exercising in the additional notes she provided at the end of the trial:

‘Away with friends for Sunday and Monday (Trial participant 14 TP14.4).’

‘Son moving house so very tired today Didn’t even make one contraction (Trial participant 14 TP14.2).’

In the Nairn focus group with mothers of young children, one mother talked about how other people distracted her from PFME. Her family would talk to her in the middle of her exercise regimen because they assumed she wasn’t doing anything. She would then forget how many exercises she’d done and often failed to resume exercising. She suggested that the benefit of using a smart phone application for PFME would mean that friends and family may be less likely to distract her from the exercises (NM1, p.97).

This study has shown that family and friends can have a direct positive influence on adherence but also an indirect negative influence in terms of distraction or demands on time. In the next section the role of partners and spouses is discussed.

6.6.2.2 PARTNERS AND SPOUSES

In the previous section the role of friends and family was discussed; here the focus is more specifically on the role of partners and spouses in adherence to PFME.

The notion of involving husbands in their wives' health behaviour is discussed by Benyamini *et al* (2011) in relation to breast self-examination. They found a positive effect of the involvement and support of husbands. They also suggested research into same sex couples where the health behaviour would have a benefit for both partners. PFME can result in improved sexual sensation for both partners and as such, there is an opportunity to promote the benefit for both partners, including homosexual couples. The promotion of the sexual benefits of PFME is discussed below.

Gomez (2003) describes the role of the pelvic floor muscles in relation to sexual arousal, orgasm and lubrication in relation to the female. Other studies focus on the role of the muscles in improving the sexual pleasure of the partner (Roe & May, 1999; Nilsson *et al*, 2011). Experts on the promotion of continence have suggested that there may be a role for including the sexual benefits of PFME in educating women about, and motivating women to exercise (Getliffe & Dolman, 2007; Colburn, 1994).

Getliffe & Thomas (2007) suggest that "*professionals rarely initiate advice on sexual activity*" (p.8) despite the fact that women report that personal and, specifically sexual relationships are affected negatively by UI (Colburn, 1994; Monga, 2002). More positively, Dolman (2007) discusses the challenges faced by health professionals in promoting PFME as a lifelong activity and suggests that this gap may be filled "*by promoting the sexual benefits of pelvic floor exercises as many women will listen to that advice*" (p.69).

In the trial, a quarter of participants (n = 7) said they wanted to do PFME to improve sexual sensation. All of the seven also included either improving continence or preventing incontinence as a reason; none of the women gave sexual sensation as their only reason for wanting to strengthen their PFM.

In the Nairn focus group with mothers of young children, one young mother suggested that the smart phone app would be a way of involving her partner in PFME:

'I think you could have a lot of fun with it, getting you partner to like time you and stuff like that (Participant from Nairn focus group with mothers of young children NM20).'

But, in the same way that discussing UI symptoms can be embarrassing, not all focus group participants were as comfortable in discussing the sex-related aspects of PFME. One focus group participants suggested that she preferred to think of PFME for health and not for sex.

In addition to the embarrassment factor and sensitivities around discussing the sexual benefits of PFME, the notion of promoting sexual benefits to encourage the involvement of spouses and partners could have some negative implications. Women may feel coerced to exercise in order to improve the sexual pleasure of their partner (Roe & May, 1999; Nilsson *et al*, 2011).

It is clear that there is a role for promoting the sexual benefits of PFME to women as this may positively influence their adherence and motivation to undertake the exercises as a lifelong activity, as discussed in section 5.3.3. Findings from this study suggest, however, that women can have very different responses to the notion of exercising for sexual benefit, some wishing not to associate the exercises with this. Therefore the topic should be handled with care and sensitivity.

Although spouses and partners may have a role in supporting women with their exercise, caution would be required to protect women from potential coercive pressure from spouses or partners.

The role of family, friends, spouses and partners have been considered as part of the social environment of women when undertaking exercise. It is clear that other people can support adherence to exercise although some caution is required around coercion by partners for sexual benefit. Mutual support can be provided between homosexual partners and between peers. The role of social groups is now considered in relation to the attitude that incontinence is 'normal'.

6.6.2.3 SOCIAL NORMALCY

As well as the attitude that incontinence is a normal part of ageing, normalcy can arise from knowing other people who have incontinence symptoms. Chiarelli (2007) stressed the importance of "*the influences and values*" of a social group in what is perceived as normal by a woman (p.157). Palmer (2002) suggested that individuals "*can adopt behaviors that are deemed desirable by the group*" and that this should be accounted for when promoting population-based continence interventions (p.395).

In the trial, participants were asked if they knew anyone else who had incontinence symptoms. Over a third of the participants knew of other women who had UI symptoms. Of those who completed the trial (n=23), fifteen did not know any women who had incontinence symptoms; eight did. In relation to adherence of PFME, five out of the eight participants who knew others with UI and ten of the fifteen participants who did not were exercising daily by the end of the trial.

Although the question "*Do you know any women who have incontinence symptoms?*" is not sufficient to measure the influence of others on the attitude of participants to UI and adherence to PFME, nor can it be used to establish whether or not that influence is positive or negative.

Beliefs about UI being normal and the importance of women not feeling alone or unusual because they have symptoms, as discussed in section 5.2., are areas about

which understanding is limited. If these aspects were understood better, the result may mean that more women could be supported to seek help.

6.7 WHAT IS THE INFLUENCE OF WIDER SOCIETY ON ADHERENCE TO PFME?

In considering the influence of women's social environment to adherence to PFME, family, friends, partners and spouses were included. In this section, influences in the wider social environment are considered. This includes the influence of media and culture (section 6.7.1). The geographical context will be briefly considered in section 6.7.2 including how notions of culture and place may influence women. The influence of the research environment, specifically the Hawthorne Effect (McCarney *et al*, 2007) will be considered in section 6.7.3.1.

6.7.1 MEDIA AND CULTURE

Bachrach and Abeles (2004) suggest that the media can influence social and cultural norms in health and, although they suggest the influence is difficult to measure, it does require consideration. In this section, the role of media in changing the culture where individuals feel embarrassed or ashamed to speak about UI symptoms is briefly outlined.

The findings from this study have shown that the normalisation of incontinence (as with cancer and bowel screening) would be welcomed by women as this may help to combat feelings of embarrassment in discussing and reporting symptoms (section 5.2.3). As such, there was tacit recognition that wider society has a role in supporting their adherence to exercise.

Participant 9 was explicit in suggesting that wider society had an impact on the way women thought of their symptoms and their help seeking behaviour. She specifically identified the lack of media coverage about incontinence as contributing to a general

lack of awareness in society about what people could do to help alleviate symptoms (TP9.11 p.177).

Getliffe & Thomas (2007) suggest that most cultures have become more accepting of the mention of bladder and bowel disorders and as such incontinence related advertisements have a higher profile in the media. They mention that adverts for incontinence pads now appear at peak times on the television. Participant 24 agreed that magazines would be a useful vehicle to promote exercise and identified baby magazines as particularly appropriate. Participant 9 described how she imagined media coverage of incontinence to be most effective:

'I think people, don't want to be bombarded, but a trickle and then they start to think! ... I don't know how successful the bowel screening has been but I think with that type of thing it probably made a greater impact on people. It's nothing to be ashamed off (Trial participant 9 TP9.17).'

Her contribution suggests that the media can help in two ways; one of normalising the subject of incontinence and making it easier for people to speak about, and two of reminding people to exercise. As she is one of the women with incontinence who had never spoken about her symptoms, prior to participating in this study, her views are particularly pertinent.

In section 4.4.3 and 5.3.5, the influence of fun and positive affect on exercise adherence was discussed and this included the suggestion from Participant 9 that PFME would benefit from an equivalent of the “*Poo Song*”. This suggests that there is a media role for positively promoting PFME and normalising incontinence. The resulting changes in culture could positively influence adherence to exercises.

6.7.2 GEOGRAPHICAL CONTEXT

In this section, a general description of the geographical context of participants is given and consideration is made of how this, and rurality, can influence women in relation to help-seeking behaviour and adherence to PFME.

In their paper *The Tyranny of Distance: the Health of Mid-age Women Living in Five Geographical Areas of Australia*, Brown *et al* (1999) found that women from rural and remote areas visited health professionals less, were more likely to undergo gynaecological surgery, and were more likely to be overweight than women living in urban areas. This suggests that rurality is a dimension which should not be ignored in relation to PFME research. Technology can offer a range of potential solutions as a way of addressing geographical disadvantage in health (Casey *et al*, 2013).

Stern *et al* (2012) discuss the benefits of computer literacy in accessing online health services and suggest that rural areas in particular can benefit. Griffiths *et al* (2007) identified geographical isolation as a reason for many internet interventions and Garai (2011) promotes mHealth as a cost-effective solution to the challenges of rural health service delivery. Cole-Lewis & Kershaw (2010) suggest that mHealth has opportunities for self-monitoring and health promotion. It is clear from the literature that internet based technology provides an opportunity to redress rural disadvantage.

All the trial participants lived in Moray, a local authority area in Grampian which is a region in the North East of Scotland. Moray is in the North East of a Northern European country and from that perspective can be considered as remote from the centre of Europe, and the capital cities of the UK and Scotland. As such, the whole region can be considered as peripheral and remote (Shurman & Talaat, 2000) and the majority of Moray is rural in Scottish Government classification.

From the 2011 census, the population of Moray is just over 93,000 and a population density of 42 people per km². There is a diversity of communities from small coastal

villages, mountain hamlets to the Cathedral City of Elgin which has a population of 21,200 (Moray Council Website).

Most of the participants (n=20) lived in accessible rural areas or accessible small towns, based on the Scottish Government's Urban-Rural Classification 2012. Seven women lived in 'other urban areas'; areas which has a population of between 10,000 and 125,000 people. This indicates that they lived in Elgin. One participant lived in a 'remote small town' and one lived in what is classified as a 'remote, rural area'. Both of these would have to drive for more than 30 minutes to reach a place with a population of over 10,000. It is unlikely that these women would describe themselves as living in a remote area due to their proximity to the cities of Aberdeen and Inverness.

With the data available it is not possible to identify the impact of rurality on the participants of this study. However, some aspects of rural health are likely to have contributed to their experiences, including the lack of anonymity in accessing health services and the increased likelihood of local health professionals also being acquaintances.

As previously mentioned in connection with embarrassment and help seeking behaviour, there is a role for technology to make it easier for rural women to access health services, especially those of a sensitive nature (section 5.2.3). In Burton *et al's* book about communities, neighbourhoods and health, there is a suggestion that the role of place, in all its vagueness, is missing from our understanding of the digital world (Burton *et al*, 2011). With the ability of digital communication to be personalised there are also opportunities for it to be contextualised for culture, heritage, and place.

Participants in focus groups found that the American accents used on some apps unappealing; some specifically declared their dislike of the accent while others just found some phrases and expressions amusing. The question of accent was

discussed at the Hilton focus group where some participants were keen to have a Scottish voice. Participants were amused at the prospect of local accents being used. This suggests that culturally appropriate apps could help to make them more fun to use (section 4.4.3) by regional cohorts of women which links with aspects of personalisation.

Amongst the physiotherapist there too was some resistance to American apps where the presenter was predominant feature. Although the American apps were considered as of superior functionality, the accent was found to be off putting. The British made app was considered dull and boring in comparison. The notion of producing an app locally which could incorporate the voices and videos of local staff was welcomed.

Further research would be required to measure the effect of accent on attitudes to PFME information and advice and the impact on acceptability of apps. Opportunities for features which reflect local culture and heritage could be investigated in relation to their influence on adherence to exercise. Apps could use location services to raise awareness of local continence services and of exercise classes which incorporate PFME.

6.7.3 RESEARCH ENVIRONMENT

As in previous sections, in order to analyse the relevance of the findings of this study, it is important to acknowledge environmental factors which may have affected results. In this section factors around participation in a research project are discussed.

At a basic level, the influence of simply participating in research activity and the awareness of participants that they are being studied are discussed. In addition, data around the influence of specific elements of the study design and implementation on the adherence of participants are discussed.

Lessons which can be learned from this study about factors that have had a positive influence on the adherence of participants and which could be incorporated into future research or services to promote PFME will be suggested.

6.7.3.1 HAWTHORNE EFFECT

The change in the behaviour of individuals which occurs as a result of their perception of being studied is described as the Hawthorne Effect (McCarney *et al*, 2007). It is likely that an element of participants' adherence to PFME was influenced by their awareness of being the subjects of research activity conducted by the local university and with the backing of the region's health service. It is impossible to isolate the effect of this influence but important to acknowledge it.

The Hawthorne Effect is illustrated by the comments of Participant 18 below:

'And also the fact that I was doing the survey for you, and it made me think "gosh, I didn't do it" and, if I'm really tired, "I've got to do it". So that helped, obviously, to get me started (Trial participant 18 TP18.13).'

Although attempts were made to conduct the study in a way that would as closely replicate 'real world' experience as possible, the simulated nature of the research project cannot be ignored and as such, caution should be taken when extrapolating results into recommendations for everyday practice.

In addition to these general impacts of participation, some specific aspects of recruitment and the methods used may also have influenced the adherence of exercise; these are discussed in the following sections.

6.7.3.2 RECRUITMENT PHASE

Some specific elements of the study design were highlighted by participants as having an influence on their adherence and there are other potential influences of design elements discussed in the following paragraphs. These include the role of contact with the researcher during recruitment, participation in the focus group and participation in the trial.

In the recruitment phase of the trial, some participants may have had face-to-face contact with the researcher as she distributed posters and fliers around the West of Moray. The contact was limited to a brief explanation of the trial whilst asking for permission for the posters to be put up. In some circumstances, there was some additional sociable conversation. The women who had this contact may have subsequently applied to participate. Other participants responded as a result of seeing the posters or fliers and had no face-to-face contact with the researcher.

There were some circumstances where the explanation was given to groups of women in various work places and it is therefore possible that small groups of women who knew each other subsequently became participants of the trial. This may have influenced each other's adherence.

Because participants were not asked about how they were recruited and if they had contact with the researcher or other participants, if this influenced adherence, it was not measured.

Given the influence of other people described earlier in this subchapter, the influence of face-to-face contact with the researcher may have affected the result of some participants. Indeed, Podsakoff *et al* (2003) report that "*face-to-face interviews tend to induce more socially desirable responding*" (p.885) and Wells *et al* (2012) found that recruitment to trials depended on the researchers enthusiasm for the intervention. It is likely, therefore, that women who experienced face-to-face contact

with the researcher may have been positively influenced to participate. However, in the community setting there will have been a range of other influences which were not measured and which the participants failed to self-identify.

Participants were only recruited to the trial when they completed the baseline questionnaire and signed the consent form; they were not asked how they heard about the study and there was no record of face-to-face contact with the researcher, nor if they knew of anyone else participating in the trial. Given the role of other people, discussed earlier in this chapter, it is clear that there are potential influences from the face-to-face contact with the researcher and the shared experience of participants who knew each other and these unrecorded influences may have affected results. It is important to recognise this as a potential weakness in the study, albeit a characteristic of small scale community based research, which may affect the ability to extrapolate results.

6.7.3.3 FOCUS GROUPS

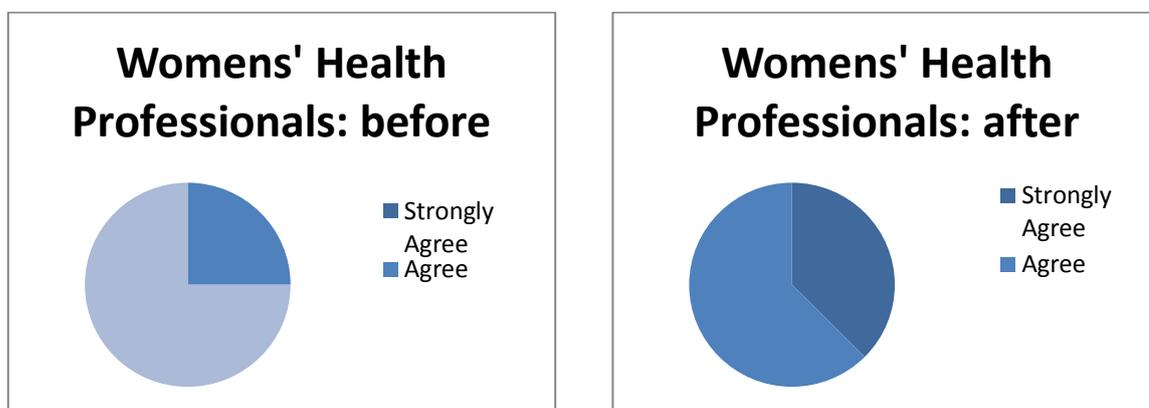
The focus groups held in Hilton and Nairn acted as awareness-raising sessions for participants and provided a forum for discussion about PFME. Commonly, the perceptions of participants about the usefulness of apps for health shifted between the start of the focus group and the end of the focus group. There was a consensus amongst the mothers of young children who participated in the focus groups in Nairn and Hilton that they would be more likely to exercise after participating in the focus group.

