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Advancing understanding of effective exercise on referral: a mixed methods evaluation of the Northumberland scheme

Coral Lucy Hanson

Exercise on Referral Schemes (ERS) are a widespread community intervention in which health professionals refer patients to a programme of supervised exercise at leisure facilities. National guidance states routine data should be collected and made available for analyses, and that there is a need to better understand what elements of ERS work, for which subgroups of the population. This thesis examines what elements of behaviour change provision within ERS work, for whom and in what circumstances, in order to gain a better understanding of what influences referral to, engagement with, and adherence to such schemes.

First the thesis presents a quantitative evaluation study of 2233 referrals to the 24-week Northumberland ERS in nine leisure facilities between July 2009 and September 2010. Main outcome measures were uptake, 12-week adherence, 24-week completion, and changes in self-reported physical activity, blood pressure, body mass index (BMI) and waist circumference. Two qualitative studies follow, one examining pre-scheme perceptions of 15 referrals and the second following them through the scheme. Data from semi-structured interviews conducted in both studies are presented as three narrative typologies of the referral journey.

This research demonstrated that demographics and other factors related to referral minimally increased ability to predict engagement. Completion resulted in significant increases in self-reported physical activity and significant, but small, reductions in BMI and waist circumference. Participants had complex social circumstances, multiple personal reasons for referral and high expectations of positive health changes. Staff and peer support were influential to success, especially if expectations were not met. The narrative typologies help to identify those for whom ERS currently works well, those for whom ERS works but who may struggle with sustained behaviour change, and those for whom it does not work. This novel approach to classifying likelihood of success is used to discuss potential improvements to ERS.

Advancing understanding of effective exercise on referral: a mixed methods evaluation of the Northumberland scheme

Coral Lucy Hanson

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LIST OF ABBREVIATIONS

| | |
|-------|---|
| BMI | Body mass index |
| bpm | Beats per minute |
| BVAL | Blyth Valley Arts and Leisure |
| CVD | Cardiovascular disease |
| cm | Centimetres |
| ERS | Exercise on referral schemes |
| GLTEQ | Godin Leisure Time Exercise Questionnaire |
| IMD | Index of multiple deprivation |
| kg | Kilogrammes |
| IQR | Interquartile range |
| MET | Metabolic equivalent |
| m | Metre |
| NCL | North Country Leisure |
| NICE | National Institute for Health and Care Excellence |
| NHS | National Health Service |
| mmHg | Millimetres of mercury |
| OR | Odds ratio |
| PHE | Public Health England |
| PAQ | Physical activity questionnaire |
| SD | Standard deviation |
| SDT | Self Determination Theory |
| TTM | Transtheoretical Model |
| UK | United Kingdom |
| WHO | World Health Organisation |

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1 Introduction

1.1 Introduction

Exercise on referral schemes (ERS) are one of the UK's most widespread interventions aimed at increasing physical activity (Sowden & Raine, 2008). Usually commissioned by local authority public health teams, they involve the referral of patients with long-term conditions from primary care to a third party, predominantly leisure providers (Department of Health, 2001). Participants are then directed into targeted physical activity programmes.

Such schemes have been in existence in England since the 1990s and have grown in popularity so that 158 such schemes were identified in 2008, mostly operating over several provider sites at district, city or county level (British Heart Foundation National Centre for Physical Activity and Health, 2010). Despite the large number of schemes there is limited evidence about effectiveness (Pavey *et al.*, 2011; Campbell *et al.*, 2015), meaning that there is an urgent need to examine existing provision. Guidance from the National Institute for Health and Care Excellence (NICE) has recognised that the nature of such schemes is diverse, as are the reasons why people are referred to them. This makes it difficult to identify which elements influence effectiveness (National Institute for Health and Care Excellence, 2014). As such there is a need to better understand what elements of exercise behaviour change provision within ERS work, for whom and in what circumstances. The programme of evaluation and research in this thesis used mixed methods to conduct a rich and detailed evaluation of one established scheme, the Northumberland ERS.

The global and national context leading to the requirement for physical activity interventions, the evidence for the health benefits of physical activity, what is known about barriers and facilitators to being active, the context for the research programme, and an outline of thesis structure are included in this chapter.

1.2 Non-communicable diseases; a modern day global health crisis

Non-communicable diseases (NCDs) are currently the leading cause of death in all regions of the world except sub-Saharan Africa and south Asia. In 2010, 34.5 million (66% of total) deaths were due to non-communicable diseases (Atun, 2014), with 28.5 million of these from cardiovascular and chronic respiratory diseases, cancers, and diabetes (Lozano *et al.*, 2012).

In 2011, at a United Nations high-level meeting, non-communicable diseases were formally recognised as a major threat to economies and societies and placed high on the development agenda. The first World Health Organisation (WHO) *Global Status Report on Non-communicable Diseases* (World Health Organisation, 2011) highlighted the devastating social, economic and public health implications of non-communicable diseases and identified their main four behavioural risk factors; tobacco use, an unhealthy diet, physical inactivity and the harmful use of alcohol. The report advocated the requirement for intensive action to map the non-communicable diseases epidemic and its causes; reduce the main risk factors through health promotion and primary prevention; and strengthen health care for those who already have non-communicable diseases (World Health Organisation, 2011).

The resulting '*Global action plan for the prevention and control of non-communicable diseases 2013-2020*' (World Health Organisation, 2013) identified nine voluntary global targets including a 25% relative reduction in risk of premature mortality (defined as the probability of dying between the ages of 30 years and 70 years) from cardiovascular diseases, cancer, diabetes, or chronic respiratory diseases and a 10% relative reduction in prevalence of insufficient physical activity. The plan set out a series of actions that the 194 member states should take to address the threat of non-communicable diseases. This high level recognition of the importance of physical activity in improving global health highlighted the requirement for action to be taken at national and local level to implement evidence-based initiatives to increase population physical activity levels.

1.3 Physical activity guidelines

In 2010 the WHO published updated recommendations for the level of physical activity required to be achieved in order to benefit health (World Health Organisation, 2010). These recommendations addressed three age groups: 5–17 years old; 18–64 years old; and 65 years old and above (Table 1.1).

The UK Chief Medical Officer's report '*Start Active, Stay Active*' (Department of Health, 2011) updated the UK physical activity guidelines to reflect the WHO recommendations, but excluded the recommendation that for further health benefits those aged 18 years and over should undertake 300 minutes per week of moderate intensity activity or 150 minutes of vigorous intensity, or a combination of both.

Table 1-1 *Global recommendations for physical activity*

(World Health Organisation, 2010, pp 7-8)

| |
|--|
| 5–17 years old |
| <p>For children and young people of this age group physical activity includes play, games, sports, transportation, recreation, physical education or planned exercise, in the context of family, school, and community activities. In order to improve cardiorespiratory and muscular fitness, bone health, cardiovascular and metabolic health biomarkers and reduced symptoms of anxiety and depression, the following are recommended:</p> <ol style="list-style-type: none"> 1. Children and young people aged 5–17 years old should accumulate at least 60 minutes of moderate to vigorous-intensity physical activity daily. 2. Physical activity of amounts greater than 60 minutes daily will provide additional health benefits. 3. Most of daily physical activity should be aerobic. Vigorous intensity activities should be incorporated, including those that strengthen muscle and bone, at least 3 times per week. |
| 18–64 years old |
| <p>For adults of this age group, physical activity includes recreational or leisure-time physical activity, transportation (e.g. walking or cycling), occupational (i.e. work), household chores, play, games, sports or planned exercise, in the context of daily, family, and community activities. In order to improve cardiorespiratory and muscular fitness, bone health and reduce the risk of non-communicable diseases and depression the following are recommended:</p> <ol style="list-style-type: none"> 1. Adults aged 18–64 years should do at least 150 minutes of moderate intensity aerobic physical activity throughout the week, or do at least 75 minutes of vigorous intensity aerobic physical activity throughout the week, or an equivalent combination of moderate and vigorous intensity activity. 2. Aerobic activity should be performed in bouts of at least 10 minutes duration. 3. For additional health benefits, adults should increase their moderate-intensity aerobic physical activity to 300 minutes per week, or engage in 150 minutes of vigorous intensity aerobic physical activity per week, or an equivalent combination of moderate and vigorous intensity activity. 4. Muscle strengthening activities should be done involving major muscle groups on 2 or more days a week. |
| 65+ years old |
| <p>Recommendations as for adults aged 18-64 years but with the addition of:</p> <ol style="list-style-type: none"> 1. Adults of this age group with poor mobility should perform physical activity to enhance balance and prevent falls on 3 or more days per week. 2. When adults of this age group cannot do the recommended amounts of physical activity due to health conditions, they should be as physically active as their abilities and conditions allow. |

The UK guidelines also included the recommendation that all adults should minimise the amount of time spent being sedentary (sitting) for extended periods. These recommendations gave very clear guidance about the levels of physical activity required for the primary prevention of disease and are important as a benchmark for measuring the effectiveness of policies and interventions aimed at increasing activity.

1.4 The physical inactivity epidemic

Globally in 2010 it was estimated that 23% of adults aged 18 years and over were not sufficiently active to benefit their health (World Health Organisation, 2014). Patterns of inactivity varied according to level of income; with those in high-income countries (33%) being more likely to be insufficiently active than those in low-income countries (17%). In addition, women were less active than men and older people were less active than younger people.

The most recent Health Survey for England physical activity data (2012) reported that 33% of men and 45% of women did not meet the UK guidelines for physical activity. Activity decreased with increasing age and body mass index (BMI). It also varied by region, with the north west of England (where 40% of men and 52% of women did not meet the guidelines), and north east of England (where 32% of men and 52% of women did not meet the guidelines) being the least active areas. Those in the lowest income households were the most likely to be inactive (Health and Social Care Information Centre, 2013).

This indicates that in England not only is there a need to increase general population physical activity levels, but also a specific focus is required on those

who are currently the least likely to be active; women, those who are older, those living in the lowest income households, those who are obese, and those in the north of England. Research is required to understand what can facilitate physical activity behaviour change in these population subgroups in England.

There is strong evidence to show that physical inactivity increases the risk of many adverse health conditions including non-communicable diseases such as coronary heart disease (CHD) (Nocon *et al.*, 2008), type 2 diabetes (Tuomilehto *et al.*, 2001) and some cancers (Monninkhof *et al.*, 2007; Wolin *et al.*, 2009). It is estimated that physical inactivity causes 6% of the global burden of disease from CHD, 7% of type two diabetes, 10% of breast cancer and 10% of colon cancer. Furthermore it is estimated that inactivity causes 9% of premature mortality (Lee *et al.*, 2012).

In the UK it is estimated that physical inactivity directly contributes to one in ten premature deaths from cardiovascular disease and one in six deaths from any cause (Lee *et al.*, 2012). In 2012, approximately 161,000 people died from heart and circulatory diseases in the UK, resulting in almost 42,000 premature deaths and accounting for 26% of male deaths and 18% of female deaths before the age of 75 years (Townsend *et al.*, 2014). The direct health cost of physical inactivity in the UK in 2013 was estimated to be INT\$1.85 billion (£1.3 billion) (Ding *et al.*, 2016), making it the fourth most economically impactful health behavioural risk factor after poor diet, alcohol consumption and smoking. From a purely economic perspective understanding what will increase levels of physical activity should therefore be of great importance to the UK Government.

1.5 The health benefits of physical activity

There are an abundance of epidemiological studies that confirm the beneficial effects of physical activity in reducing a range of age-related mortalities and all-cause mortality. Evidence about the health benefits of being physically active began to emerge in the 1950s with initial studies focusing on work related physical activity, such as those of bus company employees in London (Morris & Raffle, 1954). Since then, there have been a large number of studies that have contributed to a robust evidence base. Physical activity has been associated with a risk reduction of 35% in cardiovascular mortality (95% confidence interval, 30 to 40%) and 33% in all-cause mortality (95% confidence interval, 28 to 37%) (Nocon *et al.*, 2008). Leisure time physical activity has been associated with significant primary protection against CHD for those who reported high levels of activity [relative risk 0.73 (95% confidence interval 0.66 to 0.80)], and those who reported moderate levels [relative risk 0.88 (95% confidence interval 0.83 to 0.93)] (Sofi *et al.*, 2008).

The risk of colon cancer has been shown to be 20 to 30% lower in relation to increasing duration and intensity levels of physical activity (Harriss *et al.*, 2009). There is an average reduction of 20 to 40% in relative risk of breast cancer in women when comparing the most active with the least active women, with a decreasing risk in relationship to increasing duration and intensity of activity (Schottenfeld *et al.*, 2013). The relative risk of type two diabetes was 0.69 (95% confidence interval 0.58 to 0.83) for regular participation in physical activity of moderate intensity when compared with being sedentary, and 0.70 (95%

confidence interval 0.58 to 0.84) for regular walking when compared with almost no walking (Jeon *et al.*, 2007). Regular aerobic activity has also been reported to prevent future depression (Mammen & Faulkner, 2013).

Furthermore, in addition to the benefits of physical activity in the primary prevention of many health conditions, numerous systematic reviews have shown it to be effective in the secondary of prevention of illness. These include an association with a reduction in re-infarction and mortality post myocardial infarction (Lawler, Filion & Eisenberg, 2011); a reduction in depressive symptoms in those with mild to moderate depression (Herring *et al.*, 2012); a reduction in blood pressure in hypertensive individuals (Cornelissen & Smart, 2013); a reduction in the risk of hospital admissions and improvements in health-related quality of life for those with heart failure (Taylor *et al.*, 2014); a reduction in HbA1c for those with type two diabetes (Umpierre *et al.*, 2011); a reduction in the incidence of falls, and improvement in gait and balance in frail older adults (Cadore *et al.*, 2013); a reduction in symptoms and improved quality of life for those with asthma (Eichenberger *et al.*, 2013); clinical effectiveness in the treatment of osteoarthritis, rheumatoid arthritis, and ankylosing spondylitis (Hagen *et al.*, 2012); and an improvement in aerobic capacity and muscular strength for those with mild to moderate multiple sclerosis (Latimer-Cheung *et al.*, 2013).

This large body of evidence demonstrates that not only can physical activity prevent illness, but that it is also an effective treatment for many chronic diseases. This creates justification for action in developing policies and

programmes that aim to not only increase general physical activity levels but also target those with existing medical conditions.

1.6 The relationship between physical activity and obesity

Obesity is a serious risk factor for many health problems, including those identified as benefiting from physical activity. Globally obesity has more than doubled since 1980 (World Health Organisation, 2014), with 13% of the world's population reported as obese in 2014. The condition is more prevalent in high income countries with 24% of men and 27% of women in England reported as obese (Health and Social Care Information Centre, 2015). Obesity is most prevalent in the north east of England, where 31% of the population are reported to be obese (Health and Social Care Information Centre, 2015). It is estimated that net cost of overweight and obesity to the UK government in 2014 was £2.47 billion, equating to 1.8 per cent of the NHS budget (Tovey, 2017).