Group sessions of this nature, arranged at venues where the women are already meeting for another purpose, may be a useful vehicle for community based promotion of PFME. Materials for self-monitoring and recommendations for self-regulating could be provided. Follow-up sessions could be arranged and participants asked about their exercise adherence using a questionnaire similar to that used in the trial. In this way, data could be gathered about the effectiveness of the focus groups in raising awareness and promoting adherence to PFME.

At the start of each focus group, participants were asked to complete a question slip, marked 'A', asking if they agreed or disagreed with the statement “*Smart phone applications are a useful tool which could help individuals to self-care and self-manage their health*”. The same question was asked again at the end of each session, with the question slip marked 'B'. The results of these focus groups are presented in the following paragraphs.

Of the eight participants in the focus group with women’s health professionals, six said initially that they neither agreed nor disagreed that smart phones would be useful and two agreed. At the end of the focus group, five of the participants agreed that apps were useful and three strongly agreed. The results are illustrated in the pie charts below (Figure 34).

Figure 34 showing attitudes of women’s health professionals to mHealth before and after being shown apps for PFME

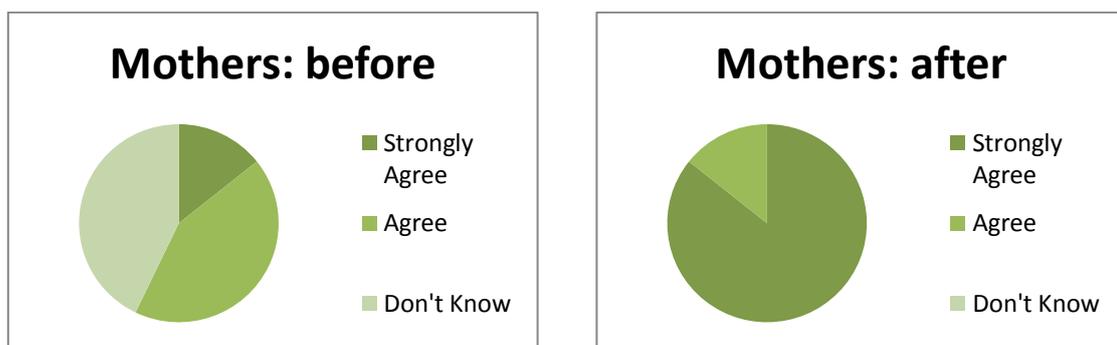


Seven mothers of young children and seven older women participated in three focus groups which were held in the Scottish Highlands in 2012. At the start of the two focus groups with young mothers, one young mother strongly agreed, three agreed and three didn’t know whether or not they thought apps would be useful. At the start of the focus group with older women, none strongly agreed and only one agreed with the statement. Two older women didn’t know, one disagreed and three strongly

disagreed. This may indicate that there is a generational difference in attitude to smart phone apps.

When the question was asked again at the end of the focus groups with mothers of young children, six out of seven stated that they strongly agreed with the statement. The shift between attitudes at the beginning of the focus group sessions and at the end of the focus group when women had been shown some apps is illustrated in the pie charts below (Figure 35).

Figure 35 showing attitudes of mothers of young children to mHealth before and after being shown apps for PFME



The exercise was not repeated at the end of the session with older women because there was a strong consensus in the room that the smart phone apps were “*no use for us old biddies*”. The role of PFME apps in the context of age is presented in section 6.1 of this chapter and includes data from the focus group with older women.

Other than with the group of older women, there was a positive change in attitude towards apps after participants had been shown the technology and they had looked at the apps for PFME. Women became more accepting of the notion of apps for health.

This suggests that the challenge which faces any new technology is to break through initial reticence about it by illustrating how it works and how useful it can be (NM2, p.104) .

There may be many women in the wider population who, if they were shown how a PFME app worked, may then go on to use the technology to help improve symptoms, prevent symptoms developing or to improve sexual sensation. There is an opportunity for community based meetings using a format similar to that used for focus groups to act as awareness raising sessions for PFME and to increase familiarity with smart phone technology.

6.7.3.4 TRIAL

Heaven *et al* (2006) suggest that “*participants may have their own coherent modes of understanding trial participation*” (p.261) and that as well as changing over the duration of the trial this can affect actual behaviour. Wells *et al* (2012) recommend reflexivity in relation to the aspects of randomised controlled trials which form the context for participants and may influence results. In this section, the influence of the trial is reviewed.

It is clear that many of the participants in the trial found their participation to be helpful. Some expressed appreciation at the opportunity to participate in the trial and the benefit they obtained from it (TP26.5 p.160):

‘I would highly recommend this system to all women. It has been very beneficial. Thank you (Trial participant 7 TP7.4).’

Taking part in the study helped women to focus on the exercises and this had a positive impact on their adherence. Participant 1 mentioned the paperwork and information provided for participants in the trial as being useful in supporting adherence. Participant 26 also referred to the paperwork but also indicated that

filling in the adherence chart helped with adherence. The influence of the adherence chart was discussed in greater detail in section 4.3.1:

'The paperwork and the information we got was great (Trial participant 1 TP1.7).'

'I think it was really good because it made me refocus again. To be honest, the times where I might have lost it, where I went on holiday or have been really busy or caught a cold, it kept me focused (Trial participant 6, TP6.7).'

'To sum it up, it was just helpful to be part of a program so that every day I needed to remind myself and actually do it. And since I'm not part of the program I don't do it regularly (Trial participant 26 TP26.7).'

Although participants did not meet with each other and did not know who each other were, the knowledge that there were others all participating in the study and exercising together acted as a positive influence on adherence for some of the participants:

'Being part of something other people were doing (Trial participant 24 TP24.10).'

'Yeah, it's very common and I'm not alone with it is helpful (Trial participant 26 TP26.8).'

For some of the participants who had incontinence symptoms, it was the fact that they were not alone in experiencing incontinence which made a difference to how they felt about their symptoms and were empowered to do something about it. This virtual peer support gave participants the sense that they were not alone, whether in relation to UI or in doing PFME, and this gave encouragement in persevering with their exercise.

This suggests that, for some individuals, simply knowing they are not alone in their activity and they are part of a virtual group may be preferable to exercising in isolation and may be preferable to face-to-face contact with others. Findings from this aspect of the study suggest that there is merit in virtual groups and there may be a role for technology in facilitating this.

Further research would help to explore the effectiveness of virtual groups, or eGroups, in supporting women with PFME and in promoting adherence to exercise. Elements of smart phone apps which incorporate social media could be used to facilitate virtual groups and to enhance communication between members of the groups. This aspect should be included in future research.

The fact that five participants were lost during the trial period and a further six lost at the longer term follow-up indicates that some aspects of the study design may not have been universally suitable (Vervolgyi *et al*, 2011). For example, Paterson *et al* (2012) identified contact in the form of home visits as supporting participants to remain involved in trials. However, where the study design deliberately minimised contact between the researcher and the participants to mirror real life experiences of women undertaking PFME in a community setting and downloading smart phone apps, it is surprising that attrition was as low as it was.

It is important to recognise that some participants may have decided not to complete the trial for reasons unrelated to the study design. Indeed, Participant 28 did not complete the trial because her husband died during the trial period. It is impossible account for the range of personal, social and economic factors which exert influence on adherence to PFME. The focus in this thesis has been on elements that positively influence adherence to PFME. To understand more about why participants were lost to the trial and why others did not increase exercise adherence, further research is required into the barriers to exercise faced by individuals, especially those who did not complete the trial.

6.7.3.5 SMART PHONE TECHNOLOGY IN RESEARCH

In section 5.3.5, the aspect of the potential desirability of the technology used in the trial was discussed. Although some participants indicated they would have exercised more if they had been provided with the technology, it acted as a distraction from exercise to others.

Technology, and specifically smart phones which can capture data in real time, have the potential to be useful as a method for future research (Carter *et al*, 2007; Heron & Smyth, 2010). Chen *et al* (2010) highlight the benefits which may result from self-monitoring using smart phone technology.

Some of the apps used in the trial included the recording of contractions and the days and times at which the exercise was done. As suggested by Heron & Smyth (2010), there is a possibility that these could be used to record exercises for research purposes, including the use of email, text or social media. As such, it would be possible to gather a range of data about the experiences of participants in adhering to exercise in an everyday setting in real time. This could provide an efficient method for data collection.

Heron & Smyth (2010) discuss the difficulties in accurate data collection in research of everyday life and promote the use of mobile devices and smart phones as a potential to increase the quantity and quality of data collected. As research in the field of apps for PFME develops, this aspect of data collection is likely to be utilised and evaluated.

Some of the apps used in this study had the potential for data collection use, in what Heron & Smyth (2010) describe as “*ecological momentary assessment*” (EMA). However, these apps were included in a range of five apps which were used in this trial and no single data collection tool was common. Furthermore, participants in the

control group did not have access to this method of data collection. Therefore, it was not possible to incorporate EMA into the study protocol.

6.8 CONCLUSIONS

Chapter 6 considered broader influences on PFME. Initially, the influences of age (section 6.1), lifestyle (section 6.2) and socio-economic status (section 6.3) were considered. Thereafter the role of personality (section 6.4) and previous experience of changing health behaviour (section 6.5) were investigated. The final two sections of the chapter focussed on the health and social environment of women (section 6.6) and the influence of wider society (section 6.7).

This study found different aspects of age which influenced adherence to PFME and attitudes to apps. Age Participants of all ages, from women in their twenties to others in their seventies, successfully achieved or maintained daily exercise by the end of the trial which suggests that age itself does not directly affect adherence. It is interesting that, in the longer term, only participants over the age of 50 years maintained that level of exercise but more evidence would be required about longer term studies to establish if age was a predictor of longer term adherence.

As was discussed in section 6.1.1, women forget to exercise over time without routine, tools for self-monitoring, or a programme to participate in. This forgetfulness relates to the passing of time and the lack of awareness about the need to maintain regular exercise rather than age itself. However, older women were found to be less likely to find apps to support their adherence acceptable.

This study revealed an anomaly where although participants self-reported that they were leading a healthy lifestyle, other data suggested less healthy aspects in their lifestyle. Findings confirmed excess weight as a risk factor for UI as three quarters of participants who indicated they were overweight experienced incontinence symptoms

but it is not possible to predict PFME adherence using neither either the self-reported assessment of weight nor level of physical activity to maintain health.

Findings about socio-economic status indicated that participants with lower socio-economic status were less likely to adhere to PFME. Where it was possible to make this link, it was not possible to link personality traits with adherence. There is a possibility that, as with self-perception of healthy lifestyle, self-perception of personality may not match with the actual personality traits of participants. Alternatively, the instrument used as a brief measure of personality may lack sufficient sophistication to be useful in this context.

Similarly, the self-efficacy score proved ineffective at predicting adherence. Interestingly, even self-reported success at any behaviour change does not predict adherence to PFME. This may indicate that motivation and adherence to PFME is dissimilar from other health behaviours and tailored programmes are required to address adherence.

The unwillingness of some participants to report their symptoms to health professionals supported the consensus that women are reluctant to, and delay the reporting of symptoms. However, findings from this study suggest that advice and direction from an expert, such as a health professional, would be welcomed as a mechanism to support adherence to PFME. The role of 'other people', whether at a social level or through health or community services was identified as providing support for adherence. There are opportunities for continence promotion to harness peer, partner, and other support although caution is required to avoid sensitivities.

Sensitivities and embarrassment in discussing UI and PFME as a treatment could be alleviated if the topics were more openly and frequently discussed in wider society. Increased profile in the media was identified as being a useful way to address stigma and to normalise the subject. There are opportunities for a fun and light hearted

approach to help avoid awkwardness and this is best achieved at regional or national level.

Aspects of the research design of this study supported participants to adhere to exercise; there are opportunities for these to be incorporated into continence promotion programmes to support PFME. Supporting women to feel 'not alone', providing discussion forums to raise awareness of PFME, and providing access to materials for self-monitoring are elements which could support women to adhere to PFME.

CHAPTER 7: CONCLUSIONS, REFLECTION AND RECOMMENDATIONS

The purpose of this study was to increase understanding about adherence to PFME and to investigate the influence of smart phone apps to support exercise. This thesis presents a creative and dynamic, multi-level strategic approach in evaluating the health intervention of apps for PFME and in understanding the complexity of behaviour change by women in a community based setting, as recommended by Aro and Absetz (2009). It has been from their perspective that “*we do not have adequate evidence for what really works*” (Aro and Absetz, 2009, p.128) that this attempt was made to gather data to fill the gap.

The recruitment process in this research project facilitated participation of women who had no symptoms and as such this study contributes to the gap in knowledge about adherence to PFME from a general population perspective. In addition, as the reluctance to report symptoms to health professionals has been identified in the literature (Sells & McDonagh, 1999) and experts have suggested that the wider population includes many women who suffer symptoms in silence (Basu & Duckett, 2009), this study and especially data about participants who had never reported their symptoms, contributes to understanding about this hard to reach population of which little is known. The focus of the study is, therefore, uncommon and the population studied (community dwelling women in Moray and the Highlands of Scotland) in this context is unique.

A mixed methods study was designed to identify factors which influence motivation and adherence to PFME. The design was structured to answer the research questions: ‘do smart phone apps for PFME support adherence’; ‘in what ways do smart phone apps for PFME support adherence’; and ‘what elements of smart phone apps make them effective in supporting PFME’.

Kahlke (2014) recommends reflexive use of a generic approach to methodology. It is in a spirit of reflexivity that the conclusions to this research project are reported in this chapter and recommendations made.

This study has helped to bring clarity about the use of the terms motivation, adherence and compliance in the field of PFME. When the term 'motivation' is more widely adopted to refer to the group of factors which influence women in wanting to start exercise and initially setting out to exercise and when the term 'adherence' is used to group factors which influence women to maintain or increase the amount of exercise they do, some of the confusion around the cross-over in use of terms would be eradicated.

7.1 CONCLUSIONS

The exploratory nature of this study has captured a wide range of influences on adherence to PFME. Conclusions of findings are presented in chapters 4, 5 and 6. In this chapter, the most salient, original conclusions are presented in order to demonstrate where this thesis has clearly added to the body of PFME research.

7.1.1 ADHERENCE TO PFME AND UI SYMPTOMS

A positive finding from this research project is that of the twenty three participants who completed the trial, fifteen participants exercised at least daily on average by the end of the trial. Of the fifteen who exercised at least daily, five continued average exercise of at least daily at the twelve month follow-up. Taking part in the study helped women to focus on the exercises and this had a positive impact on their adherence.

Eleven out of the fifteen participants with incontinence experienced an improvement in their symptoms after twelve weeks. This had a positive impact on their quality of life (Trial participants 24 and 26).

In this respect, evidence from this trial adds to the consensus that PFME are effective in alleviating UI symptoms. In addition, as can be seen from Figure 17

(p.158) where the women who had the biggest increase in level of exercise also had the biggest improvement in UI symptoms, this reinforces the notion that diligent performance of exercise positively influences efficacy.

7.1.2 ADHERENCE CHART AND APPS

In relation to the support for adherence provided by apps, some women clearly linked app use with adherence to exercise and identified aspects of the app which supported their exercise. Others did not recognise any benefit of the apps in supporting their exercise adherence.

Where apps were found to positively influence adherence, they acted as a visual focus that helped concentration and avoided distraction. In addition, the record of exercises in the apps history helped to remind participants of how many repetitions they had done and if, in fact, they had exercised that day. However, it is clear from the statements of participants that the adherence chart was even more effective in acting as a prompt or reminder for exercise. Some of the participants recognised that the discipline of writing down the number of exercises as a factor in influencing their adherence whilst others found it useful to look back on the record of how many exercises they had done.

For some, the difficulties in using the apps arose out of lack of familiarity with the technology in general. As suggested in section 4.1.2, these difficulties may be less common as the use of the technology becomes more ubiquitous. For others the layout of the apps or the inclusion of adverts were problematic and discouraged use.

7.1.3 PREVIOUS EXERCISE AND PREVIOUSLY TAUGHT PFME

This study has shown that adherence to exercise was higher in women who have been taught PFME. The development of habitual behaviour in PFME over the longer term appears to be more likely when the exercises had been done in the past.

These findings confirm that knowledge is a vital component as a mechanism of change in PFME.

However, it is also encouraging that results from this study suggest that adherence can be high in both women who have and have not previously exercised. At the start of the trial, only two participants were exercising daily. This is an indication that low cost, community based interventions can be successful in helping women to change behaviour; for some women, the behaviour change can be maintained in the longer term.

7.1.4 EXERCISE REGIMEN CHOICE AND EMPOWERMENT

Although allowing participants to set their own exercise regimen introduced difficulties in gathering precise data about how many exercises they planned to do and how many they achieved, this element of the study protocol fitted with recommendations that allowing choice in exercise regimen has a positive influence on adherence (Rennie et al, 2007).

The experience of participants, as illustrated by the following comments by participant 18, suggest that the study protocol which allowed participants to choose their own level of exercise (section 4.2.5) and set their own goals and the subsequent improvement in symptoms was empowering:

This sense of empowerment was shared by participant 26 whose experience suggests that by normalising the condition and making more socially acceptable to speak about symptoms (sections 5.1 & 5.2), women could be positively influenced and empowered to change their behaviour to improve symptoms:

The evidence of participants' low self-esteem, embarrassment and lack of awareness that anything could be done to help their symptoms resonated with the literature and

as such could have been predicted. Whereas, the gratitude expressed, and the increased empowerment and confidence reported by individuals at the end of the trial were unexpected outcomes of the study.

7.1.5 ROUTINE AND HABITUAL EXERCISE

As well as general positive feedback, participants indicated that the support they received in developing a routine of PFME was useful. Participant 5, who made a specific time to exercise and then it became part of her daily routine, and participant 24 who, when she started exercising first thing in the morning, found she was able to stick to the routine are examples of successful habit formation.

Their experience would suggest that in order to support women with disorderly or disjointed lifestyles to adhere to PFME and to develop habitual exercise the first step would be to support them to develop some consistency in their daily routines. Once a stable routine was developed, PFME could be incorporated into it and exercise could be associated with routine times or behaviours.

7.1.6 COMPETITION AND FUN

The influence of competition in adherence to PFME has not been investigated in the field of PFME research to date. Data from participants in this study suggests that competition is a factor which contributes to both motivation and adherence to PFME in some women.

Evidence from this study also suggests that health behaviour adherence affect is not contingent on condition improvement or the health benefit which is the purpose of that behaviour; some women just felt good about the fact they were exercising more. There is potential to harness positive feelings associated with exercising and a sense of fun to promote adherence.

In addition to the value of fun in reaching individuals with unmet need in incontinence services, there may also be value for health practitioners themselves. The literature includes data around the reluctance of some health practitioners to speak about and address continence issues (Sells & McDonagh, 1999; Wagg, 2002). . As with bowel cancer screening and the 'Poo Song', UI is a subject about which it can be difficult to initiate and engage in discussion and may therefore benefit from a completely different approach which uses humour and fun to diffuse awkwardness and tension.

A positive approach to continence promotion which focuses on the benefits of PFME, including the sexual benefits, would be useful in tapping into the interest in community dwelling women in the possibility of improving sexual sensation. Where there are potential for sensitivities and embarrassment and a due level of caution would be required, evidence from this study indicates that there are opportunities to engage women in PFME by promoting their sexual benefits.

The terms "*fed up*" and "*frustrated*" and "*not sure*" were used by many participants. For some, these negative experiences were overcome, the participants persisted and a habit was eventually formed. Others did not persist and no habit was formed. Further research into the feelings and experiences of women as they undertake a course of PFME would help to increase understanding of the role of affect in exercise adherence. Aspects of their experience which result in negative affect and act as barriers to adherence of exercise could then be mitigated against.

7.1.7 MOTIVATION

It is clear from this study that women are motivated to exercise to both treat and prevent symptoms of incontinence. However, motivation to exercise is much more complicated than simply the presentation of incontinence symptoms and, as some participants in the trial illustrated, the assumption that women will be motivated to exercise simply because they have incontinence symptoms should be avoided.

In terms of the self-management agenda and promotion of preventative health behaviour, encouragement can be taken from this trial that 43% of women who participated (n=12/28) had no symptoms but were sufficiently motivated by the prospect of prevention of incontinence to engage in the study.

However, despite the need for women to be autonomously motivated to exercise, some women seem to believe that they would be more successful in behaviour change if they had some external influence on their motivation. A device, a teacher, and an app were all identified by participants as factors which they think would have promoted their adherence.

Some companies capitalise on this by selling products which are marketed on the premise that they make exercise easier or more effective. These include the Kegelmaster device which has been shown not to be any more effective than PFME alone in a randomised trial (Kashanian *et al*, 2011). Indeed, the group using the Kegelmaster experienced more adverse effects than the other participants in this study. Where external aids, including devices and apps, may be a useful tool to support adherence to PFME, the key focus should be on autonomous motivation for individuals.

Given the complexity of trying to understand, and furthermore to measure inner prompts within individual women, it is clear that motivation for PFME is a subject on which we have barely scratched the surface. Further research into this field would be useful in informing the promotion of PFME to prevent incontinence and to treat symptoms.

7.1.8 AGE, BELIEFS AND ATTITUDES

Participants in the trial ranged in age from 21 years to 73 years and the average age was 48.6 years. The age of the fifteen who increased the frequency of their exercise to at least once a day or maintained daily exercise ranged from 21 to 73 and the age of those who did not exercise daily was between 25 and 67. Of the five participants who maintained daily exercise at follow up, their ages ranged from 50 to 61, (Table 21).

It is clear from the comments of participants 9 and 20 that older people were reticent to discuss incontinence. Although participant 9 was in her late sixties, despite having daily leakage of urine, she had never mentioned her symptoms to anyone prior to the telephone interview.

Another finding of this study is that there can be a difference in belief about the effectiveness of PFME within the individual. A woman can hold the general belief that exercises but may not believe that they are effective for herself. However, caution is required as the use of a likert scale to classify responses is an inadequate tool to accurately reflect the beliefs and attitudes of participants. Further research would be required to gain a better understanding of this anomaly.

In this study, it is clear that both groups of women, those who believed UI was a normal part of ageing and those who either did not or did not know were successful in changing their behaviour. This would suggest that although this attitude toward UI negatively influences help seeking behaviour it is not a factor which can be assumed to negatively influence adherence to PFME.

7.1.9 LIFESTYLE, PERSONALITY TRAITS AND PREVIOUS BEHAVIOUR CHANGE

As well as attitudes to incontinence, attitudes around healthy lifestyle, healthy weight and a healthy level of exercise were also considered in this study. Interestingly,

there was a mismatch between attitudes to healthy lifestyle in a broad sense compared to the specific elements of weight and physical activity. All of the participants indicated they led either a healthy or very healthy life but twelve said they were overweight and twelve said they did not do enough physical activity to stay healthy – these were not the same twelve women. Not surprisingly, therefore, self-reports of general health, weight or level of physical activity have not been found to be useful in predicting adherence to PFME.

Similarly, the Ten Item Personality Inventory was not been found to be a valid measure for predicting adherence of PFME, however, it is apparent that aspects of an individual's personality have influenced choice, or desired choice of PFME support tool and adherence of exercise. If these personality traits could be identified, this information could be used to tailor a contenance response with increased chance of efficacy.

In terms of previous success at behaviour change, surprisingly, of the women who maintained or increased to daily exercise throughout the trial, the largest proportion was of participants who had not successfully achieved any lifestyle changes during the previous year. This suggests that not only is the self-efficacy score ineffective at predicting adherence, self-reported success at any behaviour change does not predict adherence to PFME. Therefore, when attempts are made to predict adherence to PFME, it is important that individuals are not judged by their previous efforts at changing their lifestyle. In addition, this evidence indicates that the factors which influence adherence to PFME are not aligned with factors which support other types of behaviour change or change in lifestyle.

It is clear that there are many diverse characteristics of women which can influence adherence to exercise. Knowledge of these is important in developing a fuller understanding of women and their motivation and adherence to PFME. Women are complex and heterogeneous; their relationship to PFME cannot be dictated by single characteristics. Based on the findings discussed in this chapter, attempts to predict adherence to exercise based on any one characteristic are likely to be vain.

Furthermore, the interaction between individual characteristics is not easy to identify, far less measure.

7.1.10 THE ENVIRONMENT

In relation to environmental factors which can influence PFME adherence, health services were found to act as a barrier to PFME if they are the only source of information and support and if women are reluctant to seek help from health professionals.

The role of other people, including health professionals, family members and the wider community was discussed in section 6.6. Data from this study suggest that some individuals find it difficult to exercise alone and that support from other people helps their adherence. For these women, undertaking PFME in their own homes by themselves is particularly challenging and there can be a positive role of others in directing exercise, joining in with exercise or simply encouraging exercise.

Both participant s 9 and 24 suggested there was a role for the media to positively promote PFME. When participant 9 suggested that the promotion of PFME would benefit from an equivalent of the “*Poo Song*”, this was for the purpose of normalising incontinence and making the subject easier to talk about. Both these women experienced incontinence symptoms, neither were keen to talk about their symptoms with other people, and both identified the media as a way of raising the profile of PFME and incontinence. Further research is required to establish if the views of these women were commonly found in the population of hard to reach, undiagnosed women with incontinence. If the profile of PFME and incontinence was raised in the media, the resulting changes in culture could positively influence adherence to exercises, especially as women increasingly felt normal about having symptoms and empowered to do something about them.

7.1.11 CONCLUSIONS ABOUT APPS

Six out of ten of intervention group participants reported after twelve weeks that the apps were not useful and of the four who found them useful, their level of use was varied. On the face of it, this data could be interpreted to suggest that apps were not a successful intervention to support PFME. However, as well as the data which shows that when apps are found to be useful, adherence of exercise was supported, the additional qualitative data gathered by the focus groups and telephone interviews should also be considered.

The experience of older women in this study was predominantly negative in relation to app use and this even extended to the app acting as a barrier to exercise. In addition in relation to incontinence and age, findings from this study are consistent with the consensus that the prevalence of UI increases with age. In future, the needs of this population of women will not be met through mHealth until apps are made more acceptable and easy to use for older women. There is untapped potential for smart phone apps to meet the needs of individuals with UI and the most effective way of unlocking this potential is by raising mobile digital literacy.

As well as in older women, levels of mobile digital literacy in the wider population and especially for individuals with lower socio-economic characteristic should be addressed in order to address health inequalities.

This study has found that although an element of an app may be considered in theory to be useful in promoting adherence, in practice it is not effective. Such as the experience of trial participants which showed that the apps were less effective when reminders came at times when their phones or iPods were not at hand such as at home during the weekend when the technology was not being used as much as it was during the working week or first thing in the morning or last thing at night. The timing of audio reminders could potentially cause awkwardness or embarrassment if they went off at an unplanned or inconvenient time.

If women were included in the co-design of the apps, some of the irritations which contributed to cessation of use of apps could be avoided. Where apps allow individuals to set the wording of the text messages sent from the app or to set the wording of the reminders and prompt, this level of personalisation may help to avoid irritation and cessation of use of the service. Again, increased levels of mobile digital literacy would be required for these benefits to materialise.

A critical factor in apps being useful is that users enjoy using them. If using the apps feels good and is fun, women are more likely to both use the apps and adhere to the exercises. This would suggest that considering whether or not a patient may find an app fun should be a factor when health professionals recommend app use for PFME.

Commonality with remote sports should be investigated where there is potential to harness smart phone app technology to support both external and intrinsic competition for PFME. The potential for smart phone apps to support exercise through virtual competitors, eSupport groups, gaming and fun should not be ignored.

7.2 REFLECTION

The need for reflexivity during and in the analysis of research which takes a generic, mixed methodological approach in relation to rigour is highlighted by Caelli *et al* (2003). In addition, Heaven *et al* (2006) “*suggest that an additional layer of caution may be necessary in interpreting outcomes of trials reliant on self-report*” (p.268). As a result, the author has been circumspect in both study design and analysis.

Although the author is confident in defending the methodological approach, it was important to reflect on the specific methods used. The advice from Heaven *et al* (2006) in relation to the flaws in self-reported data was useful. They stated that “*the validity of self-report per se is not at issue*” but who recommended that “*assumptions*

about the nature and status of a report, bound by temporal and contextual factors, should be considered carefully” (Heaven et al, 2006, p.268).

When carefully considering the appropriateness of a small scale randomised controlled trial for a novel, complex intervention in a community setting, two aspects highlighted in the literature provided reassurance. The first is the simplicity of Denscombe’s (2010, p.66) description of experiments as being “*generally concerned with determining the cause of any changes that occur to the thing being studied*”. The trial provided a ‘before and after’ measure of adherence to PFME with the capacity to determine at least some of the influences for changes in this health behaviour. The second aspect was the context of the trial as exploratory (and the general aim of discovering influences on adherence which could be investigated in detail in future research). This fitted with the need for developmental research projects for complex interventions prior to larger scale studies (Craig *et al*, 2008).

In addition to reflexivity about the methods used in this study, the author has used the opportunity to reflect on techniques for different methods. For focus groups, the author examined her own role in conducting the focus groups and in any inadvertent bias which may result. In the trial, the author reflected on the disadvantages of being a single-person team. And for the telephone interviews, the author was very conscious of the need for care in discussing sensitive issues and indeed factors such as motivation and self-regulation. This helped to translate the best practise for methods described in books into skills for applied research.

The fact that the husband of one of the trial participants died during the trial provided the author with perspective about priorities and illustrated the difference between how important the research may be in the lives of participants compared to the importance of the research in the life of the author. Again, this was useful experience especially in the context of community based research projects.

Finally, in relation to personal reflection of the author, it was rewarding that some of the participants in this study benefited so clearly from taking part. During the course of the study period, many women have quietly approached the author to mention their own incontinence. This and the experience of participants in the trial reinforce the knowledge that many women suffer in silence. Reflection on their experience highlights unmet need within society for continence promotion services and for raising awareness of the benefits of PFME. Reflection on the research methods used in this study confirm the benefits of a mixed methods approach which incorporated an exploratory and pragmatic trial and qualitative data collection to capture the depth and range of experience of participants.

7.3 RECOMMENDATIONS

From the findings of this study, it is possible to make some recommendations for future practice. Initially, recommendations around the promotion of PFME are made. Later recommendations focus on the use of apps.

7.3.1 RECOMMENDATIONS AROUND THE PROMOTION OF PFME

To challenge the stigma around UI, a recommendation in this thesis is for more care to be taken in the language used to describe UI. While it is important that UI is not believed to be an 'inevitable' part of ageing, it is unhelpful for women to be told that it is not a 'normal' part of ageing. Indeed, women should be reassured that UI is a normal part of ageing but that there are a range of treatment options available which could prevent or improve symptoms. This recommendation should be tested in relation to Koch's call for further research to fully understand the "*help-seeking behaviors of women with UI*" (Koch, 2006, e43).

This recommendation challenges the notion commonly found in PFME literature that women should be corrected in assuming that UI is a normal part of ageing. However, in the literature, the negative aspects of the belief that UI is a normal part of ageing mostly relate to the impact on help seeking behaviour and not on adherence (Dugan *et al*, 2001). The intention to change the belief that UI is a normal part of ageing is often made with the hope of changing attitudes towards it so that

individuals feel more able and comfortable speaking about it. This resonates with the quote by Wagner & Subak (2010, p.2185); “*Although incontinence is not a normal part of aging, talking about it should be*” .

It is clear that adherence to PFME is increased by women’s sense of mastery that they are exercising correctly and hence, efforts should be made to increase confidence in women. The sense of empowerment experienced by some participants in this study is worthy of note.

A further recommendation from this study relates to the use of the terms ‘adherence’ and ‘motivation’ in relation to PFME. The author recommends that the term motivation is adopted to refer to the group of factors which influence women in wanting to start exercise and initially setting out to exercise and if the term adherence is used in the literature to group factors which influence women to maintain or increase the amount of exercise they do. This would help to eradicate some of the confusion around the cross-over in use of terms.

In addition to clarity in the use of the terms ‘motivation’ and ‘adherence’, increased clarity in future research about beliefs in the efficacy of PFME could be achieved by an additional survey question: “*exercising my pelvic floor muscles will prevent and / or cure my incontinence*”. This would help to differentiate general and personal beliefs.

There is a need for increased understanding about the role of routine and how it can support habitual health behaviour. The notion that women who have a stable daily routine would be more likely to incorporate PFME into that routine than those whose routine is disrupted or who have no stable daily routine is one which merits further investigation.

Further research into the feelings and experiences of women as they undertake a course of PFME would help to increase understanding of the role of affect in exercise adherence. Aspects of their experience which result in negative affect and act as barriers to adherence of exercise could then be mitigated against.

7.3.2 RECOMMENDATIONS AROUND APPS

The data from this study suggests that simply being provided with apps or equipment to use the apps cannot be linked to improved levels of participation in the study; the apps did not act as an incentive to continue in the study during the trial period. This suggests that the provision of technology is insufficient in itself to engage with individuals in health behaviour change and, far less to be relied on in isolation to support behaviour change. This has important implications for future service provision.

In relation to the quality of health information on apps, if this is to be checked before being authorised to be recommended by health professionals there are considerable resource implications. This would involve initial benchmarking of quality and the vetting of apps and also in the on-going supervision of apps as they change with upgrades.

There are opportunities for mHealth communication about PFME to be provided in an accessible, convenient format and to be personalised to support adherence to exercise. This fits with Neuhauser and Kreps (2010) who found that eHealth information which is tailored to individuals and context is better than traditional health information. They suggest traditional health information is “*static and one-size-fits-all*” but when it is personalised it is more effective in motivating and supporting people to make better decisions (Neuhauser & Kreps, 2010, p21).

As with aspects of functionality in apps, even if the content of apps is of a high quality and the information has been approved, the app will not be useful in promoting

adherence to exercise if it is dull and not fun to use. Clearly, health service systems are not currently geared to measure fun in apps and this may lead to interesting debate about what the role of the health service is in respect of mHealth. Indeed, further consideration is required of the implications of including the element of fun in prescribing mHealth interventions.

Given the interest in competition shown by participants in this study and the possibilities for gaming and competition to be incorporated into mhealth (de Leeuw *et al*, 2010), this is a field which merits further, more detailed research.