Based on the logic of the 'energy imbalance' equation, it is reasonable to predict that a person who consumes more kilojoules of energy than they expend in physical activity over a period of time will gain weight (Ness *et al.*, 2007). Over the past decade, however, there has been much debate about the nature of the relationship between physical activity and obesity. It has been speculated that a decline in work-related physical activity in high income countries has been a key contributor in the rise in obesity (Church *et al.*, 2011) and that inactive lifestyles are at least as important as diet in the aetiology of obesity (Prentice & Jebb, 1995; Dwyer *et al.*, 2006; Rikke Krogh-Madsen *et al.*, 2013). Conversely, in a systematic review of the prospective associations between measured physical

activity and change in adiposity, Wilks *et al.* (2011) concluded that physical activity may not be a key determinant of excessive gain in adiposity. It has also been suggested that low levels of physical activity are not strongly associated with future weight gain (Wareham, van Sluijs & Ekelund, 2005). Given the conflicting evidence, this is clearly an area where further research is required to understand whether there is a causative relationship between physical inactivity and obesity, and if so what it is. Despite the uncertain relationship, physiological reasoning as stated by Ness and colleagues (2007) would indicate that programmes to combat obesity should include an element of physical activity until an evidence-based relationship is either proven or disproven. In addition the evidence base for the many benefits associated with physical activity means that a more active obese population would still gain in health terms regardless of any associated weight loss (Wessel *et al.*, 2004; Barry *et al.*, 2014).

1.7 The measurement of physical activity

In order to understand whether actions taken to increase physical activity are effective, it is necessary to robustly measure levels of activity so that change can also be measured (Cavill, Roberts & Rutter, 2012). The challenges of doing this especially on a global scale, where perceptions of what physical activity is may vary between countries, means that there are limitations in the available data (Hallal *et al.*, 2012). At a population level, indirect self-report subjective methods of measuring activity have been most commonly used; physical activity questionnaires (PAQs), diaries/logs, surveys, and interviews (Prince *et al.*, 2008). Physical activity questionnaires are frequently used due their low cost,

ease of administration and general acceptance. The reliability of these has been found to be acceptable, however validity is at best moderate (Helmerhorst *et al.*, 2012). For example, Cleland *et al.* (2014) reported a moderate correlation between the Global Physical Activity Questionnaire and an accelerometer for the measurement of moderate to vigorous physical activity ($r=0.48$). Self-report methods are wrought with issues of recall and response bias, such as over-estimating of intensity in sedentary adults (Duncan *et al.*, 2001), inaccurate memory, social desirability and direct prompting by questionnaires (Brenner & DeLamater, 2014). Although there have been attempts to minimise inaccuracies in the use of self-report measures by correcting estimates for known over-reporting, age and region on a global scale, limitations mean that such data are useful for monitoring trends rather than accurately reporting levels of physical activity (Hallal *et al.*, 2012).

In contrast, direct measures such as motion sensors (accelerometers, pedometers), heart rate monitoring, calorimetry (doubly labelled water), physiologic markers such cardiorespiratory fitness, and direct observation provide more objective measures of physical activity (Dishman, Washburn & Schoeller, 2001). These measures are not commonly used at population level due to cost, specialised training required for use, and the physical proximity of participants required for data collection (Prince *et al.*, 2008). In addition no direct physical activity measure meets all of the criteria of being valid, reliable, practical, and non-interfering with physical activity (Dishman, Washburn & Schoeller, 2001). Despite this, direct methods give a more accurate measure of

physical activity levels. Advancements in accurate wearable technology also mean that there is great potential for their use in the future (Freedson *et al.*, 2012). It is therefore desirable that where possible, physical activity should be measured by a combination of activity monitors, questionnaires and analytical techniques (Janz, 2006).

Differences between self-reported and objective measures of physical activity are striking. Troiano *et al.* (2008) reported that adherence to physical activity guidelines using accelerometry was substantially lower than self-reported levels in a nationally representative health survey. During the 2008 Health Survey for England a subsample of respondents (n=4507) were selected to wear accelerometers, of whom 2115 had valid accelerometry wear time of at least 600 minutes per day. Based on the accelerometry data, 6% of men and 4% of women met the then current guidelines of 30 minutes of moderate or vigorous activity on at least 5 days of the week (Chaudhury *et al.*, 2010). This was in contrast to the self-report measures for the whole survey, where 39% of men and 29% of women were said to have met the guidelines (Health and Social Care Information Centre, 2009). This would indicate that the actual levels of those who meet the physical activity guidelines in England are far lower than the estimates being used by the WHO and the UK government when creating strategy and policy. Despite the highlighted inaccuracies resulting from the use of indirect measures nationally, the low levels of physical activity reported have resulted in action being taken at a both a global and national level and as such are valuable. Hallal *et al.* (2012) suggested that such measures need to be

used broadly and repeatedly in order to understand which interventions work for which populations and who is most at risk from physical inactivity.

At a more local level, the cost and specialised knowledge required for objective measures may inhibit their use. Assessing the effect of physical activity interventions that involve a high number of participants may therefore be most viable using a PAQ. As previously discussed the limitations must be recognised, but in the absence of a more accurate measure a PAQ still provides a useful measure of physical activity as a result of participation in the intervention.

Physical activity questionnaires used in ERS will be discussed in more detail in chapter two, section 2.4.1.

1.8 Barriers and facilitators to physical activity

Physical activity has been widely described in terms of demography (World Health Organisation, 2014) but factors affecting participation are likely to be much more complex than demographics alone (Zunft *et al.*, 1999; Allender, Cowburn & Foster, 2006; Pan *et al.*, 2009; Kern, Reynolds & Friedman, 2010; Borodulin *et al.*, 2016). A range of personal and social factors have also been identified as barriers and facilitators to being active. For example, in a cross-sectional survey of 15,239 European Union subjects using an interview-assisted face-to-face questionnaire, Zunft *et al.* (1999) identified factors such as work commitments (28%), not being the 'sporty type' (25%) and looking after others (12%) as reasons for not participating in physical activity; while maintaining good health (42%), releasing tension (30%), and to get fit (30%) were given as reasons to participate. In comparison, Borodulin *et al.* (2016) reported that in a

questionnaire based cross-sectional population study of 25-64 year olds in Finland who did not undertake sufficient physical activity (n=2260), the most common barrier to being active was lack of time. Other barriers identified were motivation, lack of companions to be active with, and expense.

Pan *et al.* (2009) reported a more complex picture in a telephone survey of 5,167 Canadians aged 15-79 years, which included self-reported physical activity using the International Physical Activity Questionnaire short form (Craig *et al.*, 2003), demographic data, intention, self-efficacy and perceived health benefits/barriers. For example, higher levels of education, family income, and perceived health benefits were more salient to older people; while for those with a university degree the availability of facilities was more likely to be a facilitator to participation than for those with a lower education level. Participants were asked to rate barriers collectively on a 7-point Likert scale, with mean scores reported. These included lack of time, energy, skill, interest/motivation, feeling uncomfortable, long-term illness, disability, injury, fear of being injured and costs. Unfortunately this meant that although 'barriers' were consistently associated with lower levels of activity it is not possible to say which were the most influential.

In a systematic review of 24 qualitative studies examining facilitators and barriers to physical activity, Allender, Cowburn and Foster (2006) reported that weight management, social interaction, and enjoyment were important reasons for taking part in physical activity. In contrast recalling negative school experiences, cost, poor access to facilities, lack of confidence, poor body

image, and lack of realistic role models were barriers to participation. This review included mainly publications examining barriers and facilities for younger people. For those who were older, De Bourdeaudhuij and Sallis (2002) identified health concerns as a major barrier.

To add to the complexity Kern, Reynolds and Friedman (2010) reported that childhood energy; sociability, adult extraversion and neuroticism were predictors of activity levels when comparing archival data from 1409 participants in the Terman Life Cycle Study (Terman, 1925). These authors suggested that physical activity needs to be understood within the context of an individual's personality and long-term trajectory rather than just current motivations.

Such studies present a complicated picture of participation in physical activity, especially when attempts are made to combine demographics with other social factors (Pan *et al.*, 2009). It is therefore likely that in order to increase population levels of physical activity there is a need for a combination of behavioural, social, and environmental approaches that are acceptable to people of various ages, different social groups, and communities (Heath *et al.*, 2012).

1.9 Background to the research programme

Given the identified benefits of a more active population, a large number of interventions have been established that attempt to increase physical activity (Marcus *et al.*, 2006; Heath *et al.*, 2012). These include environmental approaches (Sallis *et al.*, 2016), mass media campaigns (Bauman *et al.*, 2006),

lifestyle focused behaviour change interventions (Kahn *et al.*, 2002), and community-based exercise programmes such as ERS (Pavey *et al.*, 2011). This thesis focuses on one such UK based community programme for adults based in the North East of England, the Northumberland ERS.

Northumberland is the largest unitary authority in the UK and is the most northern county in England. Prior to local government reorganisation in 2009, it was a two tier authority with six district councils. It has an area of 5,013km² and is the least densely populated county in England (62 people per km²). It is a mainly rural county where deprivation is lower than the England average. However in the south east corner there is a more urban area where there are pockets of high deprivation (Northumberland County Council, 2015a). The population from the 2011 Census was 316,028 (Office for National Statistics, 2012). The Northumberland Community Health Profile (Public Health England, 2016) shows that the health of the population in the county is mixed when compared to the rest of England. Life expectancy for women is lower than the national average. Male life expectancy varies by 9.3 years and female by 7.3 years between the most and least deprived areas of the county. The prevalence of obese adults is estimated to be significantly worse than the national average, with levels of physical activity not being significantly different to the English average. Gains in health have been seen over the last 10 years, with deaths from all-cause mortality and early deaths from heart disease, stroke and cancer falling to match the England average (Public Health England, 2016).

The initial concept for this evaluation and research programme was developed during discussions about ERS provision following the publication of NICE guidance in 2006, which stated that such schemes should only be commissioned as part of a research programme to establish effectiveness (National Institute for Health and Clinical Excellence, 2006). The Northumberland ERS had already been in existence for more than 10 years, received approximately 1800 referrals per year and was provided by two leisure trusts; Blyth Valley Arts and Leisure (BVAL) and North Country Leisure (NCL). The scheme, described in Appendix 1, was based on the Transtheoretical Model (TTM) of behaviour change (Prochaska & DiClemente, 1983; Prochaska & Marcus, 1994) and included an assessment of stage of change, in addition to behaviour change techniques such as goal setting and decisional balance exercises to support processes of change. Given the popularity of the programme and the lack of other available options for the promotion of physical activity within primary care, the then National Health Service (NHS) commissioners, NHS North of Tyne, were keen to understand how the scheme was performing. Differing leisure provision created challenges for ERS delivery but BVAL and NCL formed a joint management arrangement to encourage standardisation of practice. As part of the commissioning process, a standardised protocol was agreed. During the latter stages of this PhD the two trusts merged into one larger trust, Active Northumberland.

There was no funding available to enable a research project to be undertaken. Instead a small working group was established, including staff from NHS North

of Tyne and the leisure providers, to explore what data could be routinely collected and how these could be collated. Evaluation criteria were derived through co-production between commissioners and providers. The 2006 guidance about ERS (National Institute for Health and Clinical Excellence, 2006) was considered. This recommended that evaluation measures should include intermediate outcomes such as knowledge, attitudes and skills, as well as a measure of physical activity levels.

The planning of evaluation criteria coincided with the draft publication of the *Tool kit for the design, implementation & evaluation of exercise referral schemes* (British Heart Foundation National Centre for Physical Activity and Health, 2010). Within these guidelines were suggestions for evaluation criteria, which were adopted as far as was considered possible given the lack of budget. The criteria agreed for the initial study were all included in the Toolkit recommendations. First, an assessment as to what extent the intervention reached the target population via the collection of participant characteristics and service utilisation was agreed. Second, an assessment of change in physical activity behaviour, via the use of the specifically recommended Godin Leisure Time Exercise Questionnaire (GLTEQ) (Godin & Shepard, 1985) both for the duration of the scheme and in the longer term (52 weeks after starting) was agreed. Third, an assessment of skills, attitudes and knowledge via the specifically recommended Stages of Change Questionnaire (Prochaska & Marcus, 1994) was agreed. Finally, an assessment of physiological health indicators (blood pressure, mass, BMI and waist circumference) was agreed.

The physiological measures were recommended as desirable rather than essential in the Toolkit (British Heart Foundation National Centre for Physical Activity and Health, 2010), but were already being taken during consultations.

The resultant ERS service level agreement stipulated what data should be collected and required an annual download of anonymised data be provided to commissioners. Initially it was envisaged that these would be analysed as a service audit by the NHS North of Tyne intelligence team. In tandem, the leisure trusts developed a bespoke database to ensure quality and consistency of data collection, which began in July 2009. During 2010 it became apparent that while robust data were being collected, detailed analysis of these would be limited by lack of resource. As a result BVAL agreed to fund a PhD, with both leisure trusts agreeing that they would be committed to quality of data collection and open to effecting process change in light of findings. The scheme has continued to collect data and therefore has the potential to measure any changes in performance that might have resulted from changes in scheme process. This programme of evaluation and research includes data from nine leisure facilities where the scheme was managed under the BVAL/NCL joint management arrangement.

1.10 Thesis purpose and objectives

This thesis examines what elements of exercise behaviour change provision within ERS work, for whom and in what circumstances in order to gain a better understanding of what factors influence effectiveness and how. It does this by

exploring what influences referral to, engagement with, and adherence to the Northumberland ERS. Specific evaluation and research objectives were:

- To examine the influence of demographics and other factors such as reason for referral on four stages of the Northumberland ERS pathway; initial referral, uptake, adherence at 12 weeks, and completion of the scheme at 24 weeks.
- To examine whether completion resulted in a change in self-reported physical activity six months and one year after initial engagement with the scheme.
- To examine whether completion of the Northumberland ERS resulted in significant changes to physiological health indicator measures (blood pressure, BMI and waist circumference).
- To explore pre-scheme perceptions of the Northumberland ERS for potential participants after referral but prior to starting the scheme. In doing this, the research attempted to better understand perceived influences on initial engagement and perceptions about what circumstances were most likely to facilitate positive results.
- To explore the experiences of participants referred to the Northumberland ERS and how these influenced their decisions about whether to attend. In doing this, the research attempted to better understand the actual mechanisms of engagement and/or the circumstances that might influence successful engagement.

1.11 Thesis overview

Chapter 2: Literature Review

Chapter two critically examines the development of UK physical activity policy relating to ERS. The implications in terms of the ability to evaluate such schemes are discussed. The current evidence base for UK based ERS is examined, along with the role and evidence base for the use of behaviour change theory in the planning of ERS. Finally the chapter examines and identifies gaps where further research is required.

Chapter 3: Methodological approach

Chapter three gives a rationale and justification for the methodology chosen for the evaluation and research in the thesis. It explains how the evaluation research programme developed and justifies the use of mixed methods as the most appropriate methodological approach. Specific methods used within studies are critically explored.

Chapter 4: Who comes, who stays and does it make a difference?

Chapter four describes the methodology used to collect and analyse routine quantitative data for a service evaluation of the Northumberland ERS. It includes the statistical analysis of demographic, physiological, and questionnaire data from 2223 referrals to the scheme. The chapter provides an insight into who is referred, who the scheme is successful in engaging with in the first instance and who is likely to continue to attend after 12 and 24 weeks. For those who complete the scheme at 24 weeks, an examination is made of whether this results in a change in self-reported physical activity, stage of

change and physiological measurements. Results are compared with existing literature and the chapter concludes with recommendations for future research.

Chapter 5: Participant Perspectives: why come, why stay, and what difference will it make?

Chapter five presents the design and results of a qualitative study of the views of 15 referrals to the Northumberland ERS prior to starting the scheme. This includes exploring pathways to referral, pre-scheme perceptions of what will happen during participation and perceived influences on attendance. The findings are presented as a conceptual framework, supported with more detailed explanations of emergent themes from individual semi-structured interviews with participants. The resultant findings enable recommendations to improve practice and for future research.

Chapter 6: Weight expectations and wellbeing rewards; changing perceptions of 'success' in ERS.