For community based continence promotion interventions involving PFME, there is a need to find alternative approaches to address the issue of self-efficacy. Smart phone technology may help to meet this challenge and the opportunity for apps with attachments which can be used to measure pelvic floor muscle strength should be investigated.

Familiarity with the technology, and the nature of its use, has influenced the way participants interacted with the apps for PFME. This would suggest that as smart phone usage proliferates (Boulos *et al*, 2011), women will be more likely to use apps for PFME. This suggests that health services consider the implications of mHealth in terms of how well it fits with current models of delivery and what adaptations may be required. Induction to apps and ongoing support in their use should be considered as a vital element in an mHealth service.

Further research would be required to measure the effect of accent on attitudes to PFME information and advice and the impact on acceptability of apps. Opportunities for features which reflect local culture and heritage could be investigated in relation to their influence on adherence to exercise. Apps could use location services to raise awareness of local continence services and of exercise classes which incorporate PFME.

Further research would also help to explore the effectiveness of virtual groups, or eGroups, in supporting women with PFME and in promoting adherence to exercise. Elements of smart phone apps which incorporate social media could be used to facilitate virtual groups and to enhance communication between members of the groups. This aspect should be included in future research.

7.4 BRIEF SUMMARY, CONCLUSIONS AND CONTRIBUTION OF THESIS

7.4.1 BRIEF SUMMARY

28 women started out in October last year in a study about pelvic floor muscle exercises (PFME). 23 participants completed and returned the questionnaire at the start of 2013.

All the participants lived in Moray – most lived in ‘accessible rural’ areas or ‘accessible small towns’, some in urban areas and a few in more remote areas. They ranged in age from 21 years to 73 years.

Findings:

- 87% of participants increased the frequency of PFME or maintained daily exercise.
- All of the participants who received an iPod Touch or apps either increased the frequency of their exercising or maintained regular exercise. However, not all of these women used the iPods or apps throughout the whole study period.
- Of the participants who had incontinence symptoms, 87% either maintained regular exercise or increased to a frequency of at least once a week. And 73.3% experienced a decrease in UI symptoms (which meant that 26.7% of the participants who had symptoms either experienced an increase in symptoms or their symptoms did not change).
- 40% of the participants who received an iPod Touch or apps found the apps useful and all of those increased the frequency of their exercise. Of the women who found the apps useful, all of those who had incontinence symptoms found that their symptoms improved.

- But, of the participants who didn't find the apps useful, 83% increased or maintained the frequency of their exercise and 80% of those who had incontinence symptoms found that their symptoms improved.

Seven women were interviewed by telephone a few months after the study finished.

Here is some of what they said:

- There was a lot of discussion about the fact that taking part in the study was useful in focusing on PFME and in reminding women to exercise.
- Some women found the paper adherence chart useful as both a prompt to and a record of exercise.
- Another effect of simply taking part in the study was the feeling that women were not alone in experiencing symptoms and, for the first time, they understood that UI was common and they were less ashamed of it.

7.4.2 CONCLUSIONS FROM THIS STUDY

- Apps are not a universally acceptable or effective method of motivating and supporting adherence to PFME.
- Where individuals are motivated to exercise, apps can be effective in supporting adherence in some women. These women are likely to be familiar with smart phone technology.
- Existing technology, such as television and DVDs, are suggested as of potential alternatives which may be effective; especially in reaching women with UI symptoms who have not previously sought help from a health professional.
- Some women expressed the need for human support for motivation and adherence to exercise and specifically the role of an expert to provide reassurance and advice.
- The need for promotion of PFME in the media has been identified to raise awareness of the benefits of exercise and to act as a prompt for exercise.

7.4.3 CONTRIBUTION OF THIS THESIS

Chapter 7 encapsulates the contribution of this thesis to the body of PFME research. Where the gap in understanding about adherence to PFME was identified in the literature, this thesis uses original research undertaken in the North East of Scotland to demonstrate influences on adherence to PFME and how smart phone apps in supporting adherence by reminding women to exercise, helping them to concentrate on and monitor their exercise, and in making exercise more enjoyable and fun. The thesis demonstrates the need for increase awareness of PFME as a treatment for UI and highlights the importance of understanding the context in which women exercise and the need for a person-centred approach for tailored support for PFME.

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9 APPENDICES

The formatting of some appendices has been changed in order to fit with this thesis.

APPENDIX I: FOCUS GROUP STUDY PROTOCOL (EXCERPT)

Motivation and adherence to PFME and the role smart phone apps.

(Focus Group Protocol Version: 111212)

1.1 SYNOPSIS:

Study Title	Motivation and adherence to PFME and the role of smart phone apps
Study design	Focus Groups
Study participants	Health Professionals (Women's Health) Community dwelling older women (e.g. lunch club in Nairn) / post or peri-menopausal women (e.g. social/charity group in Nairn) Community dwelling young mothers (e.g. Toddler group in Nairn)
1° objective	To gather views about PFME applications
2° objectives	To gauge opinion about the role of apps for health
Primary endpoint	Transcription and analysis of focus groups
Investigational product	Apps (mobile phone applications)
Form	PFMT apps
Activity	Focus Group

1.2 GLOSSARY OF ABBREVIATIONS:

UI	Urinary incontinence
SUI	Stress urinary incontinence

MUI	Mixed urinary incontinence
PFE	Pelvic floor exercise
PFMT	Pelvic Floor Muscle Training
HB	Health belief
TPB	Theory of planned behaviour

1.3 KEYWORDS:

App, pelvic, floor, muscle, exercise, attitude, acceptability.

2.1 BACKGROUND

With an ageing population (Scottish Government, 2007) and a “*new era of austerity in the public finances*”, the NHS will have to “*change dramatically in the next ten years*” (Matthews, 2010:1). A new model of care is emerging in which self-care is encouraged and there is more focus on anticipatory care (Scottish Government, 2008). Part of NHS Scotland’s strategy for major service change is to optimise the use of technology (Scottish Government, 2011). This is likely to involve debate as to when technology is not appropriate and, where it can be used, how to ensure quality.

“*Urinary Incontinence is a common condition which is more prevalent in women than diabetes, hypertension or depression*” (Dolman, 2007, p.56). It is estimated that less than half of the adults with moderate or severe UI seek help from healthcare providers (SIGN, 2004, p.4). Individuals may be too embarrassed to seek help or may think that symptoms are a normal part of ageing.

Exercises to strengthen pelvic floor muscles are effective in the treatment of stress and mixed UI and no evidence of any adverse effects of the exercises have been identified (SIGN, 2004, p.5). Knight *et al* (1998) discuss the need for exercises to be “*diligently performed*” (p.61) and emphasise the need for strict adherence to an exercise programme. Gaps in the literature about adherence and the need for “*adherence strategies to enhance motivation*” (Bo & Haakstad, 2011, p.195) have been identified.

There have been increasing examples of web-based health behaviour interventions in recent years and this appears “*to be an efficacious method for delivering health behaviour interventions in a cost-effective manner*”, Riley *et al*, 2011, p.53. Bennett and Emberson suggest that mobile technology provides “*a useful starting point for implementing behavioural change in resource-poor settings*”, 2011, p.7. Buolos *et al* (2007) have identified the role of technology as a solution where adherence is a problem.

2.2 RATIONALE FOR CURRENT STUDY

Urinary incontinence (UI) is a common condition which can be caused by the weakening or dysfunction of pelvic floor muscles as a result of ageing, pregnancy or obesity in women. Prevalence of UI is higher than that of diabetes, depression and hypertension but rates are difficult to establish because there is evidence of a reluctance to seek help. Women assume symptoms are normal and untreatable but can become depressed and isolated.

The first line of treatment for UI is pelvic floor muscle training (PFMT) and effectiveness has been shown in over 50 randomised controlled trials. There are gaps in research (detailed in previous section) about motivation and adherence to exercise.

Research about mobile participatory healthcare has identified the role of technology in addressing problems with adherence. There has been an increase in the use of smart phones to access the internet and in the number of health related applications but there is a lack of research about the effectiveness of this new technology in supporting individuals to self-manage.

Mobile phone apps have been developed to support women in PFME. The approaches used to promote exercise include; improving incontinence symptoms, strengthening muscles after pregnancy and increasing sexual sensation.

Research will be undertaken in Moray, North East Scotland to increase understanding of the experience of community dwelling women in using apps for PFME as part of a PhD. The study aims to increase understanding of the motivation and adherence of women in undertaking PFME and of mobile phone apps in

supporting women to exercise. It will identify factors which act as barriers or promoters to exercise and examine links between previous exercise and self-efficacy in adherence. It will investigate design elements of up to three apps and how these may trigger and prompt behaviour or contribute to habit formation. Motivations to improve the strength of pelvic floor muscles based on the treatment or prevention of incontinence, post-partum recovery and sexual function will be studied. The acceptability of apps to support PFME will be examined.

Research Question: The acceptability and effectiveness of smart phone apps in helping women to adhere to a programme of PFME?

2.3 FOCUS GROUP OBJECTIVES

Primary objective

To investigate attitudes to PFME and acceptability of health apps, generally, and PFME apps, specifically.

Secondary objectives

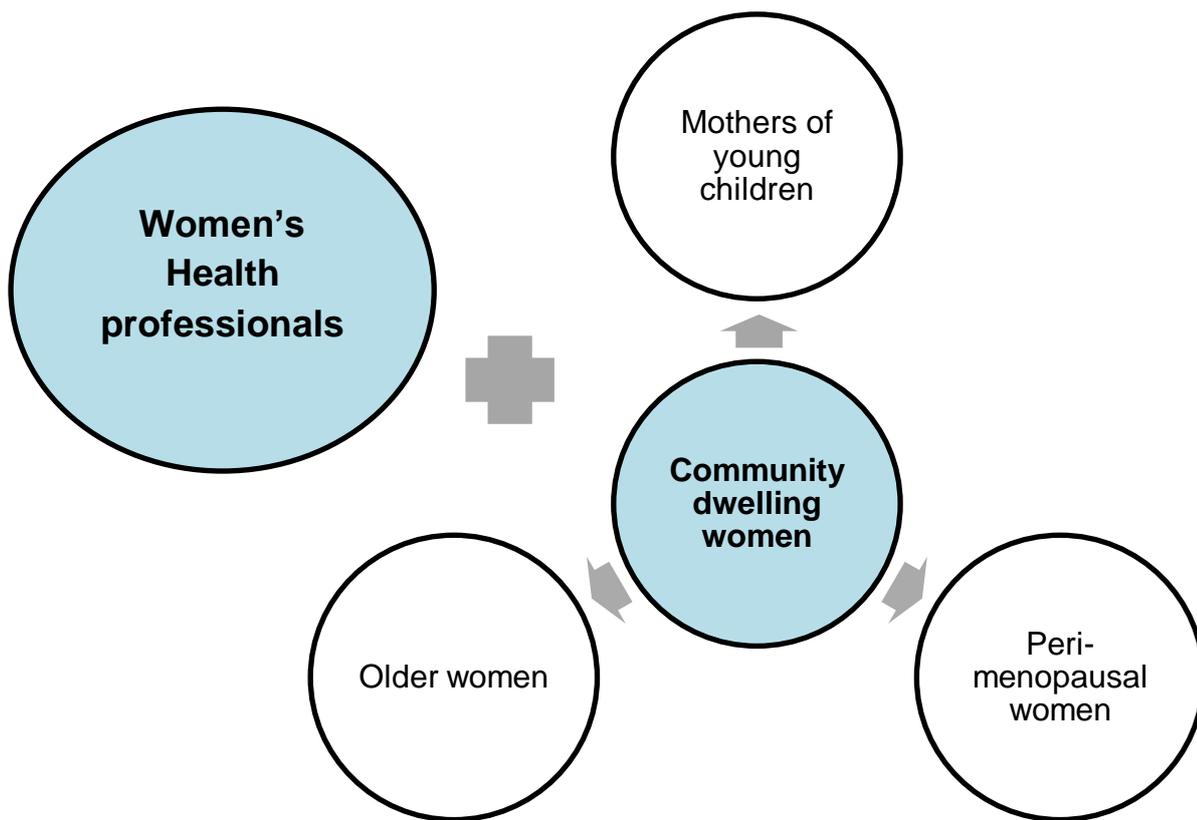
To identify opportunities and threats to the use of apps, specifically PFME apps, by women in Moray.

3.1 STUDY DESIGN

Focus groups form part of doctoral research from a pragmatic approach which will triangulate results from an explanatory randomised controlled trial with data from post-trial interviews. The focus groups, which will be held prior to the trial, will be used to provide additional qualitative data around the 'softer' issues around the use of apps including attitudes and acceptability of the technology. Four focus groups will be conducted between December 2011 and June 2012. One focus group is with health professionals and other groups will be with community dwelling women from different age groups.

Focus groups (2-4) will involve around 8 participants in each.

3.2 FOCUS GROUP STRUCTURE



3.3 ADMINISTRATION OF FOCUS GROUPS:

Information about the study will be provided to participants prior to the start of the focus group. Consent forms will be provided to ensure participants understand what it means to be involved and are happy to do so.

The section of the focus group where the apps are being presented will be recorded (audio). Comments and discussion points relating to the apps will be transcribed and coded using nVivo.

A quick 'before & after' exercise to gauge general views to mHealth will be undertaken. By comparing the responses before and after the session, it will illustrate if attitudes to apps change when information about them is provided.

The focus group sessions are expected to be completed within one hour.

Focus groups will approximately follow the following format:

- Introduction ~ 5 mins
- Quick exercise about general views to mHealth (1)
- Overview of my research (power point) > 10 mins
- Questions / Consent forms / set up audio recording ~ 5 mins
- Presentation of three apps - response sheet for each app > 10 mins each
- Quick exercise about general views to mHealth (2)
- Thanks (copies of consent forms on exit with contact details) ~ 5 mins

If individual iPod Touches are available on the date of the focus groups with community dwelling women, group members will be given those to look at and test as part of the session.

Health professionals in Womens' Health. The focus group will be part of a regular meeting of NHS Grampian's Women's Health Physio Group to which the researcher has been invited.

These focus groups will be held with participants of existing community groups such as those which meet at the Nairn Community Centre.

3.4 STUDY OUTCOME MEASURES (ENDPOINT)

Data from Focus groups will be analysed and discussed as part of a PhD thesis.

4. PARTICIPANT RECRUITMENT

The researcher will recruit participants from user groups such as those at the Nairn Community & Arts Centre. There is a large range of user groups (e.g. Lunch Club, Tai Chi, Playgroup) which will include community dwelling women in all of the age groups required. Initially contact will be made through the Centre manager with direct contact with individual groups and group leaders arranged as recommended by the manager. Focus group meetings will be arranged to suit individual groups and

may involve taking over an existing slot or negotiating a separate, convenient time (this may be necessary if groups are mixed gender or if normal group activities prevent the running of a focus group). If required, crèche facilities will be arranged.

5. STATISTICS AND DATA ANALYSIS

Data and all appropriate documentation will be stored for a minimum of 5 years after the completion of the study, including the follow-up period.

Descriptive statistics will be used.

Qualitative information and analysis:

Data from transcriptions of focus groups will be entered into nVivo for coding. This will assist with making connections between data and the literature, linking with models and theories of health behaviour, and in managing the quantity of data and information which is being generated.

Interviews will be designed to supplement the questionnaires and to obtain more in-depth data about the experience of participants.

6.1.RISK ASSESSMENT

There are no health risks associated with this study.

6.2.MONITORING

All study documentation will be reviewed and approved by the supervisory team. Data will be checked on an ad hoc basis by the director of studies at the study centre. Further checks will be provided by external examiners as part of the PhD Viva and the peer review of papers for publication.

6.3 ETHICS APPROVAL

The original study proposal was given UHI ethics approval and this detailed study design is in the process of obtaining UHI ethics approval. Confirmation will be obtained from the Head of R&D in NHS Highland that NHS ethics approval is not required for the study described. The study will be conducted in accordance with the recommendations for physicians involved in research on human subjects adopted by the 18th World Medical Assembly, Helsinki (1964) and later revisions.

6.4 CONSENT

Consent to enter the study will be sought from each participant after a full explanation has been given. Participants will be given the opportunity to ask the researcher any questions regarding the study. The right of the participant to refuse to participate or leave the focus group without giving reasons must be respected.

6.5 CONFIDENTIALITY

Participants' data will be made anonymous in the analysis and discussion.

7.1 SPONSOR

UHI Centre for Rural Health will act as the sponsor for this study.

7.2 FUNDING

UHI (Moray College & CRH), NHS Grampian, HIE. Details of funders can be obtained from Moray College.

7.3 AUDITS AND INSPECTIONS

The study may be subject to inspection and audit by UHI.

8 PUBLICATION POLICY

All publications and presentations relating to the study will be authorised by the Director of Studies. Named authors will include at least the Director of Studies and may include one or more of the supervisory team as well as Kate Stephen.

APPENDIX II: FLYER FOR FOCUS GROUPS

This flier was handed out to mothers attending parent and toddler groups and to women attending older people's groups in Nairn and Hilton community centres. Fliers were also left at the reception areas of both community centres.



My name is Kate Stephen & I am doing some research
about Pelvic Floor Exercises



and if smart phones might be useful in reminding us to do them!

Would you join me here at the _____ Community Centre for about an hour on _____
to look at some 'apps' so that I can hear what you think?

Anything you say will be treated confidentially.

You won't be asked to buy anything.

I'll bring sweeties & hope that it will be fun for you!



Please CALL, TEXT or EMAIL me at

T. 07856 761 724 E.kate.stephen@uhi.ac.uk

if you'd like to know more before coming along.



APPENDIX III FOCUS GROUP PARTICIPATION SHEET

(NAME OF GROUP)

(Date)

OVERVIEW OF STUDY

Research is being undertaken in Moray, North East Scotland to increase understanding of the experience (motivation and adherence) of women in Pelvic Floor Muscle Training and the role of smart phone apps. The study is part of a PhD.

BACKGROUND INFORMATION

Urinary incontinence (UI) is a common condition which can be caused by the weakening or dysfunction of pelvic floor muscles as a result of ageing, pregnancy or obesity in women. Women assume symptoms are normal and untreatable but can become depressed and isolated.

The first line of treatment for UI is pelvic floor muscle training (PFMT).

PURPOSE OF MEETING WITH (NAME OF GROUP)

Focus groups are being conducted to find out more about attitudes to PFME and acceptability of the technology. Women from Nairn are being asked for their views, including women from the (name of group).

WHAT WILL HAPPEN

Background information will be given about UI and apps. You will be asked to indicate your general views about mobile phone technology and its use for helping women to exercise at the start of the focus group and again at the end.

3 - 5 different apps for PFME will be shown and you will be asked to comment on each and discuss how useful you think each app might be.

The focus group will be recorded (audio), if everyone is happy with this. All comments and views will be treated with complete confidentiality.

FOLLOW UP

A sheet summarising the views expressed can be sent to participants (A sheet for contact details will be made available for those who request this follow up).

APPENDIX IV FOCUS GROUP CONSENT FORM

Moray College Health PhD: Pelvic Floor Muscle Training Study

Group	
Venue	
Date	

CONSENT FORM

I confirm that I have read and understood the information sheet (Version 111212) and have had the opportunity to ask questions which have been answered fully.	Please tick <input type="checkbox"/>
I agree to take part in the discussion about pelvic floor exercise apps. I understand that my participation is voluntary and that I am free to leave the session at any time, without giving a reason.	<input type="checkbox"/>
I understand that the discussion will be recorded (audio) and may be transcribed. I understand that any comments will be anonymised and identifiable information will be removed prior to any future use for academic analysis and publication.	<input type="checkbox"/>
I understand that hand written notes may be taken during the session and that any comments will be anonymised and identifiable information will be removed prior to any future use for academic analysis and publication.	<input type="checkbox"/>
I have been advised that any written notes, response sheets and audio recordings will be stored in a locked filing cabinet at the Centre for Rural Health or in a secure electronic folder which is available to the project team only.	<input type="checkbox"/>

Name: _____ Signature: _____

Researcher: Kate Stephen Signature: _____

APPENDIX V ATTITUDES TO HEALTH APPS VOTING FORM

Please say how much you agree with the following statement " <i>Smart phone applications are a useful tool which could help individuals in Moray to self-care and self-manage their health</i> "				
Strongly agree	Agree	Don't know	Disagree	Strongly disagree

APPENDIX VI NOTES ABOUT APPS

This form was provided for each of the apps to allow focus group participants to complete and write notes in. This was especially to capture the views of participants who were not sufficiently confident or who had insufficient opportunity to share their views within the group.

Please give your views about the following:

<u>Design and appearance</u>	Attractive	<input type="checkbox"/>	Unattractive	<input type="checkbox"/>
	Clear layout	<input type="checkbox"/>	Unclear layout	<input type="checkbox"/>
<u>Usability</u>	Straight forward looking	<input type="checkbox"/>	Complicated looking	<input type="checkbox"/>
<u>Quality of advice</u>	Too much information	<input type="checkbox"/>	Too little information	<input type="checkbox"/>
	Information appears to be correct	<input type="checkbox"/>	Information appears to be incorrect	<input type="checkbox"/>

In what way(s) might this app be useful for motivation and adherence?

Would you recommend the use of this app?	Yes - to all	<input type="checkbox"/>
	Yes – to some women	<input type="checkbox"/>
	Don't know	<input type="checkbox"/>
	No	<input type="checkbox"/>

General comments about this app:

APPENDIX VII TRIAL PROTOCOL (EXCERPT)

1.1 SYNOPSIS:

Study Title	Motivation and adherence to PFME and the role of smart phone apps.
Study design	Mixed methods Explanatory, randomised controlled trial Telephone interviews
Study Participants	<20 community dwelling women in Moray Group 1 n<10 (intervention) Group 2 n<10 (control group) 5-8 participants will be interviewed by telephone at the end of the trial, purposively selected using data from questionnaires and adherence charts.
Trail exclusion criteria	Men Females < 18 years Self-reported inability to contract PFM Non-English speaking Neurological disorders, cognitive impairments, or lack of independent mobility
Trial Sample size	N<20 (app intervention group n<10; control n<10)
Trial duration	Each group will involve 12 weeks (excluding baseline and post-study questionnaire & administration) The control group (Group 2) will run concurrently with Group 1.
1° objective	To measure adherence to PFME
2° objectives	To identify barriers and promoters to adherence to PFME
Primary endpoint	Completion of both arms of the trial, return of iPods, adherence charts and post-trial questionnaires, and interviews (February 2013).
Investigational product	Apps (mobile phone applications) Instruction leaflet or instruction leaflet with iPod Touch with app
Form	PFME apps
Activity	12 weeks of exercise (frequency chosen by participants)

1.2 GLOSSARY OF ABBREVIATIONS:

UI	Urinary incontinence
SUI	Stress urinary incontinence
MUI	Mixed urinary incontinence
PFME	Pelvic Floor Muscle Exercise
HB	Health belief
TPB	Theory of planned behaviour

1.3 KEYWORDS:

App, pelvic, floor, muscle, exercise, adherence, motivation.

2.1 BACKGROUND

With an ageing population (Scottish Government, 2007) and a “*new era of austerity in the public finances*”, the NHS will have to “*change dramatically in the next ten years*” (Matthews, 2010:1). A new model of care is emerging in which self-care is encouraged and there is more focus on anticipatory care (Scottish Government, 2008). Part of NHS Scotland’s strategy for major service change is to optimise the use of technology (Scottish Government, 2011). This is likely to involve debate as to when technology is not appropriate and, where it can be used, how to ensure quality.

“*Urinary Incontinence is a common condition which is more prevalent in women than diabetes, hypertension or depression*” (Dolman, 2007, p.56). It is estimated that less than half of the adults with moderate or severe UI seek help from healthcare providers (SIGN, 2004, p.4). Individuals may be too embarrassed to seek help or may think that symptoms are a normal part of ageing.

Exercises to strengthen pelvic floor muscles are effective in the treatment of stress and mixed UI and no evidence of any adverse effects of the exercises have been identified (SIGN, 2004, p.5). Knight *et al* (1998) discuss the need for exercises to be

“diligently performed” (p.61) and emphasise the need for strict adherence to an exercise programme. Gaps in the literature about adherence and the need for *“adherence strategies to enhance motivation”* (Bo & Haakstad, 2011, p.195) have been identified.

There have been increasing examples of web-based health behaviour interventions in recent years and this appears *“to be an efficacious method for delivering health behaviour interventions in a cost-effective manner”*, Riley *et al*, 2011, p.53. Bennett and Emberson suggest that mobile technology provides *“a useful starting point for implementing behavioural change in resource-poor settings”*, 2011, p.7. Boulos *et al* (2007) have identified the role of technology as a solution where adherence is a problem.

2.2 RATIONALE FOR CURRENT STUDY

Urinary incontinence (UI) is a common condition which can be caused by the weakening or dysfunction of pelvic floor muscles as a result of ageing, pregnancy or obesity in women. Prevalence of UI is higher than that of diabetes, depression and hypertension but rates are difficult to establish because there is evidence of a reluctance to seek help. Women assume symptoms are normal and untreatable but can become depressed and isolated.

The first line of treatment for UI is pelvic floor muscle exercise (PFME) and effectiveness has been shown in over 50 randomised controlled trials. There are gaps in research (detailed in previous section) about motivation and adherence to exercise.

Research about mobile participatory healthcare has identified the role of technology in addressing problems with adherence. There has been an increase in the use of smart phones to access the internet and in the number of health related applications but there is a lack of research about the effectiveness of this new technology in supporting individuals to self-manage.

Mobile phone apps have been developed to support women in PFME. The approaches used to promote exercise include; improving incontinence symptoms, strengthening muscles after pregnancy and increasing sexual sensation.

Research will be undertaken in Moray, North East Scotland to increase understanding of the experience of community dwelling women in using apps for PFME as part of a PhD. The study aims to increase understanding of the motivation and adherence of women in undertaking PFME and of mobile phone apps in supporting women to exercise. It will identify factors which act as barriers or promoters to exercise and examine links between previous exercise and self-efficacy in adherence. It will investigate design elements of three apps and how these may trigger and prompt behaviour or contribute to habit formation. Motivations to improve the strength of pelvic floor muscles based on the treatment or prevention of incontinence, post-partum recovery and sexual function will be investigated as well as the acceptability of apps to support PFME.

Research Question: The acceptability and effectiveness of smart phone apps in helping women to adhere to a programme of PFME?

2.3 TRIAL OBJECTIVES

Primary objective

To monitor adherence to pelvic floor muscle exercises and to identify promoters and barriers to exercise in community dwelling women and the role of smart phone apps.

Secondary objective

To make recommendations around the adoption of apps to support PFME as part of NHS incontinence prevention and care.

2.4 TELEPHONE INTERVIEW OBJECTIVES

Primary objective

To understand the experiences of women in undertaking a 12 week course of exercise and to record their thoughts and feelings about using the PFME apps.

Secondary objectives

To identify links between the experiences, thoughts and feelings of women and their adherence to exercise.

3.1 STUDY DESIGN

The study is from a pragmatic approach and will triangulate results from the explanatory randomised controlled trial and data from post-trial interviews with the literature. Community dwelling women in Moray, NE Scotland, will be recruited to undertake exercises as part the study and will be randomly allocated to an intervention group (apps) or a control group (no app). Prior to the trial, questionnaires will be tested (by staff and students at the Centre for Health Science and others).

3.2 CONSORT DIAGRAM

(See appendix XXIII)

3.3 ADMINISTRATION OF TRIAL

All individuals who have expressed an interest in participating will be sent a Participant Information Sheet, a consent form and the baseline questionnaire.

When consent forms and baseline questionnaire are returned, participants will be randomly allocated to one of four groups (including one control group):

Group 1 Apps

Group 2 Control

Participation Packs will be sent to individuals in Groups 1 & 2. Included in the participation pack sent to participants in Groups 1 will be an iPod with instructions for use.

The above administration plan is based on more than 20 women returning their consent forms and baseline questionnaires. If recruitment is slow, the study will start after 10 women have returned their forms and have been randomly allocated into either Group 1 or Group 2. Simultaneously, increased effort will be made to recruit more participants (please see section 4 for recruitment).

Contents of Participation Packs

All participants

- Cover letter
- PFME advice
- Exercise chart

Additional material for intervention group

- iPod guide
- iPod (unless own equipment is used)

The post-trial questionnaire will be sent to participants during the last week of their exercise period, with a prepaid envelope (with instructions for the return of the adherence chart, the completed questionnaire and, for the intervention group, the iPod touch). A reminder will be sent out 7 days and 10 days if required.

A follow-up questionnaire will be sent to participants approximately 3 months after they have completed their exercise period.

3.4 ADMINISTRATION OF TELEPHONE INTERVIEWS

Telephone interviews will involve more detailed questions and discussion about the experience of participants. Interviews will be semi-structured using a topic guide and based on responses to questions in the post-trial questionnaire.

3.5 STUDY OUTCOME MEASURES (ENDPOINT)

Data from:

<20 baseline questionnaires and post-trial questionnaires

4<8 Telephone interviews

Data from longer-term follow-up (repeat of post-trial questionnaire) will be a secondary endpoint.

Data will be analysed and discussed as part of a PhD thesis.

4.1 Participant RECRUITMENT

Trial participants:

Community dwelling women in Moray

Posters will be displayed and fliers will be distributed around Moray to recruit participants. Local newspapers, the local radio station and existing community groups will be used to raise awareness and to encourage participation.

If insufficient numbers are recruited through the above methods, staff and students at Moray College will be invited to participate.

Telephone interview participants:

Participants of the trial will be asked for consent to be contacted after their exercise period has finished for a telephone interview.

4.2 PRE-RANDOMISATION EVALUATIONS

The baseline questionnaire and the consent form will be used for pre-randomisation evaluation of participants in the trial.

INCLUSION CRITERIA

Women >18 years living in Moray

English speaking women

Self-reported ability to contract PFM

Normal neurological and cognitive function

Willingness to use and return equipment provided by the study

EXCLUSION CRITERIA

Men

Non-English speaking women

Women < 18 years

Self-reported inability to contract PFM

Neurological disorders and cognitive impairments

4.5 WITHDRAWAL CRITERIA

Participants may withdraw from the trial at any time and may withdraw their consent for use of data up till 3 months after their exercise programme ends.

Participants withdrawing from the control group are not required to do anything but participants in the intervention group will be required to return the iPod touch in a prepaid envelope provided.

As there are no health risk factors associated with PFME or the use of iPods, premature discontinuation of the trial is unlikely.

5.1 RANDOMISATION AND ENROLMENT PROCEDURE

This trial will involve a partially blind random allocation of participants into the two arms of the study to eliminate bias at that stage.

Individuals interested in participating in the study will be sent Participant Information Sheets, Consent Forms and baseline questionnaires. A prepaid envelope will be provided for the return of the signed consent form and completed baseline questionnaire. Completed questionnaires will be numbered, reviewed by the researcher and stratified, according to responses to questions about confounding variables, into groups of two.

COMPLIANCE ASSESSMENT

A key aim of this study is to measure compliance and to gather data about barriers and promoters of adherence to PFME. As such, compliance assessment is integral to the study (the adherence chart).

LOSS TO FOLLOW-UP

Data from longer-term follow-up is a secondary end point and not a primary outcome of this study. Therefore the negative impact of loss to follow-up will be minimal.

TRIAL CLOSURE

The end of the trial is expected to be when all participants from both groups have completed their 12 week exercise period and returned their post-trial questionnaire, adherence chart and (if applicable) their iPod touch.

8.1 STATISTICS and data analysis

Data and all appropriate documentation will be stored for a minimum of 5 years after the completion of the study, including the follow-up period.

Data will be tested to identify correlations between the variables 'previous exercise' and 'adherence'. Initially data will be plotted on a scattergram. If the data points are close to the regression line, a Pearson's r test will be undertaken (or Spearman's rho, if data is abnormally distributed).

Chi-square tests will be used to investigate any association between 'UI symptoms' and 'adherence' and between 'belief in efficacy of PFE' and 'adherence' (this may include a Yate's correction).

Due to sample size, the results are not likely to be statistically significant but will be useful in informing future trials and in establishing effect size.

Analysis will be conducted using SPSS and will be coded in nVivo when appropriate (see below for purpose of using nVivo).

Qualitative information and analysis:

Data from transcriptions of interviews will be entered into nVivo for coding. This will assist with making connections between data and the literature, linking with models and theories of health behaviour, and in managing the quantity of data and information which is being generated.

Interviews will be designed to supplement the questionnaires and to obtain more in-depth data about the experience of participants. A topic guide will be used and the interview will be conversational.

RISK ASSESSMENT

There are no health risks associated with this study.

MONITORING

All study documentation will be reviewed by the supervisory team. Data will be checked on an ad hoc basis by the director of studies at the study centre. Further checks will be provided by external examiners as part of the PhD Viva and the peer review of papers for publication.

9.3 ETHICS APPROVAL

The original study proposal and the original protocol for the study have been granted UHI ethics approval. Confirmation has been obtained from the Head of R&D in NHS Highland that NHS ethics approval is not required for the study described. The study will be conducted in accordance with the recommendations for physicians involved in research on human subjects adopted by the 18th World Medical Assembly, Helsinki (1964) and later revisions.

9.4 CONSENT

Consent to enter the study will be sought from each participant after a full explanation has been given, an Participation Information Sheet provided and time allowed for consideration. Participants will be given the opportunity to ask the researcher any questions regarding the study. Signed participant consent will be obtained for all participations of the trial. The right of the participant to refuse to participate without giving reasons will be respected. All participants are free to withdraw at any time from the protocol treatment without giving reasons and without prejudice.

9.5 CONFIDENTIALITY

Participants' identification data will be required for the registration process and for administration of trial materials. Participants' data will be made anonymous in the analysis and discussion.

9.6 INDEMNITY

The iPod Touches used in the study will be covered by the Moray Health Partnership's insurance policy.

9.7 AUDITS AND INSPECTIONS

The study may be subject to inspection and audit by UHI.