Chapter six presents three narrative typologies identified through the stories generated by the experiences described during semi-structured interviews with 11 participants in the Northumberland ERS. Stories are presented partly in descriptive terms by the researcher and partly in participants' own words using a précis of interviews. These are supported by discussion of key issues identified across narrative types. The aim of this chapter is to present rich and insightful data about participant experience of ERS, while enabling readers to draw their own conclusions from the illustrative stories.

Chapter 7: Conclusions and recommendations for future research.

Chapter seven gives an overview of the thesis, with main findings, methodological and theoretical advancements. The chapter describes changes implemented as a result of the evaluation research in the thesis, and how these have driven innovation in policy and practice in Northumberland. Strengths and weaknesses of the research programme as a whole are discussed, as are overall conclusions and recommendations for future research.

2 Literature Review

2.1 Introduction

The need to take action to change behaviour in relation to the risk factors identified by the WHO is well recognised by the United Kingdom (UK) Government. In order to achieve higher levels of population physical activity there is a need for a combination of behavioural, social and environmental approaches that are acceptable to people of various ages, different social groups and communities (Heath *et al.*, 2012). Unfortunately, at times, an evidence base to inform the practical implementation of these approaches is lacking (Wanless, 2004). This has led to the widespread development of physical activity interventions that lack evidence of effect. ERS are an example of a UK community intervention that has become one popular way of encouraging physical activity by primary care professionals among those with long-term medical conditions (British Heart Foundation National Centre for Physical Activity and Health, 2010).

Such schemes generally consist of: a referral from primary care to a third party, usually a leisure facility; an initial consultation with an exercise specialist; a programme of supervised physical activity, usually over a 10-12 week period; and a final consultation with an exercise specialist (Department of Health, 2001). Their development is an example of how impetus for action to increase physical activity levels has led to the widespread implementation of an intervention that is considered to have a weak evidence base (Sowden & Raine, 2008). This chapter critically examines the development of UK physical activity

policy in relation to ERS and the evidence base for it. The chapter concludes by identifying gaps in knowledge for this area of work.

2.2 Search strategy

Searches of electronic databases were conducted on a regular basis during the period of study, including PubMed and Web of Science. Final search terms were refined and limited to 'physical activity referral schemes' OR 'exercise referral schemes'. These terms yielded 212 titles, which were reduced to 140 when duplicates were removed. After reading abstracts, 69 titles were selected for full reading. In addition, references cited in published articles, systematic reviews and reports were retrieved and checked for relevancy. This was supplemented with searches of grey literature via Google and Google Scholar using the terms physical activity policy, physical activity referral, physical activity referral scheme and exercise referral scheme.

2.3 The development of exercise on referral within the context of UK physical activity policy

Shifting social norms for behaviours such as physical activity can be seen as a legitimate UK Government responsibility, which might be achieved via actions based on policies of taxation, subsidies, service provision, regulation and information (Wanless, 2004). Since 1996 successive UK Governments have attempted to create national policies and strategies to address population levels of physical inactivity (Department of Health, 1996; 1999; Department for Culture Media and Sport, 2002; Department of Health, 2004a; b; 2005; Department for

Culture Media and Sport, 2008; Department of Health, 2009; 2011; Public Health England, 2014a; Department for Culture Media and Sport, 2015).

Despite this sustained long-term approach, expected increases in physical activity as reported by national monitoring surveys have not materialised (Health and Social Care Information Centre, 2015; Sport England, 2016).

Although there has been previous government commitment to an evidence-based approach to developing policy (Labour Government, 1999), decisions about physical activity policy have at times been independent of research findings and contained unrealistic aspirational targets, such as 70% of the population taking part in sport three times per week by 2020 (Milton & Bauman, 2015).

The creation of evidence-informed physical activity policies is difficult however. Reasons for this include communication challenges between researchers and policy makers, the complex multi-sectoral nature of physical activity promotion, and the conceptual basis of translating research to policy, and then to practice (Pratt *et al.*, 2016). There has been an attempt to address the multi-sectoral nature of physical activity by developing cross-departmental strategies, for example *The Cycling and Walking Investment Strategy* (Department of Transport, 2016) is interlinked with the *National Planning Policy Framework* (Department for Communities and Local Government, 2012), the NHS in the *Five Year Forward View* (NHS England, 2014), Public Health England (PHE) via *Everyone Active Every Day* (Public Health England, 2014a) and the Department for Culture Media and Sport in *Sporting Future; a strategy for an active nation*

(Department for Culture Media and Sport, 2015). Unfortunately this type of approach has meant that no one government department has responsibility for increasing physical activity, which Fox and Hillsdon (2007) speculated has been detrimental to achieving progress.

The challenges of researchers engaging policy makers are highlighted by NICE attempts to provide evidence-based physical activity guidance for policy development (National Institute for Health and Clinical Excellence, 2006; 2008a; b). Unfortunately these have been seen as reinforcing what was already known rather than influencing policy makers from outside health (Allender *et al.*, 2009). It has also been suggested that some of the difficulty in creating effective policies is due to weak evidence about the cost-effectiveness of public health and preventative policies, and their practical implementation (Wanless, 2004). As such it can be argued that there is a lack of clear evidence to guide the development of physical activity policy. This does not negate the requirement for action, but rather emphasises the need for robust evaluation of any implemented initiatives.

New Labour's '*Modernising Government*' (Labour Government, 1999) stated the intention to develop all policy as part of a continuous learning process rather than a series of one-off initiatives. This included improving the use of evidence, research and pilot schemes to test for success. There was a focus on ensuring that policies and programmes were clearly specified and evaluated, and that lessons of success and failure were communicated and acted on. This apparent foresight should have set the scene for the development of tried and tested

physical activity interventions that could be scaled-up after robust evidence of initial success in small, well-planned pilots. Continued robust evaluation of scaled-up programmes would inform future developments. At the same time, unsuccessful interventions would not develop past the pilot stage. The longevity of the Labour Government (1997-2010) should have given time for such processes to become embedded in the development of policy.

Given that UK ERS were initially developed during the 1990s (Fox *et al.*, 1997) and have grown in popularity since this time (British Heart Foundation National Centre for Physical Activity and Health, 2010), there should have been ample opportunity to evaluate programmes during the early stages of development had the above policy been fully implemented. Scaling-up should only have occurred where sufficient evidence of effect was found. Inconsistencies with this approach can be found as early as 1999 however. For example in *Saving Lives: Our Healthier Nation* ERS were promoted as ‘a cost effective alternative to prescribing long-term medication’ (Department of Health, 1999, pp24). This appeared to give credence to an established evidence base despite the publication of two contradictory RCTs in 1998. One reported evidence of increased physical activity eight months after participation in ERS compared to a control group (Stevens *et al.*, 1998), while the other reported no difference between those referred to ERS and a control group after 37 weeks (Taylor, Doust & Webborn, 1998). There has been continued credibility given to ERS through inclusion in successive government strategies: *Choosing Health* (Department of Health, 2004b), *Our health, our care, our say* (Department of

Health, 2006), *Be active, be healthy* (Department of Health, 2009) and as recently as *Sporting Futures, A New Strategy for an Active Nation* (Department for Culture Media and Sport, 2015). This is despite several systematic reviews finding limited evidence of effectiveness (Gidlow *et al.*, 2005; Williams *et al.*, 2007; Pavey *et al.*, 2011; Campbell *et al.*, 2015).

The use of systematic reviews in the assessment of public health interventions can itself be considered problematic for several reasons however. It has been argued that the rigorous nature of systematic reviews, where trial-based evidence is taken to be the gold standard, fails to recognise individual and social influences on participation in interventions and may limit a broader understanding of what works, for, whom, and in what circumstances (Pawson *et al.*, 2005). In addition, studies are included on the basis of the quality of the research only, not the quality of the intervention, which can produce anomalous results (Speller, Learmonth & Harrison, 1997). An RCT of a poor quality intervention, for example, would be considered as higher quality evidence than a robust evaluation study of an existing high quality intervention because there is no comparison to a control group. This is despite the fact that potentially such a study might provide important insight into successful practice in a complex real life context (Gidlow *et al.*, 2005).

The potential limitations of RCTs in failing to facilitate understanding of the complexity of physical activity as a social phenomenon, explain why ERS may work, and explore unintended but positive health outcomes were discussed by Dugdill, Graham and McNair (2005). In addition, Gidlow *et al.* (2005) highlighted

the implications of potential differences between RCTs and 'real life' delivery meaning that the results were not transferable, and suggested that more energy should be put into high quality applied research with existing schemes. In any case, as Sowden and Raine (2008) have commented, given the widespread nature of ERS provision the evaluation of effectiveness by RCTs only is now unrealistic due to the potential difficulties in recruiting GP surgeries who would be willing to undertake an RCT. Such difficulties were highlighted by Din *et al.* (2014), who reported that some health professionals felt uncomfortable referring their patients to an ERS that was part of an RCT as entry might be deferred for 12 months. It can therefore be argued that evaluation of the evidence base for ERS via RCTs only is no longer viable. Even if it were, it can also be argued that such an approach would fail to adequately examine the intervention and to consider the research questions that might best serve to better understand successful practice.

The continued delivery of ERS despite what is considered to be a weak evidence base has been partly due to conflicting policy advice encouraging the development of such schemes (Sowden & Raine, 2008). In 2006 NICE stated that there was insufficient evidence to recommend the use of ERS to promote physical activity, other than as part of research studies where effectiveness could be evaluated (National Institute for Health and Clinical Excellence, 2006). The Department of Health contradicted this guidance with a statement issued in 2007, which clarified that schemes only needed to be part of a controlled study if they solely targeted those with no underlying medical conditions (Department

of Health, 2007). Since it was unlikely that schemes existed only in this context, ERS continued to be commissioned and provided (Sowden & Raine, 2008).

The statement by the Department of Health (Department of Health, 2007) highlighted the tension that can be found in the use of evidence to develop physical activity policy. Kingdon (2003), identified three key elements that enable a 'policy window' to open in order to facilitate change. First an issue must be recognised as a problem by policy decision-makers. Second a variety of workable solutions must be ready to be put in place. Finally, politicians must be willing and able to make a policy change. Recognition of the problem of physical inactivity and the benefits of increasing population levels of physical activity have been discussed in detail in sections 1.2, 1.4, and 1.5. Exercise on referral schemes have been previously suggested as one workable solution to increase levels of physical activity in those with long-term conditions (Department of Health, 2001). Systematic reviews (Gidlow *et al.*, 2005; Williams *et al.*, 2007) available at the time that the contradictory guidance was issued questioned whether there was sufficient evidence for ERS. Despite this politicians were faced with an imperative to be seen to be taking action to tackle sedentary behaviour in the face of a lack of evidence about what worked (Sowden *et al.*, 2008). A lack of alternatives for action on the part of politicians may have been the catalyst for the maintenance of the status quo and the widespread continuation of ERS in 2007.

The failure to create an evidence base for what works in ERS is disappointing given attempts to provide a structured approach to development via the

production of a series of guidance documents (Department of Health, 2001; National Institute for Health and Clinical Excellence, 2006; Department of Health, 2007; British Heart Foundation National Centre for Physical Activity and Health, 2010; National Institute for Health and Care Excellence, 2014a). The first guidance document, published in 2001, was an NHS National Quality Assurance Framework (Department of Health, 2001). This described ERS and gave a blue print for development and implementation. While it emphasised the importance of evaluation, it unfortunately failed to give clear, structured guidelines about what was required, or promote the development of the skills necessary to evaluate (Dugdill, Graham & McNair, 2005). Although it could be argued that a lack of evidence about what worked meant that it was necessary for providers to interpret and test implementation at a local level, the opportunity to create standardised evaluation criteria at this early stage was lost. Consequently, as highlighted in the latest NICE guidance (National Institute for Health and Care Excellence, 2014a) inconsistency in referral criteria and the type of data collected has made it not only difficult to assess effectiveness, but also to compare schemes from different areas.

Despite the 2006 NICE guidance (National Institute for Health and Clinical Excellence, 2006) and possibly because of the 2007 Department of Health statement (Department of Health, 2007) it appears that schemes continued to operate without being linked to research programmes. In 2010 the British Heart Foundation National Centre for Physical Activity and Health published '*A Tool Kit for the Design, Implementation & Evaluation of Exercise Referral Schemes*',

(British Heart Foundation National Centre for Physical Activity and Health, 2010). This gave an update on provision of ERS in England and Scotland. One hundred and fifty eight schemes were reported to be in existence, with the majority operating at district level. This is probably an underestimation as the postal survey used to assess provision had a 64% response rate and the authors stated that the response in London represented only a third of schemes previously thought to be in existence. Of these schemes, only a few have been identified as the subject of published studies since the 2006 NICE guidance (Edmunds, Ntoumanis & Duda, 2007; Gidlow *et al.*, 2007; Isaacs *et al.*, 2007; James *et al.*, 2008; Morton, Biddle & Beauchamp, 2008; Sowden *et al.*, 2008; James *et al.*, 2009; Markland & Tobin, 2010; Pentecost & Taket, 2011; Tobi *et al.*, 2012; Duda *et al.*, 2014). Two of these (Gidlow *et al.*, 2007; James *et al.*, 2008) were sibling studies that considered the same dataset, the study by Sowden *et al.* (2008) examined data from six schemes in London, and the study by Pentecost and Taket (2011) examined data from three schemes. This means that published data from only 17 of at least 158 existing schemes in England and Scotland have been identified since NICE recommended that no scheme should be commissioned without being part of a study to assess effect (National Institute for Health and Clinical Excellence, 2006). In addition there has been a pragmatic RCT in Wales (Murphy *et al.*, 2012) but information about provision in Wales was not included in the toolkit (British Heart Foundation National Centre for Physical Activity and Health, 2010).

Where schemes were well established, continued commissioning despite a lack of engagement in research to establish effectiveness may have been due to a bottom-up approach to delivery, as discussed by Matland (1995), where the local implementation environment has more dominance than national policy direction. In the case of ERS the fact that policy guidance has been contradictory may have added weight to local approaches. It is also possible that the low level of research engagement is due to a local lack of funding for evaluation. For example, the Northumberland ERS service level agreement contained no funding for evaluation although it was explicit in requiring it to be done (Northumberland Public Health, 2013). It could be argued that it is unrealistic to expect that schemes will implement robust evaluation where there is no identified resource to do so. Based on the information in the British Heart Foundation National Centre for Physical Activity and Health toolkit (British Heart Foundation National Centre for Physical Activity and Health, 2010) and the studies identified in this literature review, approximately 10% of schemes have been robustly evaluated. There is therefore a need for researchers to find a way to constructively engage with existing providers, despite a potential lack of funding. Such a pragmatic approach would add depth to understanding by considering actual practice, influence the (re)design of interventions, and compliment any future RCTs.

The British Heart Foundation National Centre for Physical Activity and Health document (British Heart Foundation National Centre for Physical Activity and Health, 2010) was a partner to, rather than a replacement for, the National

Quality Assurance Framework (Department of Health, 2001) and included recommendations for validated tools that could be used for evaluation.

Unfortunately rather than recommending one validated tool for each suggested outcome measure, details were provided about what had been previously used in the ERS literature. For example, in terms of self-report measures for physical activity, the toolkit highlighted both the Godin Leisure Time Exercise Questionnaire (GLTEQ) (Godin & Shepard, 1985) and the Seven Day Physical Activity Recall (Sallis *et al.*, 1985). It also referred readers to a rapid review of self-report methods (Hillsdon, 2009), which did not recommend either of these questionnaires. This rapid review was linked to weight management programmes rather than exercise on referral and therefore highlighted only PAQs that had been validated against doubly labelled water. One of the identified PAQs, the International Physical Activity Questionnaire Long Form (Craig *et al.*, 2003), had not been validated for use in exercise interventions to assess change in physical activity behaviour (Hillsdon, 2009), meaning that its suitability for use in the evaluation of ERS was unknown. The guidance in the toolkit (British Heart Foundation National Centre for Physical Activity and Health, 2010) was confusing for providers wishing to create routine evaluations of ERS. Once again the opportunity to recommend one validated way of measuring identified outcomes and enable direct comparisons between schemes was lost.