9.8 Trial Management

The team of supervisors will be responsible for overseeing the progress of the entire study, including the trial. The Chief Investigator, Dr Gaener Rodger, has overall responsibility for the trial (and in her absence Dr Margaret Currie), whilst day-to-day management of the trial will be co-ordinated by Kate Stephen. (NB. Subsequently Dr Sarah-Anne Munoz became the chief investigator).

10.1 SPONSOR

UHI Centre for Rural Health will act as the sponsor for this study. Details can be found on page 1 of this protocol.

10.2 FUNDING

UHI (Moray College & CRH), NHS Grampian, HIE. Full details of funders can be obtained from Moray College.

10.3 Publication Policy

All publications and presentations relating to the study will be authorised by the Director of Studies. Named authors may include one or more of the supervisory team as well as Kate Stephen.

APPENDIX VIII RECRUITMENT POSTER

Research Project

Pelvic Floor Exercises



Women in Moray Needed



to take part in a study about pelvic floor exercises.
This study is looking at what helps women to do the exercises,
what stops women doing them and the role of smart phone apps.

What will you have to do?

- Fill out a questionnaire
- Use a simple chart to record exercises
- Some women may be asked to use an “app” for pelvic floor exercises (equipment can be provided, if required)
- Fill out a short questionnaire at the end of 12 weeks
- You may also get a telephone call to ask how you got on and a follow up short questionnaire after a few months.

All the information you provide will be completely confidential.
No-one in Moray will know that you are in the study.

Who can join?

Women of any age over 18 years, any level of fitness.

For more information or to join in
PLEASE **CALL, TEXT OR EMAIL KATE**

T. 07856 761 724 kate.stephen@uhi.ac.uk

Or write to Kate Stephen, Centre for Rural Health,
Centre for Health Science, Old Perth Road,
Inverness IV2 3JH



APPENDIX IX TRIAL PARTICIPANT SHEET

Moray College Health PhD: Pelvic Floor Muscle Training Study
(120620)

Information Sheet

Thank you for responding to the request for women to participate in this study. Please take some time to read the following information and ask me if there is anything that is not clear or if you would like more information (see my contact details at the end of the sheet).

What is the study about?

The study is to investigate adherence to pelvic floor muscle exercise (PFME). PFME can prevent and cure urinary incontinence symptoms and previous research has recommended that women start exercising their pelvic floor muscles from school age and continue throughout their lives.

Why are you being asked to participate?

The study is about the experiences of women in Moray and you have been given this information sheet because your details have been passed to me by phone, text, email or post in response to requests on posters, fliers, the radio or in newspapers.

Participation

Your participation in the study will be voluntary and you are free to withdraw at any time without giving any reason.

What will the study involve for you?

You have been sent a questionnaire and a prepaid envelope for its return. Once your questionnaire has been received you will be randomly allocated to one of two groups – each group will start a 12 week program of Pelvic Floor Exercises.

Participants in both of the groups will be sent information about PFME, including instructions on how to do them correctly and advice about how often you should do the exercises. All participants will also be sent a simple chart to record PFME over the following 12 weeks.

One of the groups will be asked to use a smart phone application ('app' for short) for PFME. There are three apps to choose from. Participants who do not have iPhone or iPod Touch will be sent an iPod Touch to use for the 12 weeks. If you are in this group, you will be asked to use the 'app' to help you with your exercises and to return the iPod Touch at the end of the 12 weeks.

When you have finished the 12 week programme of exercise, you will be sent a second, shorter questionnaire to let us know how you got on. You will also be sent a prepaid envelope for the return of the questionnaire and the exercise chart – and for the iPod Touch if you received one.

If you have given your consent, you may be contacted by telephone for a short interview (maximum 30 mins) soon after you finish the exercise program. This will give you an opportunity to talk in more detail about your experience. This interview may be recorded. You do not have to agree to be contacted by telephone. A third, short questionnaire may be sent to you between 3 and 6 months after the second questionnaire as a longer term follow up.

How will this study affect you?

The study may help you to remember to exercise your pelvic floor muscles and to exercise correctly.

There are a number of benefits of exercising the pelvic floor muscles and there are no adverse effects.

What happens if the study is stopped or if something goes wrong?

You would be informed by post if the study was stopped and provided with prepaid envelopes to return study materials.

Confidentiality

This process will be completely confidential and any information we hold from your questionnaires and exercise chart (or telephone interview) will not have your name or address attached. It will be anonymous. No-one will be informed that you are taking part in the study.

Anonymisation and Storage

Any information gathered will be kept completely confidential. You will not be named or identified publically. Any quotations will be anonymous. The questionnaires, exercise charts, recordings of interviews and paper work will be kept in a locked and secure filing cabinet and / or password protected computers belonging to UHI.

Who is funding the research?

The research project has been funded by UHI, NHS Grampian and Highlands and Islands Enterprise. The iPod Touches have been purchased by the Moray Health Partnership and will be used by them at the end of this study.

Who is reviewing and approving the research?

The research is approved by the UHI Research Degrees Sub-committee and has been reviewed by the Head of NHS Research and Development in Highland.

Contact for further information

If you have questions, please contact me, Kate Stephen by;

Post: Centre for Rural Health, Centre for Health Science,
Old Perth Road, Inverness, IV2 3JH

Text or phone: 07856 761724

Email: kate.stephen@uhi.ac.uk

Thank you for reading this information sheet.

**Please sign and return the consent form in the prepaid envelope provided,
along with the completed questionnaire, if you are happy to take part.**

APPENDIX X TRIAL CONSENT FORM

Moray College Health PhD: Pelvic Floor Muscle Training Study

CONSENT FORM

For office use: P.I. _____

Signature:

Date:

- I confirm that I have read and understood the information sheet (Version 120620) and have had the opportunity to ask questions which have been answered fully. Please tick
- I understand that my participation is voluntary and that I am free to withdraw from the project at any time, without giving a reason.
- I understand that information from the questionnaires and exercise log will be made anonymous in any reports produced.
- I agree to take part in the project and to complete and promptly return the exercise chart, the second questionnaire and any additional resources that I may be sent in the prepaid envelope which will be provided.
- I agree to be contacted after the study by telephone.
- (You can still take part in the study if you do not tick this box)

I agree to be contacted up to two times for longer term follow up to the study within the next 5 years.

(You can still take part in the study if you do not tick this box)

I confirm that I am over 18 years of age and have no neurological disorders or cognitive impairments.

Name: _____ Date of birth:

Address: _____ Postcode:

Email: _____ Telephone: _____

Mobile:

Signature: _____ Date: _____

Please return this form in the prepaid envelope provided to: Centre for Rural Health,

Centre for Health Science, Old Perth Road, Inverness IV2 3JH

APPENDIX XI EXERCISE INSTRUCTION SHEET

PERSONAL TRAINING FOR YOUR PELVIC FLOOR MUSCLES

Personal training for your pelvic floor muscles

Men and women of all ages may experience problems with their bladder, bowel, or sex life. These problems could be owing to weak pelvic floor muscles. It is important for both men and women to exercise these muscles.

What are pelvic floor muscles?

The pelvic floor muscles span the bottom of the pelvis. They are core muscles that support the pelvic organs and control the bladder and bowel. When toned, they also help with sexual function and satisfaction.

What causes weak pelvic floor muscles?

There are many possible causes of pelvic floor muscle weakness, for example:

- pregnancy and childbirth
- after prostate/pelvic surgery
- long term conditions or health problems such as a persistent cough or multiple sclerosis
- obesity
- constipation or persistent straining to empty the bowel
- menopause/hormonal changes
- ageing
- high impact sports
- repeated heavy lifting.

What are the symptoms of weak pelvic floor muscles?

Symptoms of weak pelvic floor muscles include:

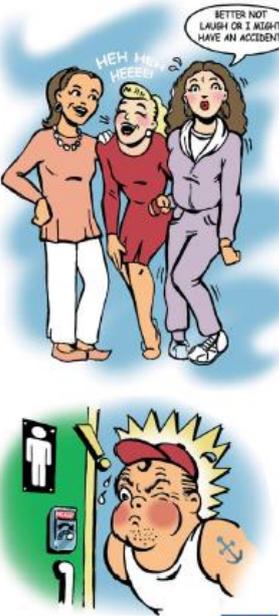
- urinary leakage on coughing, laughing, sneezing, exercise or walking downstairs
- not being able to get to the toilet in time to empty the bladder or bowel
- difficulty emptying the bladder or bowel
- loss of sexual satisfaction
- women may develop a prolapse. This may feel like pelvic discomfort or the sensation of something 'coming down'
- men may find it difficult to achieve or maintain an erection.

How can weak pelvic floor muscles affect you?

Weak pelvic floor muscles may affect you in a number of ways, for example:

- worrying about going out because you think you might leak
- avoiding places because you don't know where the nearest toilet is
- avoiding activities which you know make you leak
- cutting down on the amount you drink
- loss of sex drive.

These can all affect your quality of life and how you feel about yourself.



BETTER NOT LAUGH OR I MIGHT HAVE AN ACCIDENT!

HEH HEH HEHEE!



THE CHARTERED SOCIETY OF PHYSIOTHERAPY
www.csp.org.uk

Finding your pelvic floor muscles

It is important to exercise your pelvic floor muscles to help your bladder and bowel control. It may also improve your sex life. To do this, you need to make sure you are working the right muscles in the right way.

Imagine you are trying to stop yourself passing wind and at the same time trying to stop yourself from passing urine. It should feel like a 'squeeze and lift' inside. Men should be aware of a slight lift of the scrotum.

Pelvic floor muscle exercises

It is important to start by finding out what your muscles can do. Squeeze and lift your muscles. How long can you hold? How many times can you repeat this? This will be your starting point for your exercise routine.

You may need to build-up your routine, aiming towards doing this three times every day:

- Squeeze and lift as strongly as you can. Hold for ten seconds. Relax for ten seconds. Repeat ten times.
- Follow with ten fast squeezes. Squeeze and lift as hard and as briskly as you can and then let go completely.

It is important to breathe normally when you are doing your exercises. If you find you are holding your breath, try breathing out as you do the 'squeeze and lift'. Breathe normally as you continue to squeeze and lift.

If you stick to your daily personal training routine you should be able to feel the benefit of these exercises within three to five months. However, the muscles will lose their strength if you don't maintain the exercises.

Using your pelvic floor muscles In daily life

- Each time you feel you are about to cough or sneeze, quickly squeeze and lift your pelvic floor muscles as strongly as you can and try to hold them until the coughing/sneezing has finished.
- Whenever you think of it, squeeze and lift your pelvic floor muscles gently, especially during everyday activities such as standing from sitting, walking or climbing stairs.

Preventing problems

To help prevent a problem in the future, always 'squeeze and lift' your pelvic floor muscles before you lift heavy objects, cough or sneeze. Speak to your GP about improving other health problems, such as a persistent cough or constipation.



Getting help

If you think you need help with your exercise routine or it does not solve your problem you may need extra advice. Chartered physiotherapists working in continence care are experts in pelvic floor muscle exercise and rehabilitation. For further advice and information, contact:

- Association of Chartered Physiotherapists in Women's Health (ACPDH) www.acpwh.org.uk
- Chartered Physiotherapists Promoting Continence (CPC) www.cpc.org.uk

If you experience pain or discomfort or have any serious concerns contact your GP.

Chartered Society of Physiotherapists (2010) *Personal Training for your Pelvic Floor Muscles* [out of print].

APPENDIX XII QUESTIONNAIRES

BASELINE QUESTIONNAIRE

QUESTIONNAIRE (1)

This questionnaire forms part of a Pelvic Floor Muscle Exercise Study which is based at the Centre for Rural Health in Inverness. It will be used to gather information as part of a trial about adherence to exercise and the role of smart phone applications.

All replies will be held securely and confidentially and answers will be anonymised.

By participating in the study, and completing this questionnaire, you will be contributing to the field of research about pelvic floor exercise. There is a gap in understanding about the exercise and there is no previous research in the role of smart phone applications for this purpose.

Your contribution is vital to this research and I am most grateful for your willingness to participate in the study.

If you have any difficulties completing the questionnaire or you have any queries, please do not hesitate to contact me. If you phone and there is no reply, please leave your name and number on the answer machine and I'll get back to you as soon as possible within the following few days.

Centre for Rural Health

Centre for Health Science

Old Perth Road

Inverness

IV2 3JH

T. 01463 225894

M. 07856 761724

Questions about Pelvic Floor Muscle Exercise

Q.1 On average, how often do you do Pelvic Floor Exercises (please tick ONE option)?

- Three times a day
- Daily
- Weekly
- Monthly
- Yearly
- Never

Q.2 In the past, was there a time when you did Pelvic Floor Exercise regularly?

- Yes
- No

Q.3 Have you ever been taught how to do Pelvic Floor Exercises?

- Yes (Please go to Q.4)
- No (Please go to Q.5)

Q.4 If yes, who taught you?

- Midwife or health visitor
- Gynaecologist
- Physiotherapist
- Incontinence nurse
- Other (please specify)

Please indicate how much you agree with the statements in Q.5 and Q.6

Q.5 Pelvic Floor Exercises are effective in preventing and curing incontinence.

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly Disagree

Q.6 I am confident that I can correctly identify and contract my pelvic floor muscles

- Strongly agree
- Agree
- Neither agree nor disagree
- Disagree
- Strongly Disagree

Q.7 Which of the reasons given, if any, make you want to strengthen your pelvic floor muscles?

- To improve continence
- To prevent incontinence
- To improve sexual sensation

Q.8 Have you found it difficult to exercise your pelvic floor muscles?

- Yes (please go to Q.9)
- No (please go to Q.10)

Q.9 What has made it difficult to exercise? (Please tick all the reasons which apply to you)

- I forget
- I get interrupted
- I am too tired
- I find it uncomfortable
- I have found no benefit
- Lack of time due to other commitments
- I didn't think I needed to exercise
- I do not enjoy the exercise
- Other (please specify)

Q.10 Which of the following best describes the life you lead?

- Very healthy
- Fairly healthy
- Fairly unhealthy
- Very unhealthy

Q.11 Which of these words best describes your weight at the moment?

- Very underweight
- Underweight
- About right
- Overweight
- Very overweight

Q.12 Are urinary incontinence problems a normal part of ageing?

- Yes
- No

Q.13 On average, over the last 4 weeks, how often did you leak urine?

- Never
- About once a week or less often
- Two or three times a week
- About once a day
- Several times a day
- All the time

Q.14 Do you know any women who have incontinence symptoms (not due to other medical conditions)?

- Yes
- No

Q.15 For your age, do you think you do enough physical activity to stay healthy?

- Yes
- No

Q.16 What is your age? _____ years

Q.17 Thinking back over the past year, have you tried to make any of the following changes in your lifestyle?

- Cut down smoking
- Stop smoking
- Cut down the amount of alcohol I drink
- Stop drinking alcohol
- Be more physically active
- Control weight
- Eat more healthily
- Reduce the amount of stress in my life

Q.18 And which, if any, have you managed to maintain?

- Cut down smoking
- Stop smoking
- Cut down the amount of alcohol I drink
- Stop drinking alcohol
- Be more physically active
- Control weight
- Eat more healthily
- Reduce the amount of stress in my life

Questions about technology

Q 19 Which of these items do you use or have access to?

- iPhone
- Other smart phone
- iPod Touch
- Wireless broadband

Q.20 If you have an iPhone or iPod Touch, would you be willing to download an app as part of this research?

- Yes No
(The cost of the app would be refunded)

Q.21 Had you heard about apps for Pelvic Floor Muscle Exercises prior to this study?

- Yes No

And finally

Q.22 How well do the following statements describe your personality? Please indicate the extent to which you agree or disagree with each statement.

I see myself as:	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly
Extraverted, enthusiastic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Critical, quarrelsome	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dependable, self-disciplined	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anxious, easily upset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Open to new experiences, complex	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reserved, quiet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sympathetic, warm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Disorganised, careless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Calm, emotionally stable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conventional, uncreative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Thank you

for taking the time to complete this questionnaire.

Please return it in the prepaid envelope provided.

Your answers will be kept confidential.

QUESTIONNAIRE (2)

This questionnaire forms part of a Pelvic Floor Muscle Training Study which is based at the Centre for Rural Health in Inverness. It is the second questionnaire in the study and will be used to gather information at the end of a trial about adherence to exercise and the role of smart phone applications.

All replies will be held securely and confidentially and answers will be anonymised.

By participating in the study, and completing this questionnaire, you will be contributing to the field of research about pelvic floor exercise. There is a gap in understanding about how women adhere to exercise and there is no previous research in the role of smart phone application

Your contribution is vital to this research and I am most grateful for your willingness to participate in the study and for the time you have given to it over the last few weeks.

If you have difficulties completing the questionnaire or you have any queries, please do not hesitate to contact me. If you phone and there is no reply, please leave your name and number on the answer machine and I'll get back to you as soon as possible within the following few days).

Centre for Rural Health

Centre for Health Science

Old Perth Road

Inverness

IV2 3JH

T. 01463 225894

M. 07856 761724

E. kate.stephen@uhi.ac.uk

1. On average, how often do you do Pelvic Floor Exercises (please choose the option that is most like your current practice)?

Three times a day Daily Weekly Monthly Yearly Never

Please indicate how much do you agree with the following statements?