In 2014, NICE issued new guidance for ERS (National Institute for Health and Care Excellence, 2014a). This document specifically recommended that

schemes should collect data in line with the 'essential criteria' outlined in the *Standard evaluation framework for physical activity interventions* (Cavill, Roberts & Rutter, 2012). These included programme details, evaluation details, demographics of individual participants, baseline data, follow-up data to at least one year, and process evaluation. As the Standard evaluation framework was not designed exclusively for ERS, there were still no specific recommendations for validated tools for assessing physical activity in this setting. However if commissioners and providers of ERS implemented the evaluation guidance (Cavill, Roberts & Rutter, 2012) there would be an increase in the quality and quantity of data available for analysis. Since NICE (National Institute for Health and Care Excellence, 2014a) also recommended that PHE should develop and manage a system to collate local data from ERS, there is great potential for progress to be made in increasing the evidence base for what works.

The 2014 NICE guidance (National Institute for Health and Care Excellence, 2014a) was also helpful in identifying particular areas where better understanding was required. These included the need to consider whether there were differences in effectiveness among population sub-groups such as socioeconomic status, age, gender and ethnicity. Although change in physical activity was suggested as the primary outcome measure, the need to understand the effect of supportive behaviour change techniques such as motivational interviewing (Miller, 2002), and the need to better understand what factors encourage or discourage uptake of, and adherence to, ERS were highlighted as areas for future research (National Institute for Health and Care

Excellence, 2014a). Despite the arguments presented earlier in this section, the NICE guidance still called for more RCTs to assess cost-effectiveness and effectiveness.

In addition to specific ERS policy and guidance documents, PHE attempted to identify UK physical activity interventions that had been robustly evaluated in '*Identifying what works for local physical inactivity interventions*' (Public Health England, 2014c). Of the 952 programmes that submitted evidence only 34 were sufficiently rigorous to be classified according to Nesta standards. No ERS interventions met standards for 'proven practice' or 'promising practice', and only 6 of the 28 programmes classed as 'emerging practice' were ERS-based. Similar to systematic reviews, the rigorous quantitative Nesta standards resulted in criticisms of the ERS evidence base in terms of sparse use of RCTs and failure to establish causality (Oliver *et al.*, 2016). This presents a challenge for providers of ERS given the pragmatic nature of the schemes and service expectations of referrers.

Despite the cautious approach to commissioning ERS recommended by NICE (National Institute for Health and Care Excellence, 2014a), new schemes have recently been implemented via Sport England's 'Get Healthy, Get Active' fund (Sport England, 2014a). These schemes use sport, rather than more traditional ERS gym or class-based activities, in an attempt to improve the evidence base for the role sport plays in engaging inactive people as recommended by Cavill, Richardson and Foster (2012). Such an approach can be criticised since the extent to which the implementers of

sport programmes are committed to, and capable of, delivering on health agendas has previously been questioned (Bloyce *et al.*, 2008). In addition it has been argued that perceived weaknesses in the current ERS evidence base are likely to apply to sport-based ERS trials, resulting in continued ambiguity in national policy guidance (Oliver *et al.*, 2016). These authors also suggested that sport-based ERS are unlikely to offer alternatives suited to engaging those underserved by current schemes. Despite these criticisms the pilot projects required a robust approach to evaluation in order to gain funding (Sport England, 2014b), so there is the potential for high quality evidence to inform future policy decisions.

This section has described the development of physical activity policy in relation to ERS in England. Policy guidance has been contradictory and at times confusing. On the one hand NICE (National Institute for Health and Clinical Excellence, 2006; 2014a) has continued to question the evidence base for ERS; while on the other successive Government policies (Department of Health, 1999; 2004b; 2006; 2009; Department for Culture Media and Sport, 2015) have continued to promote them. Despite consistent calls over more than a decade for the need to evaluate physical activity interventions, including ERS, there remains a lack of evidence about what works due to significant gap in routine data collection (Public Health England, 2014c). Since little progress has been made in raising physical activity levels (Health and Social Care Information Centre, 2015; Sport England, 2016) there is an urgent need to better understand what elements of existing

provision works, for whom, and why. In the case of ERS what is required is a better understanding of which elements encourage participation, for which particular groups of the population and why successful elements work better for some people than others. Given the limitations of RCTs in achieving this understanding, and the lack of funding to carry out such studies in practice, there is a need to take a more pragmatic approach to establishing robust evaluation of existing schemes.

2.4 The evidence base for UK exercise on referral

There have been several UK systematic reviews of ERS (Gidlow *et al.*, 2005; Morgan, 2005; Williams *et al.*, 2007; Pavey *et al.*, 2012; Campbell *et al.*, 2015), which have questioned effectiveness in increasing long-term physical activity levels and criticised data collection. There has been a lack of consistency in studies included in these reviews however, revealing a different understanding and interpretation of ERS between authors. For the purposes of this literature review, studies have been considered that were UK-based and included both a referral from primary care to a third party leisure provider and an initial assessment by fitness staff. Two European RCTs (Gusi *et al.*, 2008; Sorenson *et al.*, 2008) also formed part of the evidence considered in the two most recent systematic reviews of effectiveness and cost-effectiveness (Pavey *et al.*, 2011; Campbell *et al.*, 2015). The study by Gusi *et al.* (2008) compared a supervised walking programme with a control group and did not include an initial assessment by a third party provider. The other European study (Sorenson *et al.*, 2008) was physiotherapy led. These factors make both studies dissimilar to

most UK ERS and so they have not been considered further in this literature review.

Exercise on referral in the UK has been examined via a variety of methods; RCTs (Stevens *et al.*, 1998; Taylor, Doust & Webborn, 1998; Harrison, Roberts & Elton, 2005; Isaacs *et al.*, 2007; Murphy *et al.*, 2012; Duda *et al.*, 2014), evaluation studies of data routinely collected by scheme providers (referred to in this review as evaluation studies) (Lord & Green, 1995; Dugdill, Graham & McNair, 2005; Harrison, McNair & Dugdill, 2005; Gidlow *et al.*, 2007; James *et al.*, 2008; Sowden *et al.*, 2008; James *et al.*, 2009; Tobi *et al.*, 2012), qualitative studies, or qualitative elements of studies, of barriers and facilitators to participation (Lord & Green, 1995; Singh, 1997; Martin & Woolf-May, 1999; Tai *et al.*, 1999; Stathi, McKenna & Fox, 2004; Wormald & Ingle, 2004; Moore, Moore & Murphy, 2011a; Pentecost & Taket, 2011; Mills *et al.*, 2012; Din *et al.*, 2014), and behaviour change outcome evaluation studies (Jones *et al.*, 2005; Edmunds, Ntoumanis & Duda, 2007; Morton, Biddle & Beauchamp, 2008), which were also evaluative. In addition Littlecott *et al.* (2014) undertook a secondary analysis of data from the RCT by Murphy *et al.* (2012) to examine psychosocial mediators of physical activity change.

Although not all of the approaches employed in these studies would be considered as high quality evidence in a rigorous systematic review process, the variety of methods has helped to increase understanding of the complexity of the intervention. The identified studies have been critiqued in the next section

by considering the different elements of effectiveness that have been examined, for example change in physical activity behaviour.

2.4.1 Evidence for change in physical activity behaviour

A primary outcome measure for the UK RCTs (Stevens *et al.*, 1998; Taylor, Doust & Webborn, 1998; Harrison, Roberts & Elton, 2005; Isaacs *et al.*, 2007; Murphy *et al.*, 2012; Duda *et al.*, 2014) was self-reported physical activity. A noticeable weakness in evaluation studies was a failure to measure this element. Only one evaluation study (Dugdill, Graham & McNair, 2005) reported this variable. This is perhaps not surprising given the lack of specific guidance in the development of monitoring and evaluation as described in section 2.3. Where schemes have been asked to provide data retrospectively, a physical activity behaviour measure may not have been routinely collected in the same way as for example age, gender and attendance at assessments.

ERS aim to change long-term physical activity behaviour but a major criticism of most UK schemes is the short-term nature of the interventions, usually between 10-16 weeks (Pavey *et al.*, 2011). There has been no evidence identified that has examined whether a longer intervention would have a greater effect on long-term (defined as one year) physical activity behaviour. This is an area worthy of examination. There are also limitations in the way that physical activity behaviour change has been measured. All identified studies that examined this element (Stevens *et al.*, 1998; Taylor, Doust & Webborn, 1998; Dugdill, Graham & McNair, 2005; Harrison, Roberts & Elton, 2005; Isaacs *et al.*, 2007; Murphy *et al.*, 2012; Duda *et al.*, 2014) used self-report methods rather than objective

measurement. This pragmatic approach is perhaps the only realistic way to assess physical activity in larger scale studies, although it is likely to lead to inaccuracies in levels reported as discussed in section 1.7.

The most commonly employed PAQ was the 7-Day Physical Activity Recall (Blair *et al.*, 1985), which was used by Taylor, Doust and Webborn (1998), Harrison, Roberts and Elton (2005), Murphy *et al.* (2012), and Duda *et al.* (2014). This PAQ has been well-validated to measure change in physical activity behaviour (Sallis *et al.*, 1987; Gross *et al.*, 1990; Richardson *et al.*, 2001). One study (Isaacs *et al.*, 2007) used the Minnesota Leisure Time Physical Activity Questionnaire (Taylor *et al.*, 1978). This has also been validated to be an acceptable measure of physical activity (Richardson, 1991; Elosua *et al.*, 1994). Finally one study (Dugdill, Graham & McNair, 2005) used the GLTEQ (Godin & Shepard, 1985).

The GLTEQ (Godin & Shepard, 1985) has been used in this thesis to measure self-reported physical activity. It was chosen because it was the simplest of the two questionnaires recommended in the British Heart Foundation National Centre for Physical Activity and Health *A Tool Kit For the Design, Implementation & Evaluation of Exercise Referral Schemes* (British Heart Foundation National Centre for Physical Activity and Health, 2010). It records frequencies of strenuous, moderate and mild activity, with answers used to calculate a weekly leisure time activity score correlated to the two main determinants of physical fitness; maximal oxygen uptake and percentage body fat. Internal and concurrent validity results indicate that it is an appropriate tool

for measuring leisure time physical activity change (Godin & Shepard, 1985). The questionnaire has been reported to have acceptable reliability and validity (Jacobs *et al.*, 1993; Miller, Freedson & Kline, 1994; Amireault *et al.*, 2015). A criticism of the questionnaire is that although it can be used to examine significant changes in physical activity levels, the score is difficult to interpret in terms of being meaningful to health (Godin, 2011). In an attempt to address concerns with interpretation, Godin (2011) published updated guidelines for the questionnaire. This equated scores to being 'active' (giving substantial benefits), 'moderately active' (giving some benefits) and 'insufficiently active' (giving less substantial or low benefits). In this updated method of interpretation, only moderate and strenuous ratings were used. The validity of using this approach in classifying healthy adults has been supported (Amireault & Godin, 2015).

It is difficult to compare the results relating to physical activity from the ERS studies due to the way in which they were reported. Four of the six studies (Dugdill, Graham & McNair, 2005; Harrison, Roberts & Elton, 2005; Isaacs *et al.*, 2007; Murphy *et al.*, 2012) examined 12-month effect as recommended by NICE (National Institute for Health and Care Excellence, 2014a). The others measured 37-week effect (Taylor, Doust & Webborn, 1998), six-month effect (Duda *et al.*, 2014), and eight-month effect (Stevens *et al.*, 1998).

In a pragmatic study of the Welsh National ERS Murphy *et al.* (2012) compared the scheme to a control group who received usual care plus an information leaflet and addresses of local leisure facilities. The authors reported significantly higher levels of those achieving at least 90 minutes of moderate activity after 12

months among those ERS participants referred for coronary heart disease only when compared to the control group (OR 1.29, 95% confidence interval 1.04 to 1.60, $p < 0.05$). This is the largest UK RCT to date ($n=2160$) and researchers only minimally influenced the actual intervention, increasing the likelihood of external validity and generalisability of results. A further strength of the study was that it examined effect among sub-groups of the referral population as recommended by NICE (National Institute for Health and Care Excellence, 2014a).

In contrast Harrison, Roberts and Elton (2005) reported a significant difference between intervention and a control group for participation in at least 90 minutes of moderate activity at six months (OR 1.67, 95% confidence interval 1.08 to 2.60, $p=0.05$), but not at 12 months (OR 1.45, 95% confidence interval 0.84 to 2.50, $p=0.18$). It is possible that lack of power was responsible for lack of observed effect however, as there was a much smaller sample size ($n=312$) at 12 months compared to the trial by Murphy *et al.* (2012) ($n=1479$). Difference in effect may also be explained by the fact that Murphy *et al.* analysed results by considering sub-groups of referrals by medical condition, while Harrison, Roberts and Elton (2005) did not. It should be noted that the interventions studied differed. The trial by Murphy *et al.* (2012) studied a 16-week intervention, compared to the trial by Harrison, Roberts and Elton (2005), which examined a 12-week intervention. It is possible that the extra four week intervention period was responsible for creating an effect. Harrison and colleagues (2005) reported that the ERS examined received a lower number of

referrals than expected during the study period, possibly due in part to the implementation of the trial itself. Almost all referrals were accepted onto the trial in an attempt to closely reflect actual practice, but this highlights a potential difficulty in using RCT methodology with existing schemes.

Isaacs *et al.* (2007), compared the effectiveness of referral to a 10-week ERS, a 10-week structured walking programme, and advice only in promoting physical activity. The study reported that all groups significantly increased the number of participants achieving 90-150 minutes of physical activity after six months (13.8% in ERS group, 11.1% in walking group, and 7.5% in the advice-only group) but there were no significant differences between groups. The control group were then re-allocated into one of the intervention groups, meaning that although there were 12-month data available for ERS and walking, there was no comparison with a control. Both groups still maintained significantly higher levels of physical activity compared to baseline at one year, with levels in the walking group being significantly higher than in the ERS group. The control group received a pre-trial fitness assessment and knew that they would be re-allocated into an intervention group after a six-month period. It is possible that these were confounding factors in having a true control, as they may have encouraged participants to begin to be more active in preparation for when they were able to access the scheme. This study also reported the percentage of sessions attended against the number of sessions prescribed (usually between 20 and 30) as recorded by hand-held diaries and class registers. In the ERS group, 7.6% (n=24) of participants attended no sessions, 10.4% (n=33)

attended 1-24% of sessions, 14.8% (n=47) attended 25-41% of sessions, 25.2% (n=80), attended 50-74% of sessions, and 42.0% (n=133) attended 75-100% of sessions. In comparison, in the walking group, 23.0% (n=73) attended no sessions and 21.5% (n=67) attended 75-100% of sessions. This would indicate that the ERS had more success than the walking intervention in creating higher levels of engagement, but this did not translate into a significant difference in the percentage of participants achieving recommended levels of physical activity.

Dugdill, Graham and McNair (2005) reported mean change in self-reported physical activity for those who completed a 12-week ERS. At the time of this publication there were no guidelines about how to interpret the score generated by the GLTEQ (Godin 1985) in terms of health benefit, which was a limitation of the questionnaire. Dugdill, Graham and McNair (2005), therefore translated scores by calculating an estimated minimum level of moderate physical activity based on assuming an average level of METs achieved across the reported number of at least 15 minute blocks of physical activity. The mean weekly activity score was divided by its metabolic equivalent for moderate activity (5.0 METs) and the resultant score multiplied by 15 minutes, the minimum amount of time for each bout of activity reported (Dugdill, 2011). Participants reported undertaking 27.36 units per week (82 min moderate activity per week) at baseline and 34.40 units per week (103 minutes of moderate activity per week) after one year. This gave a mean increase at one year of 7.04 units per week (21 minutes of moderate activity per week) compared to baseline. Significance

levels and sample size at one year were not reported meaning that interpretation of results is limited. This was an evaluation study, which gave it potential external validity and generalisability, but there was no control group for comparison of effect. Although the study can be criticised for interpreting results in a pragmatic way, it did allow for a comparison of effect with recommended levels of moderate physical activity (Department of Health, 2011). Levels of physical activity achieved were below that recommended for health benefit indicating that although the scheme had a significant effect on increasing physical activity at one year, this was not to levels that are known to be beneficial to health.

Other studies only reported physical activity behaviour in the medium-term, limiting knowledge about longer-term effectiveness. Duda *et al.* (2014) reported no significant difference between groups for either moderate/vigorous physical activity or physical activity excluding walking after six months. This study compared standard ERS with a Self Determination Theory (SDT) (Deci & Ryan, 1985; 2000) based ERS, rather than between ERS and a control group. As with all other studies, the intervention period was short; 10-12 weeks. Significant within-group differences were found at six months but not between groups. The authors reported issues with staff completing training and hence the knowledge base for those undertaking the SDT-based intervention. They speculated that this may have explained a lack of effect. This study was different from the other RCTs in that it compared two interventions, making it impossible to comment on whether the changes observed were significantly better than doing nothing.

Due to recruitment issues the study was underpowered, which may have been a further factor in lack of differences between groups being observed. Only 20.6% (n=347) of those referred to the scheme during the recruitment period agreed to be part of the study. This highlights one of the challenges in trying to implement an RCT within an existing ERS. The study was a cluster-based design, where leisure centres were randomly allocated to one of the interventions. Given this, if an evaluation approach had been adopted it may have been possible to compare the two interventions by using anonymised data from all referrals made during the study period (n=1683) to the 13 leisure centres involved. Sites could still have been randomly allocated to one of the two intervention arms and the same questionnaires could have been administered. Although a lack of blinding to outcome measures by staff collecting the data would have increased potential bias, the number of participants would have been far higher, giving greater power to results. While such an approach would not be classed as 'gold standard' evidence, it may have provided a greater amount of information to allow for an assessment of the success of the two interventions and have greater external validity.

Stevens *et al.* (1998) examined the number of incidences of moderate and vigorous physical activity undertaken in the four weeks prior to follow-up. Significantly higher levels of moderate physical activity (an additional 1.45 episodes, 95% confidence interval 1.03 to 1.74) and overall physical activity (an additional 1.52 episodes, 95% confidence interval 1.14 to 1.95) were reported for ERS when compared to a control group eight months after the intervention.

Levels of significance were not stated. Participants were recruited for the study based on physical activity levels alone rather than having an existing medical condition. As with other studies the intervention was short, only 10 weeks. This is an older study and NICE guidelines do not recommend that such schemes should now be commissioned (National Institute for Health and Care Excellence, 2014a). As such it is of limited use in assessing the effect of current schemes.

Finally Taylor, Doust and Webborn (1998), examined referral to a 10-week exercise programme of up to 20 sessions, compared to control group who received a leaflet containing lifestyle advice to prevent CHD. The trial reported no significant difference in physical activity levels between groups after 37 weeks. Along with Isaacs *et al.* (2007) this was one of only two trials to report actual attendance data, finding that participants in the ERS attended a mean (SD) of 9.1 (7.2) of the 20 sessions prescribed. As with the trial by Duda *et al.* (2014) recruitment was an issue, with only 41% (n=142) of those eligible agreeing to take part in the trial. Thirty seven week data were available for only 71 participants, limiting the power of the trial. Since the study was part of an established larger scheme however, the authors stated that concurrent data supported the findings of the trial, increasing the likelihood of generalisability (Taylor, Doust & Webborn, 1998).

Although other studies have not reported change in physical activity behaviour, some have reported 80% attendance at ERS sessions as a requirement to be classed as an adherer (Gidlow *et al.*, 2007; James *et al.*, 2008; 2009; Tobi *et*

al., 2012). Unfortunately there was a lack of definition about the number of sessions, or amount of time per week where physical activity was undertaken. For example in the study by James *et al.* 2009, the scheme did not have a defined number of sessions, with agreement being made between fitness professional and participant at the first consultation. This meant that the intervention could vary between participants, with a maximum of 26 weeks of attendance but not a defined number of sessions per week. Completion was defined as attending 80% of agreed sessions (Mills, 2011). This lack of clarity makes it difficult to define the intervention period, again limiting understanding about what works.

The lack of detail provided by these studies is disappointing since such data may have the potential to provide a proxy measure of activity during the period of participation in the scheme if length of session is known. The lack of attention given to obtaining good quality attendance data, even in RCTs, has been criticised (Gidlow *et al.*, 2005). These authors suggest that this is the most important outcome upon which all others are dependent and is a variable that should be easily available. By understanding how many times and over what time period those who dropout attended, an insight may be gained into whether there is a crucial time period that is of particular importance to dropout/retention. As recommended by Gidlow *et al.* (2005), more attention needs to be paid to this in future studies.

2.4.2 Evidence for change in physiological indicators of health

Assessment of change in physiological markers is not explicit in NICE guidance (National Institute for Health and Care Excellence, 2014a) for ERS, but such changes may provide a direct measure of health improvement. One problem with this is that although an association between changes to physiological health measures and completion of ERS may be established, there is a difficulty in attributing causality (Isaacs *et al.*, 2007). It would be challenging to understand whether factors other than ERS, for example medication or stopping smoking, were responsible for changes to health outcomes. This is especially true when trying to assess effect over one year. This does not negate the worth in examining physiological health indicators, but many of the UK ERS studies have failed to do this (Pavey *et al.*, 2011). Findings from the studies (Taylor, Doust & Webborn, 1998; Isaacs *et al.*, 2007; James *et al.*, 2009; Duda *et al.*, 2014) that have reported these health outcomes are critically appraised in this section. Those measures, [for example, mass (kg), BMI (kg/m²) and blood pressure (mmHg)] that could realistically be measured in a large scale evaluation such as the one undertaken in this thesis have been considered.

Duda *et al.* (2014), measured mass, BMI and blood pressure at baseline and six months only. It is unclear when these measures were taken, or by whom.

Participants were offered a fitness assessment at the end of their initial interview, but the authors reported that uptake was low. The number of participants with physiological data was not reported. Physiological measures were seen as secondary outcomes and little attention paid to them in the results

or discussion. Small, but significant changes were reported for the standard ERS group for mass [-0.77 kg (95% confidence interval -0.38 to -0.16)], and BMI [-0.24 kg/m² (95% confidence interval -0.45 to 0.03)]. No change was evident for blood pressure measures. There were no significant differences between standard provision and SDT provision.

The RCT by Isaacs *et al.* (2007) contained the most comprehensive data of all of the studies identified. Measures included mass (kg), BMI (kg/m²), and blood pressure (mmHg), which were taken by trained researchers, a strength of the study. For those who took part in ERS, significant reductions were reported in mass -0.5 kg (95% confidence interval -0.85 to -0.10, $p < 0.05$), BMI -0.1 kg/m² (95% confidence interval -0.31 to -0.03 $p < 0.05$), systolic blood pressure -3.1 mmHg (95% confidence interval -4.90 to -1.35, $p < 0.05$), and diastolic blood pressure -2.4 mmHg (95% confidence interval -3.34 to -1.46, $p < 0.05$) after 10 weeks. After one year there was a significant reduction in body fat 0.5% (95% confidence interval 0.23 to 0.90, $p < 0.001$), systolic blood pressure -6.2 mmHg (95% confidence interval -8.27 to -4.20, $p < 0.001$), and diastolic blood pressure -4.5 mmHg (95% confidence interval -5.54 to -3.44, $p < 0.001$). However, there were no significant differences between ERS and a control group for any measures at either 10 weeks or six months, and no difference between ERS and a walking intervention at one year. As with changes in physical activity, Isaacs *et al.* (2007) discussed the difficulties in having a true control group when the participants knew that they were going to take part in the intervention later. It is possible that this group made positive lifestyle changes in preparation

for taking part in the scheme. Although it is not possible to compare the one year results with a control group, the fact that blood pressure reductions approximately doubled over this time period is an indication that completion of ERS may be associated with significant long-term positive change in this health outcome.

Taylor, Doust and Webborn (1998), examined change in systolic and diastolic blood pressure (mmHg), BMI (kg/m^2), and sum of four skinfolds (mm). Measurements were taken at baseline, 16 weeks, 26 weeks and 37 weeks by trained researchers. A significant difference was reported between intervention and control groups in sum of skinfolds at 16 weeks, ($p < 0.01$), which was not maintained at 37 weeks. No differences were reported in blood pressure or BMI. These findings indicate that the ERS had a limited short-term effect on some health outcomes but this was not maintained in the medium-term. These results are perhaps not surprising given that as identified earlier, participants attended less than 50% of recommended sessions. Higher levels of change were seen in those who attended at least 75% of recommended sessions but the small number of participants in this category ($n=23$) meant that analysis lacked power (Taylor, Doust & Webborn, 1998). These findings indicate that if high levels of attendance can be achieved, ERS has the potential to change physiological indicators of health. As with Isaacs *et al.* (2007) the use of researchers to take measures is a strength of this study.

James *et al.* (2009), examined the association between socio-demographic characteristics and referral reason in relation to health outcomes; BMI (kg/m^2)

and blood pressure (mmHg). Since this was an evaluation study, measures were taken by members of fitness staff. Although there are limitations with this approach due to a lack of tested error measurements meaning that accuracy is unknown, this must be balanced against a large data set ($n=1315$) giving confidence in results. This is the only study identified that has attempted to quantify physiological benefits for UK ERS in this way.

The study concluded that referrals of mixed ethnicity were significantly more likely to reduce BMI than those who were white (OR=3.991; 95% confidence interval 1.191 to 13.373, $p<0.05$) and that those in skilled manual employment were significantly more likely to reduce blood pressure than those who were unemployed (OR=1.875; 95% confidence interval 1.044 to 3.227, $p<0.05$). In addition those who completed were significantly more likely to achieve a reduction in body mass (OR=3.541; 95% confidence interval 2.721 to 4.608, $p<0.001$) and a reduction in blood pressure (OR=1.680; 95% confidence interval 1.250 to 2.003, $p<0.001$) than those who did not. Furthermore, those who achieved a reduction in body mass were significantly more likely to achieve a reduction in blood pressure (OR=1.292; 95% confidence interval 1.008 to 1.641, $p<0.05$).

No differences in health outcomes were reported between those referred for different medical conditions, although it should be noted that being overweight or obese was not stated as a reason for referral. This study identified significant differences between some socio-demographic categories, but it did not identify actual levels of BMI or blood pressure reduction achieved in each category.

This means that it is not possible to identify whether reductions were significant compared to baseline measures, limiting the value of results.

These limited studies have indicated that participation in ERS may lead to significant positive changes in physiological health outcomes. There is little evidence to show that these changes are significantly different to a control group however. The small number of studies and the different time points where measures were taken means that there is still a need to gain a better understanding of how completion of ERS is associated with health outcomes.

2.4.3 Evidence for engagement and adherence

Although some beneficial effects of participation have been identified in the previous two sections, overall effectiveness of ERS is influenced by the number of those who are referred that start (uptake) and of those, the number that continue to attend until a defined end-point (adherence) (Pavey *et al.*, 2012). Therefore in addition to understanding whether ERS results in changes in levels of physical activity or health outcomes for those who adhere, it is also necessary to understand how many of those referred start and of those that do, how many adhere.

In a systematic review of ERS uptake, which included studies from other countries, Pavey *et al.* (2012) reported a pooled level of uptake of 81% (95% confidence interval 68% to 94%) for RCTs compared to 66% (95% confidence interval 57% to 75%) for evaluation studies. Of the RCT studies included in this literature review, Isaacs *et al.* (2007) reported the highest uptake (92%) and

Stevens *et al.* (1998) the lowest (35%). Methods of recruitment varied from face-to-face to letters. Letters were reported to be far less effective and this may account for the lower uptake reported by Stevens *et al.* (1998). Of the evaluation studies Harrison, McNair and Dugdill (2005) reported the highest uptake (79%), which compared to a concurrent RCT uptake of 84% (Harrison, Roberts & Elton, 2005), and Sowden *et al.* (2008) the lowest (58%). Reasons for differences in uptake between RCT and evaluation studies are unclear, but it is possible that in an RCT initial recruitment by referrers is more rigorous than in real life practice (Harrison, Roberts & Elton, 2005).

Uptake has been defined as either attendance at an initial appointment (Lord & Green, 1995; Stevens *et al.*, 1998; Taylor, Doust & Webborn, 1998; Dugdill, Graham & McNair, 2005; Harrison, McNair & Dugdill, 2005; Isaacs *et al.*, 2007; Sowden *et al.*, 2008; Murphy *et al.*, 2012) or having attended at least one session (Gidlow *et al.*, 2007; James *et al.*, 2008). It is not clear whether this meant attendance at an exercise session or a one-one-consultation. In addition to a difference in classifying uptake, the pre-attendance process differed in these two studies, where referrals were filtered for suitability between referral from primary care and leisure provider (Johnston *et al.*, 2005). Those who were excluded via this initial filter (16% of referrals) were not included in uptake figures. This makes a direct comparison to other studies difficult.

Some of the studies attempted to consider whether demographic factors influenced uptake (Lord & Green, 1995; Dugdill, Graham & McNair, 2005; Harrison, McNair & Dugdill, 2005; Gidlow *et al.*, 2007; Isaacs *et al.*, 2007;

Sowden *et al.*, 2008; Moore *et al.*, 2013). Results are equivocal. Increasing age was reported to be positively associated with uptake by Dugdill, Graham and McNair (2005), Gidlow *et al.* (2007) and Sowden *et al.* (2008), but no association was reported by Lord and Green (1995), Isaacs *et al.* (2007) or Moore *et al.* (2013). Lord and Green (1995) and Sowden *et al.* (2008) reported that females were more likely to take up referral than males, while Harrison, McNair and Dugdill (2005), Gidlow *et al.*, (2007), and Moore *et al.* (2013) reported no significant association between gender and uptake. Gidlow *et al.* (2007), reported that uptake was lower for participants who were referred from areas of greater deprivation than for those from areas of greater affluence. Moore *et al.* (2013), also reported those in moderately deprived areas were less likely to start than those in the least deprived areas and that car ownership positively predicted uptake. In contrast, Harrison, McNair and Dugdill (2005) and Sowden *et al.* (2008) reported no association between uptake and levels of deprivation.

Although some studies also reported on uptake in terms of reason for referral, due to considerable variation in scheme criteria, it is very difficult to draw any meaningful conclusions about whether referrals with a particular pre-existing diagnosis are more likely to result in uptake to ERS. Harrison, McNair and Dugdill (2005) reported that those with mental health problems were more likely to attend than those with no reason for referral; while James *et al.* (2008) reported that those referred for mental health problems, musculoskeletal problems and overweight/obesity were less likely to participate than those

referred for cardiovascular problems. In contrast, Sowden *et al.* (2008) reported that those referred for musculoskeletal problems were more likely to participate.