2. I am confident that I can correctly identify and contract my pelvic floor muscles.

Strongly agree Agree Don't know Disagree Strongly disagree

3. Pelvic Floor Exercises are effective in preventing and curing incontinence.

Strongly agree Agree Don't know Disagree Strongly disagree

4. On average, over the last 2 weeks, how often did you leak urine?

Never About once a day
About once a week or less often Several times a day
Two or three times a week All the time

5. Did you use an app as part of this study?

No

Yes
Please turn overleaf

1. Which app(s) did you use?

2. Which of these factors helped you to exercise?

- | | | | |
|---|--------------------------|----------------------------------|--------------------------|
| The audio alert / alarm | <input type="checkbox"/> | The ability to time contractions | <input type="checkbox"/> |
| The ability to choose when to get reminders | <input type="checkbox"/> | The ability to track progress | <input type="checkbox"/> |
| It was fun | <input type="checkbox"/> | The instructions on the app | <input type="checkbox"/> |
| Encouraging comments | <input type="checkbox"/> | It was discreet | <input type="checkbox"/> |
| Other (please list) | | | |

3. Which of these factors made it difficult to exercise

- | | | | |
|------------------------------------|--------------------------|---|--------------------------|
| Too complicated / difficult to use | <input type="checkbox"/> | Battery kept running out | <input type="checkbox"/> |
| Forgot to use it | <input type="checkbox"/> | Others kept asking me what I was doing / indiscreet | <input type="checkbox"/> |
| It was boring after a while | <input type="checkbox"/> | Too much information | <input type="checkbox"/> |
| It didn't work properly | <input type="checkbox"/> | Too many alerts / alarms | <input type="checkbox"/> |
| Other (please list) | | | |

Thank you

for taking the time to complete this questionnaire.

Please return in the prepaid envelope provided.

Your answers will be kept confidential.

Pelvic Floor Muscle Training Study

QUESTIONNAIRE (3)

130624

This questionnaire forms part of a Pelvic Floor Muscle Training Study which is based at the Centre for Rural Health in Inverness. It is the third questionnaire in the study and will be used to gather information as a follow up to a trial about adherence to exercise and the role of smart phone applications.

All replies will be held securely and confidentially and answers will be anonymised.

By participating in the study, and completing this questionnaire, you will be contributing to the field of research about pelvic floor exercise. There is a gap in understanding about how women adhere to exercise and there is no previous research in the role of smart phone applications for this purpose.

Your contribution is vital to this research and I am most grateful for your willingness to participate in the study and for the time you have given to it over the last few weeks.

If you have difficulties completing the questionnaire or you have any queries, please do not hesitate to contact me. If you phone and there is no reply, please leave your name and number on the answer machine and I'll get back to you as soon as possible within the following few days).

Centre for Rural Health

Centre for Health Science

Old Perth Road

Inverness

IV2 3JH

T. 01463 225894

M. 07856 761724

E. kate.stephen@uhi.ac.uk

1. On average, how often do you do Pelvic Floor Exercises (please choose the option that is most like your current practice)?

Three times
a day Daily Weekly Monthly Yearly Never

2. On average, over the last 2 weeks, how often did you leak urine?

Never About once a day
About once a week or less often Several times a day
Two or three times a week All the time

3. Have you used an app to help you exercise your pelvic floor muscles since the end of the study?

No Yes

Thank you

for taking the time to complete this questionnaire.

Please return it in the prepaid envelope provided.

Your answers will be kept confidential.

APPENDIX XIII ADHERENCE CHART

A Record of Your Exercises

WEEK 1

This week I plan to do ____ fast and ____ slow contractions each day.

Please record the number of contractions you actually do:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast							
Slow							

WEEK 2

This week I plan to do ____ fast and ____ slow contractions each day.

Please record the number of contractions you actually do:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast							
Slow							

WEEK 3

This week I plan to do ____ fast and ____ slow contractions each day.

Please record the number of contractions you actually do:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast							
Slow							

WEEK 4

This week I plan to do ____ fast and ____ slow contractions each day.

Please record the number of contractions you actually do:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast							
Slow							

WEEK 5

This week I plan to do ____ fast and ____ slow contractions each day.

Please record the number of contractions you actually do:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast							
Slow							

WEEK 6

This week I plan to do ____ fast and ____ slow contractions each day.

Please record the number of contractions you actually do:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast							
Slow							

WEEK 7

This week I plan to do ____ fast and ____ slow contractions each day.

Please record the number of contractions you actually do:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast							
Slow							

WEEK 8

This week I plan to do ____ fast and ____ slow contractions each day.

Please record the number of contractions you actually do:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast							
Slow							

WEEK 9

This week I plan to do ____ fast and ____ slow contractions each day.

Please record the number of contractions you actually do:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast							
Slow							

WEEK 10

This week I plan to do ____ fast and ____ slow contractions each day.

Please record the number of contractions you actually do:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast							
Slow							

WEEK 11

This week I plan to do ____ fast and ____ slow contractions each day.

Please record the number of contractions you actually do:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast							
Slow							

WEEK 12

This week I plan to do ____ fast and ____ slow contractions each day.

Please record the number of contractions you actually do:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast							
Slow							

Please return to Kate Stephen, Centre for Rural Health, Centre for Health Science, Old Perth Road, Inverness IV2 3JH in the prepaid envelope provided.

PLEASE FEEL FREE TO ADD NOTES OR COMMENTS

ABOUT WHAT HELPS AND WHAT HINDERS EXERCISE:

APPENDIX XIV ADDITIONAL QUESTIONS FOR INTERVENTION GROUP

This was attached to the adherence chart for participants in the intervention group.

This version is different from the original because of format changes in transferring the questionnaire to the thesis).

Which app did you use at the start?

Why did you choose this app?

Did you change to a different app during the study? YES / NO

If yes, why did you change?

When did you change app and what new app did you use?

What were your favourite things about the app(s)?

What did you not find useful about the app(s)?

Please return to Kate Stephen, Centre for Rural Health, Centre for Health Science,
Old Perth Road, Inverness IV2 3JH in the prepaid envelope provided.

PLEASE FEEL FREE TO ADD NOTES OR COMMENTS

ABOUT WHAT HELPS AND WHAT HINDERS EXERCISE:

APPENDIX XV COVER LETTER FOR TRIAL PARTICIPANT PACK (CONTROL GROUP)

Centre for Rural Health
Centre for Health Science
Old Perth Road
Inverness
IV2 3JH
T. 01463 225894
M. 07856 761724
E. kate.stephen@uhi.ac.uk

Dear

Thank you for agreeing to take part in this study. By participating you are helping to increase understanding about women's experience of doing pelvic floor exercises and the role of smart phone applications.

You have been allocated to group 2 along with more than 10 other women. As part of Group 2, you do not receive an iPod Touch to help with your exercises. If you are interested in using an app, I may be able to arrange for you to test it at the end of the study period.

In this envelope you should have received the following items:

- Instructions about how to correctly perform Pelvic Floor Exercises
- A sheet for recording the number of contractions you plan to do and how many you actually do.
- Blu tack.

What to do next

After reading the instructions about how to correctly perform Pelvic Floor Exercises, please think about how many you want to do each day and fill in the chart (see overleaf for a sample section of the chart). 'Fast' refers to the number of fast (or quick) contractions you do and 'Slow' refers to the number of contraction when you hold the muscles for longer (up to 10 seconds each time). There are recommendations for the ideal number of contractions on the "*Personal Training for your Pelvic Floor Muscles*" sheet enclosed.

Every day, please write in the number of contractions you actually do. Be honest about the number you do ... if you don't do any, or you do less than you planned, please do not feel that you should put in a higher number. It is important for the study to know how many contractions women actually do, even if that is zero or hardly any exercises. Please do not feel pressured to do more, or say that you are doing more, because you are taking part in the study.

WEEK 1

This week I plan to do 15 fast and 18 slow contractions each day.

Actual number of contractions:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast	15	20	25	15	0	5	10
Slow	18	20	6	12	0	12	18

Feel free to add comments about what has helped and / or hindered you from doing your pelvic floor exercises in the Notes section (overleaf from the chart). I have enclosed some Blu Tack so that you can put the chart up on a cupboard door, fridge or wall which help you remember to complete the chart. If you do forget to fill it out, please put in the number you think you did on that day.

Please do not hesitate to contact me if you have any questions or are not sure what to do (if you phone, please leave your name and number on the answer machine if there is no reply and I'll get back to you as soon as possible within the following few days).

About 11 weeks after you start, you will receive another letter with a post-paid envelope and another short questionnaire to see how you got on.

All the best with your exercises!

Yours sincerely,

Kate Stephen

APPENDIX XVI COVER LETTER FOR TRIAL PARTICIPANT PACK INTERVENTION GROUP (IPOD)

Centre for Rural Health
Centre for Health Science
Old Perth Road
Inverness
IV2 3JH
T. 01463 225894
M. 07856 761724
E. kate.stephen@uhi.ac.uk

Dear

Thank you for agreeing to take part in this study. By participating you are helping to increase understanding about women's experience of doing pelvic floor exercises and the role of smart phone applications.

You have been allocated to Group 1 along with between 9 - 11 other women. In this envelope you should have received the following items:

- Instructions about how to correctly perform Pelvic Floor Exercises
- A chart for recording the number of contractions you plan to do and how many you actually did.
- An iPod Touch which has apps for Pelvic Floor Muscle Exercises
- Instructions about how to use the iPod.
- Blu tack.

Please contact me as soon as possible if something is missing (see above for contact details).

What to do next

After reading the instructions about how to correctly perform Pelvic Floor Muscle Exercises, please think about how many you want to do each day and fill in the chart (see over for a sample section of the chart). 'Fast' refers to the number of fast (or quick) contractions you do and 'Slow' refers to the number of contraction when you hold the muscles for longer (up to 10 seconds each time). There are recommendations for the ideal number of contractions on the "*Personal Training for your Pelvic Floor Muscles*" sheet enclosed.

Every day, please write in the number of contractions you actually do. Be honest about the number you do ... if you don't do any, or you do less than you planned, please do not feel that you should put in a higher number. It is important for the study to know how many contractions women actually do, even if that is zero or hardly any exercises. Please do not feel pressured to do more, or say that you are doing more, because you are taking part in the study.

WEEK 1
 This week I plan to do 15 fast and 18 slow contractions each day.

Actual number of contractions:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast	15	20	25	15	0	5	10
Slow	18	20	6	12	0	12	18

Feel free to add comments about what has helped and / or hindered you from doing your pelvic floor exercises in the Notes section (overleaf from the chart).

I have enclosed some Blu Tack so that you can put the chart up on a cupboard door, fridge or wall which help you remember to complete the chart. If you do forget to fill it out, please put in the number you think you did on that day.

Five pelvic floor muscle exercise apps have been installed on the iPod Touch enclosed:



Please have a quick look at each app before deciding which one you would like to use. Gently tap the square icon of the app to open it and follow the instructions. Please say why you have chosen the app and put any comments about using the app on the notes section at the back of the chart – feel free to use more paper if you have lots to say!

Please do not hesitate to contact me if you have any questions or are not sure what to do (if you phone, please leave your name and number if there is no reply and I'll get back to you as soon as possible within the following few days). In about 11 weeks you will receive another letter with a post-paid envelope and another short questionnaire to see how you got on.

All the best with your exercises!

Yours sincerely,

Kate Stephen

APPENDIX XVII COVER LETTER FOR TRIAL PARTICIPANT PACK INTERVENTION GROUP (APP NO IPOD)

Centre for Rural Health
Centre for Health Science
Old Perth Road
Inverness
IV2 3JH
T. 01463 225894
M. 07856 761724
E. kate.stephen@uhi.ac.uk

Dear

Thank you for agreeing to take part in this study. By participating you are helping to increase understanding about women's experience of doing pelvic floor exercises and the role of smart phone applications.

You have been allocated to Group 1 along with between more than 10 other women. In this envelope you should have received the following items:

- Instructions about how to correctly perform Pelvic Floor Exercises
- A chart for recording the number of contractions you plan to do and how many you actually did.
- Blu tack.

Please contact me as soon as possible if something is missing (see above for contact details).

What to do next

After reading the instructions about how to correctly perform Pelvic Floor Muscle Exercises, please think about how many you want to do each day and fill in the chart (see over for a sample section of the chart). 'Fast' refers to the number of fast (or quick) contractions you do and 'Slow' refers to the number of contraction when you hold the muscles for longer (up to 10 seconds each time). There are recommendations for the ideal number of contractions on the "*Personal Training for your Pelvic Floor Muscles*" sheet enclosed.

Every day, please write in the number of contractions you actually do. Be honest about the number you do ... if you don't do any, or you do less than you planned,

please do not feel that you should put in a higher number. It is important for the study to know how many contractions women actually do, even if that is zero or hardly any exercises. Please do not feel pressured to do more, or say that you are doing more, because you are taking part in the study.

WEEK 1
This week I plan to do 15 fast and 18 slow contractions each day.

Actual number of contractions:

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Fast	15	20	25	15	0	5	10
Slow	18	20	6	12	0	12	18

Feel free to add comments about what has helped and / or hindered you from doing your pelvic floor exercises in the Notes section (overleaf from the chart).

I have enclosed some Blu Tack so that you can put the chart up on a cupboard door, fridge or wall which help you remember to complete the chart. If you do forget to fill it out, please put in the number you think you did on that day.

You should receive five pelvic floor muscle exercise apps (below) by email.



Please have a quick look at each app before deciding which one you would like to use. Gently tap the square icon of the app to open it and follow the instructions. Please say why you have chosen the app and put any comments about using the app on the notes section at the back of the chart – feel free to use more paper if you have lots to say!

Please do not hesitate to contact me if you have any questions or are not sure what to do (if you phone, please leave your name and number if there is no reply and I'll get back to you as soon as possible within the following few days). In about 11

weeks you will receive another letter with a post-paid envelope and another short questionnaire to see how you got on.

All the best with your exercises!

Yours sincerely,

Kate Stephen

APPENDIX XVIII END OF TRIAL LETTER (NO IPOD)

Centre for Rural Health
Centre for Health Science
Old Perth Road
Inverness
IV2 3JH
T. 01463 225894
M. 07856 761724
E. kate.stephen@uhi.ac.uk

Dear Participant

It is now almost 12 weeks since I provided you with material for the pelvic floor exercise study. I am really interested to hear how you got on and look forward to seeing your chart and any notes you have made.

Could you please complete the short questionnaire (enclosed)?

I would be most grateful if you could send back the questionnaire and adherence chart as soon as possible after the end of Week 12. I have enclosed prepaid envelope for your convenience. If this might be a problem for you, please let me know.

I would like to thank you, again, for your time and commitment in taking part in this study. This research would not mean anything if it weren't for all the women who have participated.

Yours sincerely,

Kate Stephen

PS. I will be in touch again in a few months' time with another short questionnaire.

APPENDIX XIX END OF TRIAL LETTER INTERVENTIN GROUP (IPOD)

Centre for Rural Health
Centre for Health Science
Old Perth Road
Inverness
IV2 3JH
T. 01463 225894
M. 07856 761724
E. kate.stephen@uhi.ac.uk

Dear Participant

It is now almost 12 weeks since I provided you with material for the pelvic floor exercise study. I am really interested to hear how you got on and look forward to seeing your adherence chart and any notes you have made.

Could you please complete the short questionnaire (enclosed)?

I would be most grateful if you could send back the questionnaire, exercise chart and iPod Touch as soon as possible after the end of Week 12. I have enclosed a prepaid envelope for your convenience. If this might be a problem for you, please let me know.

I would like to thank you, again, for your time and commitment in taking part in this study. This research would not mean anything if it weren't for all the women who have participated.

Yours sincerely,

Kate Stephen

PS. I will be in touch again in a few months' time with another short questionnaire.

**APPENDIX XX ADDITIONAL SECURITY PAPERWORK FOR
PARTICIPANTS WITH IPODS**

THE CODE FOR YOUR IPOD WILL BE SENT SEPARATELY

Researcher: Kate Stephen, Centre for Rural Health, Centre for Health Science, Old
Perth Road,
Inverness. IV2 3JH. T.07856 761724. E. kate.stephen@uhi.ac.uk

THE CODE FOR YOUR IPOD IS

Researcher: Kate Stephen, Centre for Rural Health, Centre for Health Science, Old
Perth Road,
Inverness. IV2 3JH. T.07856 761724. E. kate.stephen@uhi.ac.uk

APPENDIX XXI PROVISION FOR NOTE TAKING (INTERVENTION GROUPS)

Some Notes about the Apps

Which app did you use at the start?

Why did you choose this app?

Did you change to a different app during the study? YES / NO

If yes, why did you change?

When did you change app and what new app did you use?

What were your favourite things about the app(s)?

What did you not find useful about the app(s)?

Please return to Kate Stephen, Centre for Rural Health, Centre for Health Science, Old Perth Road, Inverness IV2 3JH in the prepaid envelope provided..

APPENDIX XXII SAMPLE END OF TRIAL REMINDER LETTER

Centre for Rural Health
Centre for Health Science
Old Perth Road
Inverness
IV2 3JH
T. 01463 225894
M. 07856 761724
E. kate.stephen@uhi.ac.uk

Dear

It is now approximately 12 weeks since I provided you with material for the pelvic floor exercise study. I am really interested to hear how you got on and look forward to seeing your adherence chart and any notes you have made.