Reasons for the differences in findings have not been explored, but it is possible there may be differences in the way in which referrals were recruited or the way that schemes were structured that might offer some explanation. It has been suggested that by combining quantitative profiling with qualitative research it should be possible to move beyond describing patterns of uptake to an explanation (Pavey *et al.*, 2012). There is therefore a need to ensure that high quality data collection of both demographic and attendance data is combined with qualitative research informed by quantitative findings.

The other element of assessing effectiveness of ERS that has been most examined is adherence. In a systematic review of levels and predictors of uptake and adherence, which included studies from other countries, Pavey *et al.* (2012) identified a pooled adherence of 43% (95% confidence interval 32% to 54%) for RCTs and 49% (95% confidence interval 40% to 59%) for observational studies. Four RCTs (Taylor, Doust & Webborn, 1998; Harrison, Roberts & Elton, 2005; Isaacs *et al.*, 2007; Murphy *et al.*, 2012) and 10 evaluation studies have been identified that have analysed adherence (Lord & Green, 1995; Martin & Woolf-May, 1999; Dugdill, Graham & McNair, 2005; Edmunds, Ntoumanis & Duda, 2007; Gidlow *et al.*, 2007; James *et al.*, 2008; Morton, Biddle & Beauchamp, 2008; Sowden *et al.*, 2008; James *et al.*, 2009; Tobi *et al.*, 2012). Again two of these (Gidlow *et al.*, 2007; James *et al.*, 2008) considered the same dataset. A study by Moore *et al.* (2013), considered

predictors of adherence from the Welsh RCT as part of a mixed methods evaluation. Some studies, such as Dugdill, Graham and McNair (2005) and Sowden *et al.* (2008) defined adherence as those who attended a final consultation after 12-14 weeks; while other studies (Gidlow *et al.*, 2007; James *et al.*, 2008; 2009; Tobi *et al.*, 2012) classed adherence as attendance at 80% of sessions and attendance at a final consultation, but without defining a number of target sessions as discussed in section 2.4.1. Time frames considered ranged from 12-26 weeks, making comparisons difficult.

In the RCTs adherence ranged from 28% (Taylor, Doust & Webborn, 1998) to 51% (Murphy *et al.*, 2012). This was slightly lower than the evaluation studies, where adherence ranged from 31% (Lord & Green, 1995) to 57% (James *et al.*, 2009) with the exception of Martin and Woolf-May (1999). These authors reported the lowest adherence; either 6% (n=60) of the total number of referrals (n=884), or 12% of those for whom there were recorded telephone numbers (n=490). The study was a qualitative evaluation of an ERS however, and the reporting of adherence was incidental. It does suggest that there was very poor recording of referral data at this particular ERS, although it should also be noted that the study is dated and may not reflect current practice. The slightly higher range of adherence reported in evaluation studies has not been explained, but it is possible that in RCTs more rigorous criteria have been used to assess this aspect. For example, Isaacs *et al.* (2007) used a combination of hand-held diaries and registers from sessions, in addition to attendance at assessments to report levels of adherence.

Most studies that examined predictors of adherence reported a significant positive association with increasing age (Lord & Green, 1995; Dugdill, Graham & McNair, 2005; Gidlow *et al.*, 2007; James *et al.*, 2008; Sowden *et al.*, 2008; James *et al.*, 2009; Moore *et al.*, 2013) although Isaacs *et al.* (2007) reported no significant association. Given the mainly positive association, ERS appears to be more successful for those who are older. Apart from age there was no clear consensus about whether other demographic factors predict adherence. Some studies reported that males were more likely to adhere than females, (Dugdill, Graham & McNair, 2005; Gidlow *et al.*, 2007); while others reported no significant association between gender and adherence (Sowden *et al.*, 2008; James *et al.*, 2009; Tobi *et al.*, 2012). Levels of deprivation (Gidlow *et al.*, 2007; Sowden *et al.*, 2008), rurality, referrer and leisure provider (Gidlow *et al.*, 2007), and occupation (James *et al.*, 2009) were not reported to be significant predictors of adherence.

As with uptake, there has been little attempt to explain differences in findings. Since increasing age has been found to be the one area of agreement between studies, there is a need to understand why this is the case. Similar to uptake it is unlikely that this understanding can be provided by quantitative methods alone, therefore there is a need to combine these with qualitative methods to enhance knowledge (Pavey *et al.*, 2012). As highlighted in the recent NICE guidance (National Institute for Health and Care Excellence, 2014a) other factors such as scheme design, content and delivery, referral mechanisms, choice of activity, and cost may also play an important part in influencing both

uptake and adherence. It is possible that these factors may be influenced by demographics, for example cost may be a barrier for those who live in areas of higher deprivation. The Welsh RCT (Murphy *et al.*, 2012) attempted to examine a wider perspective by including a series of sibling studies (Moore, Moore & Murphy, 2011a; Moore *et al.*, 2013; Din *et al.*, 2014; Littlecott *et al.*, 2014) and Mills *et al.* (2012) added a qualitative element to the study by James *et al.* (2009). The results of these are discussed in the next section. As suggested by Teddlie and Tashakkori (2013), the addition of qualitative components to an initial quantitative numerical analysis can help to make greater sense of numerical findings by adding the 'how' or 'why a programme succeeded or failed', to 'did the programme work'? Given that only two schemes appear to have been evaluated in this way, there is a need for additional programmes of research that take this type of approach in order to better understand ERS.

2.4.4 What circumstances influence uptake and adherence?

A focus only on outcome evaluation can limit understanding as it is not always easy to define the elements of a complex intervention such as ERS that are effective (Craig *et al.*, 2008). Given this, there is a need to understand both how such schemes have been implemented and how participants' interactions facilitate behaviour change (Moore *et al.*, 2013). There is therefore a need to examine what is known about the circumstances under which ERS may facilitate or discourage physical activity participation.

Uptake is considered to be a key outcome measure for ERS but, given that approximately one-third of referrals never attend, there is a need to better

understand what factors influence decisions about whether to participate (Pavey *et al.*, 2012). In addition to attempts to examine demographic predictors, an in-depth understanding of participants' ERS journey including the referral process is required in order to improve uptake (Din *et al.*, 2014). One element of this is whether referrals are appropriate in the first instance. In an attempt to explore this, Johnston *et al.* (2005) studied an ERS that applied a filter before referrals reached the provider. The authors identified that 16% of referrals were inappropriate. Of these, 45% were classified as being 'not ready to exercise' in that they either did not respond to contact from the scheme or told the scheme that they were undecided about whether to take part in exercise; 16% reported already being active; 9% cited a psychosocial reason such as being too busy with family, moving house etc.; and a further 29% were excluded for medical reasons. Based on these findings Johnston *et al.* (2005) argued that there was justification to implement a filtering system after referral but prior to providers receiving participant details. This suggestion does not appear to have been widely implemented as more recent studies do not describe such a mechanism. The influence of poor referral practice on the potential success of ERS has been highlighted by NICE (National Institute for Health and Care Excellence, 2014a), and as such is worthy of further investigation.

One way in which understanding may be increased is by examining perceptions of those who refer to such schemes. Two studies have been identified that specifically explored the attitudes of health professionals to ERS (Graham, Dugdill & Cable, 2005; Din *et al.*, 2014). Both studies reported that while health

professionals described physical activity promotion in general as important, there were concerns about expertise, lack of time, and its priority as health promotion activity. Views of ERS itself were mixed. Some were positive, describing ERS as a holistic intervention with social benefits, but others expressed concerns regarding lack of evidence, and the potential worsening of inequalities (Din *et al.*, 2014). Barriers to referral included geographic isolation, lack of knowledge about selection criteria (Din *et al.*, 2014), medico-legal implications, and a lack of feedback about participants (Graham, Dugdill & Cable, 2005; Din *et al.*, 2014). While these studies are helpful in highlighting some potential issues that may lead to improvements in ERS process and uptake, they did not explore participant perspectives of the referral process.

Din *et al.* (2014), reported that some health professionals felt that they were merely acting as gatekeepers for those who knew about the scheme and asked to be referred. In a sibling study, Moore, Moore and Murphy (2011a) also reported that, in the view of fitness professionals, those who sought referral were more likely to adhere than those who were advised to attend.

Unfortunately there was no objective reporting in either study about what percentage of referrals accessed the scheme by actively seeking referral or via opportunistic advice from a health professional, or indeed whether there were other pathways to referral. Furthermore there was no reporting about actual uptake or adherence in either group, or any detail about how participants found out about the scheme in order to seek referral. More detail is therefore required in order to better inform recruitment strategies for the future.

In a qualitative study involving 116 referrals to three ERS and a pulmonary rehabilitation scheme, Pentecost and Taket (2011) conducted semi-structured interviews with 31 non-attenders, 45 low attenders, and 40 high attenders. Factors negatively associated with uptake included exercise identity due to a lack of active role models and concerns about being less capable than others based on perceived differences in age, gender, or ethnicity. In contrast the perceived importance of changing an uncomfortable social or psychological situation and perceptions about the availability of support to change had a positive influence on uptake. The study used framework analysis (Ritchie *et al.*, 2013) and appears to be the most comprehensive study of participant perceptions of factors influencing uptake to date. The study recommended that ERS could increase uptake by demonstrating that people of similar age, gender, ethnicity, and ability already attended services. The study did not explore pathways to referral, however, and so does not provide an understanding of how participants came to be referred.

A number of ERS studies have been identified that examined facilitators and barriers of adherence (Lord & Green, 1995; Singh, 1997; Taylor, Doust & Webborn, 1998; Martin & Woolf-May, 1999; Tai *et al.*, 1999; Carroll, Ali & Azam, 2002; Stathi, McKenna & Fox, 2004; Wormald & Ingle, 2004; Crone, Smith & Gough, 2005; Dugdill & Graham, 2005; Moore, Moore & Murphy, 2011a; Pentecost & Taket, 2011; Mills *et al.*, 2012). Reported facilitators to adherence were professional, supportive staff; improvements in mental or physical health and social support from other participants (Singh, 1997; Taylor, Doust &

Webborn, 1998; Martin & Woolf-May, 1999; Stathi, McKenna & Fox, 2004; Wormald & Ingle, 2004; Pentecost & Taket, 2011; Mills *et al.*, 2012) and encouragement/support from family, peers or friends (Pentecost & Taket, 2011). Barriers to adherence were reported to have included inconvenient operating hours, intimidating exercise environment, insufficient staffing, and narrow range of activities available (Taylor, Doust & Webborn, 1998; Wormald & Ingle, 2004; Dugdill & Graham, 2005), lack of money (Tai *et al.*, 1999), poor organisation (Lord & Green, 1995), transport, illness and time (Martin & Woolf-May, 1999) and feeling different to others who attend/not fitting in (Pentecost & Taket, 2011). In an evidence synthesis that specifically examined ERS provision for south Asian Muslim women, Carroll, Ali and Azam (2002) reported that access to facilities, cost, childcare, cultural codes of conduct and language were particular barriers to adherence for this group.

Williams *et al.*, (2007) criticised the poor quality of many of these studies in a systematic review of the effectiveness of ERS to promote physical activity in adults. Criticism was focused on the superficial nature of both questions and analyses. For example, although an intimidating gym environment was identified as a potential barrier to attendance by Wormald and Ingle (2004), and Dugdill and Graham (2005) neither study explored why participants felt uncomfortable or what changes could be made to improve their experience. In addition these studies, with the exception of Pentecost and Taket (2011), involved participants who were already participating in, and mainly adhering to, ERS. This means that results were potentially positively-biased towards such

schemes. Future studies that examine the views of those who have dropped out, or declined to attend at all, would be valuable in discovering the limitations of such schemes.

In a recent systematic review of participant barriers and facilitators to ERS, Morgan *et al.* (2016) included studies from unpublished PhD theses but not the largest study of barriers and facilitators identified during the literature review in the present thesis (Pentecost & Taket, 2011). In addition to the barriers identified by published studies, the review also identified complex equipment, poor quality facilities, and loud music in the gym as negative influences on attendance. Additional facilitators included good public transport links, accessible location, and in contradiction to it being a barrier from some, loud music in the gym. These additional facilitators and barriers tended to be linked to the physical environment of ERS and changing some of them may be difficult. Studies were assessed against the NICE criteria for quality (National Institute for Health & Clinical Excellence, 2012), with only two fulfilling most or all of the criteria on the checklist (Tai *et al.*, 1999; Carroll, Ali & Azam, 2002). This is in agreement with the earlier criticisms of quality by Williams *et al.* (2007) and indicates that there is still a need for high quality, rigorous studies to examine barriers and facilitators to ERS.

In summary there are a growing number of studies that have taken a mixed methods or qualitative approach to examining barriers and facilitators to uptake and adherence to ERS. Many of these studies are based on mainly successful participants and fail to explore wider implementation issues such as why

referrals choose not to participate in the first instance. Results have indicated that both the environment and psychosocial factors influenced participation. Although it may be beyond the scope of an ERS to change the exercise environment, it is possible to provide support for psychosocial factors. In order to understand how this might be achieved, it is necessary to consider how behaviour change might be supported.

2.4.5 Behaviour change theories in exercise on referral

As discussed in chapter two, participation in physical activity is affected by many diverse factors. The use of psychological theories (Bandura, 1977; Prochaska & DiClemente, 1983; Deci & Ryan, 1985; Azjen, 1991) is one potential method of encouraging behaviour change. Bauman *et al.* (2002) have speculated that existing theories fail to address sufficient factors associated with physical activity behaviour and therefore do not provide an adequate basis for understanding such behaviour or guiding intervention design. It has been suggested that poor fidelity of implementation and inappropriate intervention design are potential contributory factors to the lack of success in using behaviour change theories to address physical inactivity (Rhodes & Pfaeffli, 2010). Bauman *et al.* (2002) speculated that physical activity behaviour is too complex to be encompassed by a single theory and that understanding may be best served by continuing to apply existing theories, supplemented by creative thinking to evaluate influencing variables that are outside current theories.

In an attempt to address such complexity within health behaviour change interventions, Michie, van Stralen and West (2011) have proposed a behaviour

change wheel model to be used in guiding intervention design. This has three essential elements at its hub; capability, opportunity and motivation. These are surrounded by nine intervention functions; persuasion, incentivisation, coercion, training, enablement, modelling, environmental restructuring, restrictions and education, which are aimed at addressing deficits in one of the three essential elements to allow behaviour to change. Finally, there is an outer wheel of categories of policy that could allow intervention functions to occur. This includes guidelines, regulation, fiscal measures, communication and marketing, and service provision (Michie, van Stralen & West, 2011).

To date, there is little evidence of how effective such an approach might be in planning successful physical activity interventions; however the model has begun to be used to guide planning. For example, Webb, Foster and Poulter (2016) have used it to design an educational intervention to encourage nurses to deliver very brief physical activity advice to cancer patients. The effectiveness of the planned intervention is not yet known, but the coding of behaviour change techniques within the intervention using the Behaviour Change Technique Taxonomy (v1) (Michie, Atkins & West, 2014) should aid evaluation and allow for future replicability (Webb, Foster & Poulter, 2016). Such evaluations will also allow for an assessment of effectiveness of the behaviour change in helping intervention planning.

The complexity of behaviour change theories is demonstrated in a recent comprehensive systematic review. Kwasnicka *et al.* (2016) identified five overarching themes influencing ongoing participation in an activity: maintenance

motives, self-regulation, resources, habits and contextual influences. These authors suggested that an individual needs at least one sustained motivator to maintain behaviour and that behaviour change attempts are most likely to be started at times when motivation is high and opportunity costs are low. At different times motivation and costs may vary, so that at some times there is more need for self-regulatory effort to maintain the behaviour than at others. Over time, and with repeated effort, conscious self-regulation decreases and behaviour becomes habitual, increasing the chance that it will be maintained. Whatever stage of behaviour adoption, however, the environmental and social context can facilitate or hinder behaviour change maintenance (Kwasnicka *et al.*, 2016). This would suggest that even the best designed behaviour change intervention, delivered perfectly all of the time, will still not work for everyone.

Despite these limitations, the National Quality Assurance Framework (Department of Health, 2001) recommended that schemes should employ an accepted model of behaviour change, as did the updated NICE guidance (National Institute for Health and Care Excellence, 2014a). Due to a lack of clarity about if and how behaviour change techniques have been applied within ERS, it is unclear which ones would be most effective in this setting (Beck *et al.*, 2016). Only one study has been identified that has described the development of ERS based on a specific model (Duda *et al.*, 2014). The scheme studied was based on SDT (Deci & Ryan, 1985; 2000).

SDT (Deci & Ryan, 1985; 2000) focuses on the social-environmental conditions that enhance or diminish self-motivation leading to the long-term adoption of a

particular behaviour, or otherwise. It distinguishes between intrinsic motivation where an activity is undertaken because of its inherent satisfaction and extrinsic motivation where an activity is undertaken for instrumental reasons, or to obtain a separate outcome. Extrinsic motivation can be split into controlled forms. The first are those with externally administered reward/punishment. Second are more autonomous forms, when an activity is not inherently fun or satisfying but is of personal value; for example being physically active because of a desire to improve physical appearance. In SDT, these different forms of motivation are conceptualized as lying along a continuum from completely intrinsic to extrinsic. The theory hypothesises that the more intrinsic the motivation, the more likely that any resultant behaviour will be maintained.

Within this theory the concept of basic psychological needs is central to understanding motivation, specifically autonomy, competence and relatedness - perceptions of personal connections with others. Need fulfilment is closely associated with important others taking the perspective of the person trying to change a behaviour, supporting their choices, minimizing pressure, creating an empathetic and positive environment, and limiting negative feedback while providing appropriately challenging tasks (Deci & Ryan, 2000).

There is consistent support for a positive relationship between more autonomous forms of motivation and exercise behaviour, along with good evidence for the value of SDT in understanding and promoting exercise (Edmunds, Ntoumanis & Duda, 2006; Brickell & Chatzisarantis, 2007; Fortier *et al.*, 2007; Silva *et al.*, 2010). It is unclear, however, which sub-type of

autonomous motivation is more important in explaining and promoting such behaviour (Teixeira *et al.*, 2012). These authors suggested that health interventions should seek to maximise experiential rewards such as social interaction, skills development, and enjoyment in order to promote long-term adherence; concentrate on providing sufficient structure and optimal challenge to promote competence; and encourage active exploration of reasons to be physically active beyond the most common motives such as improved body shape and attractiveness. In the case of ERS, Markland and Tobin (2010) have argued that since referral by a health professional is essentially externally motivated, such schemes need to foster internal motivation. This may have particular relevance to practice if, as suggested by Moore, Moore and Murphy (2011a), those who asked to be referred were more likely to adhere. If internal motivation can be fostered in those who are opportunistically referred, this may help to redress such a balance, if it exists.

Although the RCT by Duda *et al.* (2014) reported that participation in both a SDT-based ERS and standard ERS resulted in increases in physical activity, there were no between group differences. This would indicate that in this case a SDT-based intervention was not more effective in increasing physical activity than a standard ERS. Duda *et al.* (2014), however, commented on the difficulties in implementing a theoretically-based behaviour change ERS model. Issues with staff training and commitment to the behaviour change model were suggested as implementation barriers. In a validation sub-study, Rouse *et al.* (2016), reported that overall need support was higher in the consultations of the

SDT-based scheme, but the specific provision of autonomy support was not. Duda *et al.* (2014) speculated that either members of staff delivering the standard scheme were naturally working in an autonomy supportive manner, or that the training offered to the SDT staff was not sufficient to alter this dimension of the consultation experience.

Similar implementation issues were reported by Moore, Moore and Murphy (2011b). The Welsh RCT (Murphy *et al.*, 2012) was not based on an explicit theory of behaviour change, but the intervention was said to reflect causal assumptions about how change is produced (Littlecott *et al.*, 2014). Members of staff delivering this intervention undertook a two-day training course in motivational interviewing (Miller, 2002) but an examination of implementation reported poor fidelity to techniques (Moore, Moore & Murphy, 2011b). These authors commented on not only the amount of further training and support that would be required to deliver motivational interviewing properly, but also on perceptions that the amount of data collection required during one-to-one assessments made implementation difficult. The two RCTs (Murphy *et al.*, 2012; Duda *et al.*, 2014) highlight some of the difficulties of trying to implement theoretically-based models within pre-existing delivery. It could be argued that these issues are amplified where evaluation does not result in additional resource for either training or extra delivery time that may be required to implement such models. If these problems were reported in a nationally implemented RCT, it is probable that researchers working with deliverers to provide evaluations of current practice would find similar issues.

Only one study (Beck *et al.*, 2016) has been identified that attempted to assess how behaviour change techniques were implemented in an existing ERS. The CALO-RE taxonomy (Michie *et al.*, 2011) and The Behaviour Change Counselling Index (Lane *et al.*, 2005) were used to assess the implementation and consistency of behaviour change techniques in initial consultations of an established ERS in south west England (Beck *et al.*, 2016). These were compared with effective techniques for promoting physical activity as identified in the literature. Six members of staff were observed undertaking 22 consultations. Results indicated that although advisors had the capability to provide a client-centred service, they did not do so consistently. Median (IQR) protocol implementation completeness was 63.6% (35.6% to 74.6%). The most implemented behaviour change techniques were 'providing information about where and when to perform the behaviour' (86%) and 'setting outcome goals' (82%). Other techniques such as self-monitoring were infrequently observed. Goals tended to be outcome rather than behaviour focused (Beck *et al.*, 2016). This study was limited in that it drew from the evidence base identified in systematic reviews and only included a few members of staff. It does however provide a good example of a pragmatic evaluation conducted on a small budget; a realistic way to inform practice in the current climate of austerity. The study resulted in a redrafting of the ERS protocol with the inclusion of evidence based techniques and an agreement to further staff training.

The difficulties of implementing behaviour change techniques in ERS do not negate the value of such theories in attempting to better understand what

elements of interventions support behaviour change. As with Beck *et al.* (2016), there are other studies that have used elements of behaviour change theory to examine ERS (Jones *et al.*, 2005; Edmunds, Ntoumanis & Duda, 2007; Isaacs *et al.*, 2007; Morton, Biddle & Beauchamp, 2008; Markland & Tobin, 2010; Littlecott *et al.*, 2014) and suggest potential improvements to practice. The majority of studies highlighted above (Edmunds, Ntoumanis & Duda, 2007; Morton, Biddle & Beauchamp, 2008; Markland & Tobin, 2010; Littlecott *et al.*, 2014) examined ERS in relation to SDT (Deci & Ryan, 1985; 2000). The study by Markland and Tobin (2010) was an assessment of: psychological need support provided by exercise practitioners; satisfaction of the psychological needs for autonomy, competence and relatedness; and the internalization of behavioural regulation for 133 females who had taken part in ERS in the previous year. The mean (SD) age of participants was 54.5 (12.9) years, with a self-reported mean (SD) BMI of 28.3 (5.9) kg/m². Results indicated that when need support promoted autonomy and social assimilation, individuals were less amotivated and less externally regulated. In terms of ERS practice the authors recommended that, in addition to promoting autonomy and competence, participants required help to assimilate into the social environment of exercise facilities, as well as more direct interpersonal support. The study measured physical activity via a modified version of the GLTEQ (Godin & Shepard, 1985) but an assumption was made that activity had increased as no baseline comparator was available. Level of physical activity was significantly associated with autonomy, competence, social assimilation, identified regulation ($p < 0.01$) and intrinsic regulation ($p < 0.05$). Although this study is limited in that it was

retrospective and only included female completers in the sample, findings provided support for the theoretical concepts of SDT within ERS.

Littlecott *et al.* (2014) also provided support for the use of SDT as a framework for ERS. In a secondary study of the Welsh RCT (Murphy *et al.*, 2012), Littlecott *et al.* reported improvements in autonomous motivation and social support from family and friends after six months ($p < 0.05$). Changes in autonomous motivation partially mediated change in 12-month physical activity, explaining 44% of the total intervention effect on physical activity. However, there was no evidence of socio-demographic patterning in changes in autonomous motivation (Littlecott *et al.*, 2014). Since differences in adherence between socio-demographic groups were reported elsewhere (Murphy *et al.*, 2012), these must have resulted from processes not considered in the study. The study was limited in that it did not include baseline measures and was reliant on response to a postal questionnaire, which received a greater response from completers. The effect may therefore be overestimated as those whose motivation did not change may have dropped out and not responded. The study was part of a pragmatic RCT however, meaning that results have good generalisability.

Two studies (Edmunds, Ntoumanis & Duda, 2007; Morton, Biddle & Beauchamp, 2008) examined whether the level of self-determination at entry to ERS was associated with adherence. Results were contradictory. Morton, Biddle and Beauchamp (2008) reported that those who had adhered had significantly higher self-determination at baseline, while Edmunds, Ntoumanis and Duda (2007) reported no association between baseline self-determination

measures and adherence. There were differences in the interventions that may explain the difference in findings. In the study by Edmunds, Ntoumanis and Duda (2007) participants received an initial consultation and an exercise induction session. The authors reported that they received little other support and that perceived autonomy support, commitment and behavioural intention decreased over the course of the 3-month scheme period. In comparison, Morton, Biddle and Beauchamp (2008) studied the 6 week effect of a scheme that included an initial consultation, allowed participants to choose what activity to undertake and also whether they wanted to exercise individually or in a group environment. Sessions took place twice a week and there was a peer-mentor component that allowed new referrals to 'partner up' with someone who had successfully completed the programme. Thus the scheme employed multiple strategies consistent with the theoretical tenets of SDT (Deci & Ryan, 1985; 2000), whereas the scheme studied by Edmunds, Ntoumanis and Duda (2007) did not. Edmunds, Ntoumanis and Duda (2007) suggested that if the scheme implemented more strategies based in SDT results might improve, while Morton, Biddle and Beauchamp (2008) identified the need to explore the exact effect of each of the strategies employed by the scheme studied.

In addition there were differences in study populations that might also explain the difference in findings. The study by Edmunds, Ntoumanis and Duda (2007) specifically targeted those who were overweight/obese [mean (SD) BMI 38.75 (7.25) kg/m²] and the mean (SD) age of participants was 44.98 (14.61) years. In comparison, the participants in the study by Morton, Biddle and Beauchamp

(2008) had a mean (SD) age of 51 (15) years and reason for referral was not differentiated. Given that increasing age is thought to be a predictor of adherence, factors other than self-determination may have been more influential in determining adherence in the study by Edmunds, Ntoumanis and Duda (2007). Both studies reported that for those who adhered to ERS, self-determination significantly increased from baseline to 12 weeks.

SDT (Deci & Ryan, 1985; 2000) is not the only behaviour change theory that has been examined in relation to ERS. Two studies (Jones *et al.*, 2005; Isaacs *et al.*, 2007) have been identified that have considered the Transtheoretical Model (TTM) (Prochaska & DiClemente, 1983). Initial research for the TTM (Prochaska & DiClemente, 1983) was centred around smoking cessation and addictive behaviour but has since been applied to a broad range of health promotion behaviours including physical activity (Prochaska & Marcus, 1994). The TTM consists of four major constructs; stages of change, processes of change, self-efficacy and decisional balance. The core concept is stages of change and the model theorises a cyclical sequence including: pre-contemplation, those with no intention of becoming physically active; contemplation; those thinking about starting to become physically active within the next six months; preparation, those making small changes in behaviour but still not meeting a criterion for physical activity; action, those meeting a criterion of physical activity, but only recently usually within the last six months; and maintenance, those meeting a criterion for physical activity for 6 months or longer.

Each stage is supported by processes of change including consciousness-raising, dramatic relief, environmental re-evaluation, self re-evaluation, social liberation, self-liberation, reinforcement management, helping relationships, counter conditioning, and stimulus control. Links between process of change and stage of change are shown in diagrammatic format below:

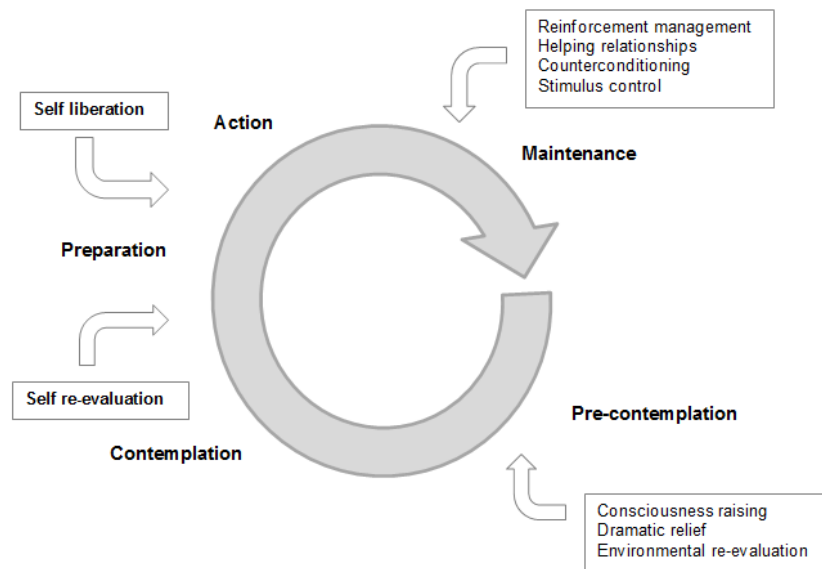


Figure 2-1 *The Transtheoretical model of behaviour change*
(Adams & White, 2003, pp107)

A questionnaire was developed specifically to assess stage of change for physical activity behaviour (Marcus *et al.*, 1992). The questionnaire is designed to categorise respondents into one of the five stages of change; pre-contemplation - those not intending to exercise or start to exercise in the next six months; contemplation - non-exercisers intending to start in the next six months; preparation - those doing some exercise, but not regularly (defined as three times per week for 20 minutes or longer); action - those exercising

regularly, but for less than six months; and maintenance - those exercising regularly for six months or longer. In its short form it consists of four questions. The reliability of the physical activity stages of change instrument has been demonstrated by Marcus *et al.* (1992), with concurrent validity demonstrated via significant association with the Seven Day Recall Physical Activity Questionnaire (Marcus & Simkin, 1993). A criticism of the questionnaire is that it has been mainly validated against self-report rather than direct measures of physical activity, however Hellsten *et al.* (2008) extended the validation evidence to clinical, minority and senior samples not against only self-reported physical activity, exercise, and sedentary behaviour, but also against pedometers and physical functioning.

The construct of self-efficacy used within TTM has been defined as:

'Beliefs in one's capabilities to organise and execute the course of action required to produce given levels of attainment'(Bandura, 1977, pp 193)

Perceived self-efficacy has been reported to be an important factor in forming intentions to undertake physical activity and maintaining it over a period of time (Shaw, Dzewaltowski & McElroy, 1992; Dishman *et al.*, 2004). According to Bandura (2004), self-efficacy, a core concept of Social Cognitive Theory (Bandura, 1977; 1986) can be increased by positive past performance accomplishments; succeeding in attainable, yet challenging behaviour change goals; seeing the same behaviour performed by relatable peers; social persuasion from others such as friends, family and health care practitioners, particularly if they are seen as being knowledgeable; and by maintaining an optimal level of physiological intensity, for example, excited but not too anxious.