Could you please complete the short questionnaire (enclosed)?

I would be most grateful if you could send back the questionnaire and adherence chart as soon as possible after the end of Week 12. Don't worry if you haven't managed to keep up the exercises or have forgotten to complete the chart – just fill it out as accurately and honestly as you can! I have enclosed prepaid envelope for your convenience. If this might be a problem for you, please let me know.

To return the iPod Touch, you have two options:

1. I can send you a prepaid envelope for Special Delivery – you will need to take this to a Post Office for postage.
2. I can arrange to pick the iPod up from your house, your work or from the Reception at Moray College in Elgin – whichever is most convenient on 30th January.

Please complete the attached slip to let me know which option you choose.

I would like to thank you, again, for your time and commitment in taking part in this study. This research would not mean anything if it weren't for all the women who have participated. Over the next few weeks, I may phone you for a very quick chat about how you got on!

Yours sincerely,

Kate Stephen

PS. I will be in touch again in a few months' time with another short questionnaire.

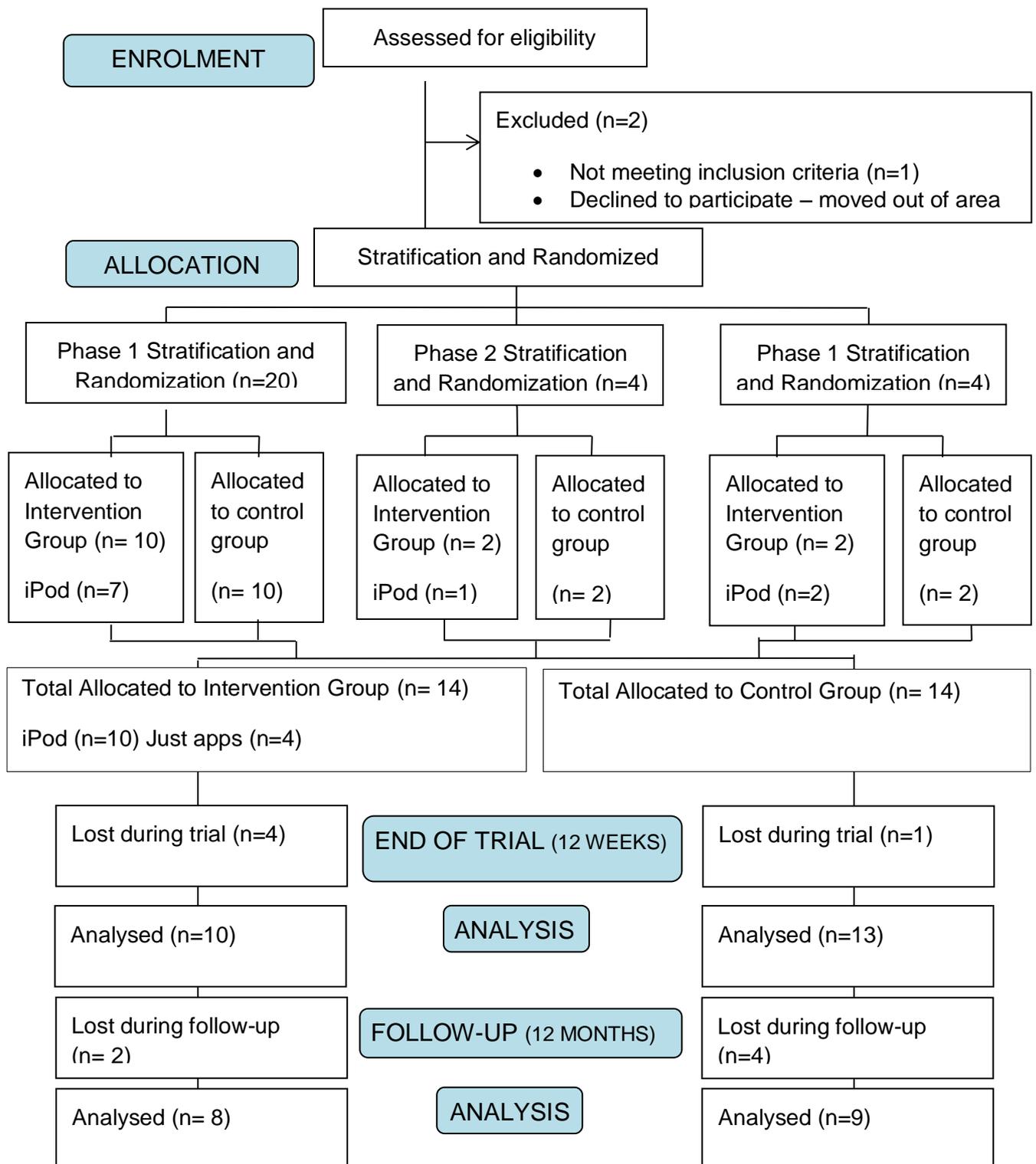
Name:

I would like to return the iPod Touch by: (please tick)

	<p>OPTION 1: Special Delivery (I am able to take the parcel to the Post Office for posting)</p>
	<p>OPTION 2: Please collect the iPod Touch on <u>Wednesday 30th</u> January from: (please insert the address)</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>Are there any special instructions?</p> <p>.....</p> <p>.....</p> <p>If things don't go to plan, what number can I contact you on?</p> <p>.....</p>

APPENDIX XXIII CONSORT DIAGRAM FOR TRIAL

Figure 36 CONSORT 2010 Flow Diagram for Trial



APPENDIX XXIV SPSS CROSSTABLATIONS

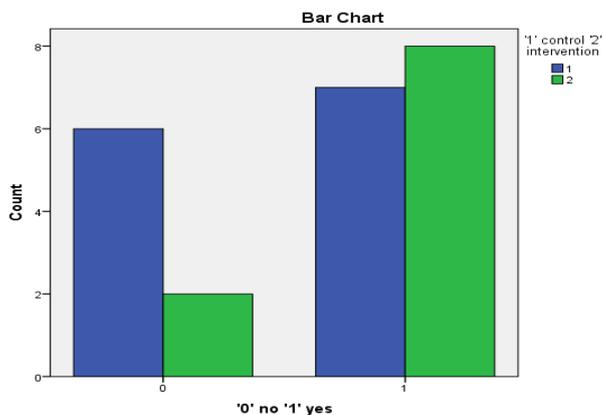
Crosstabulation showing daily exercise at the end of the trial with group (n=23):

Figure 37 Crosstabulation showing daily exercise

'0' no '1' yes * '1' control '2' intervention Crosstabulation

		'1' control '2' intervention		Total
		1	2	
0	Count	6	2	8
	% within '0' no '1' yes	75.0%	25.0%	100.0%
	% within '1' control '2' intervention	46.2%	20.0%	34.8%
	% of Total	26.1%	8.7%	34.8%
1	Count	7	8	15
	% within '0' no '1' yes	46.7%	53.3%	100.0%
	% within '1' control '2' intervention	53.8%	80.0%	65.2%
	% of Total	30.4%	34.8%	65.2%
Total	Count	13	10	23
	% within '0' no '1' yes	56.5%	43.5%	100.0%
	% within '1' control '2' intervention	100.0%	100.0%	100.0%
	% of Total	56.5%	43.5%	100.0%

Figure 38 Bar chart illustrating above cross-tabulation



APPENDIX XXV ANALYSIS OF STRATIFIED PAIRS

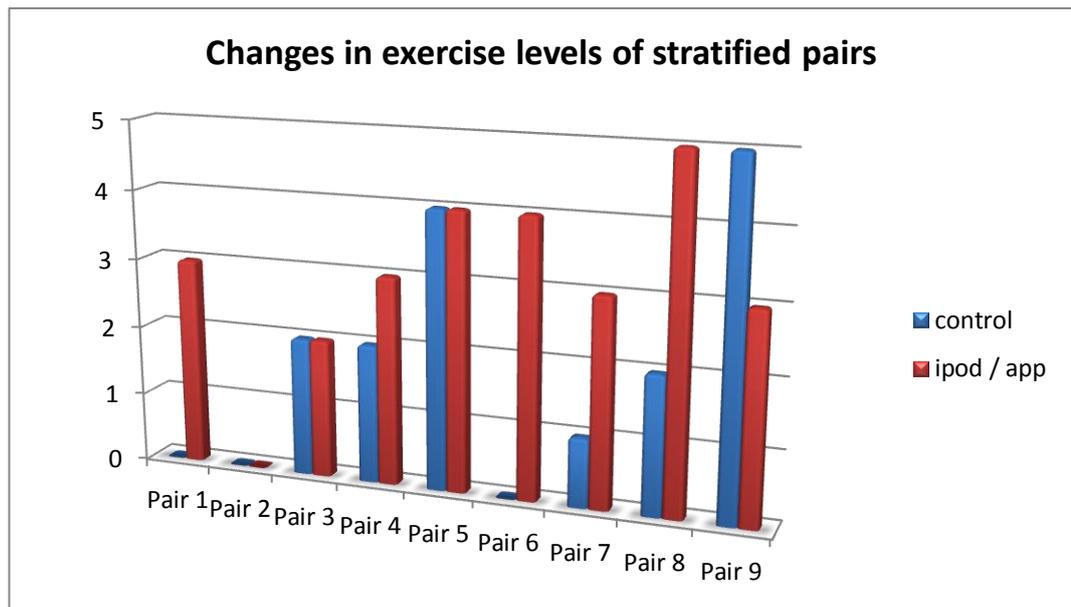
Participants were stratified prior to randomisation as described in section 3.3.2.2. As there were 28 participants, this produced 14 stratified pairs. The stratification process is illustrated in the Consort diagram in Appendix XXIII.

Five participants were lost to the trial as a result of not returning a completed post-trial questionnaire. This affected five pairs. Therefore, at the post-trial stage, there are 9 stratified pairs available for analysis.

The graph shown in Figure 39 illustrates a comparison between the stratified pairs. Three of the pairs showed no difference in how much they changed in terms of level of exercise pre- and post- trial. In five of the six of the pairs the participant who had the biggest increase in exercise activity was in the intervention group.

As was stated previously, although it is interesting to note the difference between the stratified pairs in relation to behaviour change, it is important to be cautious in interpretation of the results. Just because five out of the six pairs showed higher levels of adherence from the participant from the intervention group, qualitative data from the trial shows that this could be as a result of the influence of a range of factors and not simply as a result of using an app. This data is therefore presented in an appendix for interest and not in the body of the thesis.

Figure 39 showing change in levels of exercise by stratified pairs



In this appendix, there has been a brief report about the stratification process and the experience of pairs of women with similar characteristics was discussed in terms of their allocation to the intervention group or the control group. It is clear that there are so many influences on adherence to PFME that results from the measurement of any one factor, including app use, requires careful interpretation. Furthermore, as Ritterband *et al* (2009) warned, lower levels or drop-out of app use may indicate successful use of the app for participants who require a low 'dose'. This resonates with the discussion about adherence to measurement tools in section 4.3 about adherence charts.

APPENDIX XXVI TOPIC GUIDE & TELEPHONE INTERVIEW TEMPLATE

Moray College Health PhD: Pelvic Floor Muscle Training Study

TOPIC GUIDE

Describe experience

Barriers to exercise:

Prompts: Lack of motivation, forgetting, too hard.

Promoters to exercise:

Prompts: planning, scheduling, friends & family, ui symptoms, app – history, alerts, enjoyment.

Role of friends / family:

Prompts: Peer support, reminding, pressure, embarrassment, discreet.

Elements of app:

Alerts

You tube / video

Audio

Encouragements

History

PROMPTS AND ANSWER TEMPLATE FOR TELEPHONE INTERVIEWS:

Participant Ref _____

Can you tell me, in your own words, how you got on with the exercises?
So, can you tell me what you think about PFME – how important are they, how useful are they? What made you want to do them?
And for getting into a habit of exercising, what do you think helps best with that?
Do you do a lot of exercise, generally?
Can you remember the apps – what did you think was good about them? If you were to design an app, what would you want it to be like?
If you and some friends all decided to do more PFME, what kind of things would help you all?
Additional notes:

APPENDIX XXVII NVIVO NODES AND ANALYSIS FOR TELEPHONE INTERVIEWS

Name	Sources	References
Previous exercise	2	2
Awareness of need to exercise	3	5
Motivation	4	8
excuses for poor performance	2	5
Promotion of PFME	5	12
apps	6	16
Barriers to exercise	3	3
Correctly identifying muscles	2	2
About the study	5	9
Other people and groups	6	16
Age and smart phone experience	4	7
what might help (promoters)	7	23
being told or encouraged	4	8
being taught	4	5
Self evaluation and reflection	6	26
UI symptoms	4	9
Embarassment & discussing	3	11
what did help (promoters)	3	8

APPENDIX XXVIII REPORT TO TRIAL PARTICIPANTS (SEND WITH FOLLOW-UP QUESTIONNAIRE)

WHAT WE FOUND OUT FROM THE STUDY

28 women started out in October last year in a study about pelvic floor muscle exercises (PFME). 23 participants completed and returned the questionnaire at the start of 2013.

All the participants lived in Moray – most lived in ‘accessible rural’ areas or ‘accessible small towns’, some in urban areas and a few in remote areas. They ranged in age from 21 years to 73 years.

We found that:

- 87% of participants increased the frequency of PFME or maintained daily exercise.
- All of the participants who received an iPod Touch or apps either increased the frequency of their exercising or maintained regular exercise. However, not all of these women used the iPods or apps throughout the whole study period.
- Of the participants who had incontinence symptoms, 87% either maintained regular exercise or increased to a frequency of at least once a week. And 73.3% experienced a decrease in UI symptoms (which meant that 26.7% of the participants who had symptoms either experienced an increase in symptoms or their symptoms did not change).
- 40% of the participants who received an iPod Touch or apps found the apps useful and all of those increased the frequency of their exercise. Of the women who found the apps useful, all of those who had incontinence symptoms found that their symptoms improved.
- But, of the participants who didn't find the apps useful, 83% increased or maintained the frequency of their exercise and 80% of those who had incontinence symptoms found that their symptoms improved.

7 women were interviewed by telephone a few months after the study finished. Here is some of what they said:

- There was a lot of discussion about the fact that taking part in the study was useful in focusing on PFME and in reminding women to exercise.

- Some women found the paper adherence chart useful as both a prompt to and a record of exercise.
- Another effect of simply taking part in the study was the feeling that women were not alone in experiencing symptoms and, for the first time, they understood that UI was common and they were less ashamed of it.

POTENTIAL CONCLUSIONS FROM THIS STUDY

- Apps are not a universally acceptable or effective method of motivating and supporting adherence to PFME.
- Where individuals are motivated to exercise, apps can be effective in supporting adherence in some women. These women are likely to be familiar with smart phone technology.
- Existing technology, such as television and DVDs, are suggested as of potential alternatives which may be effective; especially in reaching women with UI symptoms who have not previously sought help from a health professional.
- Some women expressed the need for human support for motivation and adherence to exercise and specifically the role of an expert to provide reassurance and advice.
- The need for promotion of PFME in the media has been identified to raise awareness of the benefits of exercise and to act as a prompt for exercise.

THESE ARE THE APPS USED IN THE STUDY

Kegeltopia



Get Bladder Fit



Kegel Buddy



Pelvic Floor Health



Kegel Camp



This app has some sexual content

APPENDIX XXIX PRESENTATIONS AND PUBLICATIONS

PUBLICATIONS:

Stephen, K. and Cumming, G.P. (2012) 'Searching for pelvic floor muscle exercises on Youtube: what individuals may find and where this might fit with health service programmes to promote continence', *Menopause International*, 18 (3) pp.110-115.

Cumming, G.P., Luciano, J.S., MacRury, S., McKendrick, D., Stephen, K., Chitty, A. (2014) 'Health web science: facilitating health care and well-being using examples in urinary incontinence, medical education, and diabetes', in *mHealth multidisciplinary verticals*, Adibi, S. (ed). CRC Press, Taylor & Francis Group, Boca Raton, pp.628-645.

Abstract for the Rural Society special edition accepted, awaiting decision for full paper (submitted Nov, 2014).

PRESENTATIONS:

UHI Post-Graduate Conferences: 2011, 2012, 2013.

Centre for Health Science Health Research Lunchtime Seminar: Research decisions around mHealth applications for pelvic floor exercises. [Feb, 2012]

International Telehealth & Telecare Congress: Attitudes to apps for continence. [March, 2012] (Abstract published)

Event, Centre for Health Science, Inverness: mHealth. 'Ethics in Healthcare ICT' [June, 2012]

NHS Highland Continence Team [Jan, 2014]

Interactive workshop at the BMJ International Forum on Quality & Safety in Healthcare, Paris. [April, 2014].

UHI Division of Health Journal Club [June, 2014]

International Congress of Telehealth and Telecare: The Use of Apps to Support Pelvic Floor Muscle Exercise. [Sept, 2014] (Abstract published)

NHS North Research [Oct, 2014].

Women's Health Day, 'There is an app for that', Alexander Graham Bell Centre, Moray [Dec, 2014].