Despite the popularity of the TTM as a theoretical framework in developing physical activity interventions, its effectiveness in changing long-term physical activity behaviour has been questioned (Adams & White, 2003; Bully *et al.*, 2015). It has been suggested that this may be because many interventions do not use validated algorithms for determining the critical component of stage of change; because of the complexity of physical activity behaviour in comparison to a single behaviour such as smoking; because physical activity behaviour is influenced by external factors, such as age, gender and socioeconomic status that are not considered within the model; because stage progression is not always associated with behaviour change; and because addressing all five stages of change is highly complex and may require more complex or multiple interventions (Adams & White, 2005). In addition, Bridle *et al.* (2005) criticised a lack of specificity within the TTM about how to overcome the barriers to stage progression, but identified that the poor quality of intervention designs in addressing only stages of change rather than all other components of the model (processes of change, decisional balance, and self-efficacy) may explain a lack of effect.

In a systematic review of physical activity behaviour change based on the use of TTM, Hutchison, Breckon and Johnston (2009) reported that only seven studies out of 24 used all four components of the TTM, with six of these showing evidence of short-term physical activity behaviour change and one showing evidence of both short and long-term physical behaviour change. This compared to 12 (71%) of the other 17 interventions showing a short-term effect,

and one showing both short and long-term effects (Hutchison, Breckon & Johnston, 2009). These broadly similar results would indicate that even without using all elements of the model, use of the TTM in planning interventions can lead to short, but not long, term physical activity behaviour change. There was no indication of whether any component of the model was more effective than another. Due to the lack of evidence about the efficacy of TTM based interventions, future research should ensure that it tests all dimensions of the model and consider applying fidelity measures.

In the ERS RCT by Isaacs *et al.* (2007), mean stage of change for ERS and walking group participants significantly increased at 10 weeks and six months compared to baseline levels ($p < 0.05$). Both groups had a significantly higher mean stage of change at 10 weeks and six months than an advice-only control group ($p < 0.05$). After one year both groups retained a significant improvement in mean stage of change compared with baseline. The trial reported no significant differences among the treatment groups, or change over the period of the trial, for self-efficacy or decisional balance. These constructs were not correlated with, or predictive of, either stage of change or barriers-to-exercise (Isaacs *et al.*, 2007). These authors suggested that being offered tangible opportunities to exercise might be more important than offering psychosocial support in terms of changing physical activity behaviour.

Only one other study Jones *et al.* (2005) has been identified that examined ERS in relation to TTM (Prochaska & DiClemente, 1983). Stages of change measures were only taken at the point of entry to the scheme, when 21% were

classified as being in pre-contemplation, 48% in contemplation, 19% in preparation, 1% in action, and 11% in maintenance. Neither baseline stages of change or self-efficacy predicted adherence. The study reported that those who did not adhere to ERS had higher expectations of change, while those who adhered had lower levels of expectation and achieved a level of change near to expectations. This study was limited in that it struggled to obtain follow-up data for those who dropped out, limiting knowledge about this group. Results give rise to implications for delivery however, indicating that ERS should ensure participants are well prepared for what might be achieved as a result of taking part. This issue needs to be addressed both at the point of referral and during the initial consultation in order to promote adherence.

In summary, there are a growing number of studies ERS (Jones *et al.*, 2005; Edmunds, Ntoumanis & Duda, 2007; Isaacs *et al.*, 2007; Morton, Biddle & Beauchamp, 2008; Markland & Tobin, 2010; Moore, Moore & Murphy, 2011b; Duda *et al.*, 2014; Littlecott *et al.*, 2014) that have examined how behaviour change theories are relevant to ERS practice. Despite reported difficulties in implementing behaviour change techniques within ERS (Markland & Tobin, 2010; Moore, Moore & Murphy, 2011b; Duda *et al.*, 2014) there is improving knowledge as to how such theories might support delivery (Markland & Tobin, 2010; Littlecott *et al.*, 2014). While theories may make a valuable contribution to the planning of interventions that attempt to change behaviour, social and environmental factors will still have an effect on the likelihood of success (Kwasnicka *et al.*, 2016). In the case of ERS this means that even if behaviour

change techniques are fully implemented, schemes will still not work for everyone. What is needed is a better understanding of what behaviour change techniques will improve ERS delivery for which sub-groups of the population.

2.5 Summary; the evidence gap

While much is known about the benefits of physical activity to health, levels of the UK population that are active enough to enjoy this benefit is low (Health and Social Care Information Centre, 2015; Sport England, 2016). This is despite 20 years of government policy that has attempted to increase population levels of physical activity (Department of Health, 1996; Department for Culture Media and Sport, 2002; 2008; 2015). Systematic deficiencies in the monitoring and evaluation of interventions have been identified as contributing factors in a failure to identify what works to increase physical activity (Public Health England, 2014c).

Specific to ERS there have been criticisms of the evidence base in terms of sparse use of RCTs and failure to establish causality (Oliver *et al.*, 2016). To date ERS RCTs have shown a limited effect (Pavey *et al.*, 2011; Campbell *et al.*, 2015) and there is a need to better understand what works, and for whom, within these interventions (National Institute for Health and Care Excellence, 2014a). It has been argued that it is inappropriate to use only RCTs to evaluate complex community interventions (Craig *et al.*, 2008) and in any case, for ERS it is no longer viable due to the established nature of such schemes (Sowden & Raine, 2008). Based on the evidence reviewed in this chapter I would argue that there is a need for robust evaluations of existing schemes in order to better

understand the effect of ERS within sub-groups of the referral population, along with what factors influence uptake of and adherence to such schemes in these groups. It is likely that this will best be achieved via the use of mixed methods. Learning must be used to pilot improved interventions that are targeted at those for whom they are likely to be the most successful. Other interventions should be developed and tested for those for whom ERS is not suitable. Further RCTs examining ERS in its current form are not likely to provide evidence of benefit different to those already published. Instead new RCTs should be delayed until there is a better understanding of what works, for whom and in what circumstances.

3 Methodological approach

3.1 Introduction

This chapter maps my journey of discovery about how to best understand the performance of the Northumberland ERS and explains what decisions were made about methodological approach and why. The studies in this PhD thesis were firmly grounded in evaluation research; that is the systematic application of research methods to assess the effectiveness and outcomes of the intervention, with the intent of generating new knowledge (Secret, Abell & Berlin, 2011). It began after a discussion between commissioners and providers about the need to better understand the effect of the Northumberland ERS following the publication of the 2006 NICE guidelines stating that ERS should only be commissioned as part of a research study (National Institute for Health and Clinical Excellence, 2006). Commissioners wanted to know whether the scheme was effective in changing physical activity behaviour and if so, for whom? Pawson and Tilley (1994) argued that evaluation research cannot rely on quasi-experimental methods, which may fail to add knowledge in terms of practical developments for an intervention. Instead they argued that such research must consider whether the conditions of a programme are right to enable participants to succeed if they choose to engage. Rather than asking does it work, this programme of evaluation research therefore attempted to answer the question, *what works, for whom, and in what circumstances?*

I approached this PhD as a new researcher but with 15 years of ERS experience, first as a practitioner and latterly as a strategic manager in a local authority environment. In the final stages of writing up this thesis I left my employment and completed it in an 'academic only' context. My understanding of the practicalities of the scheme was far greater than a researcher approaching this area from a purely academic standpoint. Having been involved in the Northumberland scheme since 1995 my experience spanned almost the entire existence of not only this ERS, but of UK ERS in general. This related not only to delivery but also to shaping the format of the scheme, securing ongoing funding and defining the evaluation process. I had followed the evidence/policy debate (Sowden & Raine, 2008) with interest and been proactive in suggesting to commissioners that robust evaluation was possible in Northumberland. I was open to the fact that a programme of evaluation research might show that the scheme was lacking in effect and I understood that the end result might be that it was decommissioned. Anecdotally I thought it likely that the scheme would be found to work better for certain groups and that delivery would become more targeted. Since I strongly believed that practice should be evidence-based, I accepted that if it did not work it should not be commissioned.

Perhaps because of my practical background, my initial instinct was to take a pragmatic (Dewey, 1928) approach to the programme of evaluation research. As discussed by James (1907) in Goodman (1995) the pragmatic method involves:

'The attitude of looking away from the first things, principles, "categories," supposed necessities; and of looking towards the last things, fruits, consequences, facts' James (1907) in Goodman (1995, pp 57)

In the case of the present PhD this included looking at the existing evidence, asking what relevant questions would increase understanding, and seeking the most appropriate way to answer these. Through my practical experience I knew that the influences on ERS were likely to be very complex. Many years of dealing with referrals had taught me that individual participants could react to the same intervention in very different ways depending on their reasons for attending and barriers to being active. In addition to this, the delivery of the scheme itself was likely to be influential in a participant's decision about engagement. Over the years I had noticed that where staff seemed to follow procedure retention was higher and also that the attitudes/personalities of staff seemed to influence success. As the strategic manager of the ERS I was in the fortunate position of being able to determine data collection in partnership with commissioners and ensure that an agreed approach was implemented. Also, there was the potential to make changes to scheme delivery if results showed that this was required.

Initial discussions with commissioners identified the potential to use data that already existed within the scheme but was not being collated or analysed as a starting point to gain a better understanding. I wanted the findings of this initial study to inform the direction for future studies. For instance, from basic monitoring I was aware that there were a substantial number of referrals who never attended, and that approximately half of those who started did not adhere

to the scheme. What I did not know was the detail of who was more likely to start or adhere. A large amount of data was available to the scheme via referral forms, physical activity questionnaires, consultation processes, and attendance recording. Collating and analysing these data seemed like a logical starting point. This approach would examine whether referral to the Northumberland ERS resulted in engagement with the scheme and whether it changed physical activity levels/physiological indicators of health for those who participated. It would also explore whether the scheme was more likely to result in success for any identifiable groups, for example females.

Although analysing these data would give an insight into the Northumberland ERS I felt that this approach would be too simplistic to gain a rich and deep understanding of the scheme. This was because after working with a large number of referrals over many years, anecdotally I was often able to predict adherence after discussions with participants at the initial consultation. Other scheme staff shared this view. Sometimes though, these predictions were spectacularly wrong. This indicated that what was happening at the individual level was important. I had no idea whether or how this related to the potential to use demographic data to predict likelihood of uptake or adherence; in fact I had not considered this. From a practical viewpoint, however, it seemed logical to me that understanding individual influences would involve exploring the views of the participants. This somewhat fragmented knowledge provided the context in which I began reading about the evidence for ERS and the different academic approaches to research and evaluation. It was with great interest that I

discovered that there were divided opinions about the mixing of philosophical approaches and methods of research.

3.2 Mixed methods approach

Mixed methods research has evolved over several decades of discussion around methods and paradigms in behavioural and social sciences. It has been described as the third methodological movement and offers a pragmatic approach to using qualitative and quantitative methods in conjunction with each other (Teddlie & Tashakkori, 2013). Differences between quantitative and qualitative approaches can be simplistically described as quantitative research involving deductive testing of theory, with a positivist epistemology and an objectivist ontological approach; while qualitative research involves inductive generation of theory, with an interpretivist epistemology and a constructionist ontological approach (Bryman, 2004). Researchers have questioned whether it was possible to work with competing discourses when each took a contradictory view about reality (Guba, 1989). This has been termed the 'incompatibility thesis' (Howe, 1988) and the resulting 'paradigm wars' have been the subject of much debate over several decades. Among this confusion Teddlie and Tashakkori (2012) presented the case for paradigm pluralism, which rejected the one-to-one linkages described earlier. In doing so, they created a case that a variety of paradigms may serve as an underlying philosophy for using a mixed methods approach. This fitted well with my own pragmatic view about the need to use the most appropriate methodology to answer the questions that arose from the evaluation as it progressed. This section examines the mixed methods

approach and describes how it was applied to this evaluation research programme.

Mixed methods have been defined as

'the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collections, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration.' (Johnson, Onwuegbuzie & Turner, 2007, pp 123)

A further definition by Greene (2007) is that mixed methods research

'actively invites us to participate in dialogue about multiple ways of seeing and hearing, multiple ways of making sense of the social world, and multiple standpoints on what is important and to be valued and cherished.' (Greene, 2007, pp 20)

Creswell (2013) discussed options within mixed methods for the researcher to collect and analyse both qualitative and quantitative research either concurrently or sequentially by building one on to the other in a way that gave priority to both. Since this approach involved selecting the best techniques available to answer research questions that may evolve as a study unfolded, it rejected the incompatibility of methods thesis that such paradigms cannot be mixed due to supposedly fundamental differences underlying these methods. For example, an initial quantitative study reflecting a positivist leaning might be replaced with a shift to a constructionist paradigm in a second qualitative phase. In evaluation research there are numerous examples of initial quantitative-only projects having a follow-on qualitative component in order to make greater sense of numerical findings; adding the *how or why did a programme succeed*

or fail? to did the programme work? (Teddlie & Tashakkori, 2013). In this PhD, the initial quantitative approach examined whether referral to the Northumberland ERS resulted in engagement with the scheme, and if so whether it changed physical activity levels/physiological indicators of health for those who participated. It also explored whether the scheme was more likely to result in success for any identifiable groups. This was then followed by a qualitative component that explored what other factors in addition to demographics influenced the chances of success or failure in engaging with the Northumberland ERS.

One of the challenges involved in this methodological eclecticism, which Teddlie and Tashakkori (2012) identified as a core concept of mixed methods research, is the researcher having sufficient skill in each method to produce meaningful results. Critics are sceptical that researchers sufficiently develop skills to perform both types of research adequately (Denzin, 2008) believing that this would result in 'qualitatively light' research. Teddlie and Tashakkori (2012) argued that mixed methods researchers must be competent in the full spectrum of research methods and select the most relevant to answering their research questions. In contrast Bliss (2008) argued that adopting a team approach to developing and analysing research at least at the point of question generation and inference would help ensure competency. Such an approach could allow for a sharing of research expertise from both quantitative and qualitative fields to ensure high quality is achieved in both areas. In this programme of study, supervision involved researchers from both a quantitative and qualitative

background. Having started with predominantly quantitative experience, supervision by a researcher with a qualitative background proved invaluable in developing my qualitative research skills.

Having identified that a mixed methods approach would provide a suitable way of exploring many aspects of the Northumberland ERS, the evaluation programme adopted a sequential mixed design (Teddlie & Tashakkori, 2009). The mixing of designs occurred across the chronological phases of the evaluation research programme. Issues identified in the initial study were used to build research questions for the second study and so forth, choosing the methodological approach considered to be the most suitable at that point.

Initially a quantitative approach was chosen to examine scheme uptake, adherence, physical activity behaviour change, stage of change and changes in physiological health indicators. While informative, the results did not adequately explain who the scheme worked for, or why. A qualitative study was therefore planned that would encompass two sets of interviews, one prior to participation and one after participation. An approach following the principles of Grounded Theory (Glaser & Strauss, 1967) was adopted due the exploratory nature of the planned study. During analysis, it became apparent that the rich data justified two differing approaches to present information about initial referral and experience. In keeping my pragmatic approach to the thesis as a whole, a pragmatic approach to method choice was also adopted. This resulted in an eclectic design where study three evolved from study two through the additional use of narrative methods. A flow diagram explaining the interaction between the

studies is shown overleaf (Figure 3-1). The following sections describe first how the quantitative approach was developed and then how the results of this influenced the development of the qualitative approach for the second and third studies.

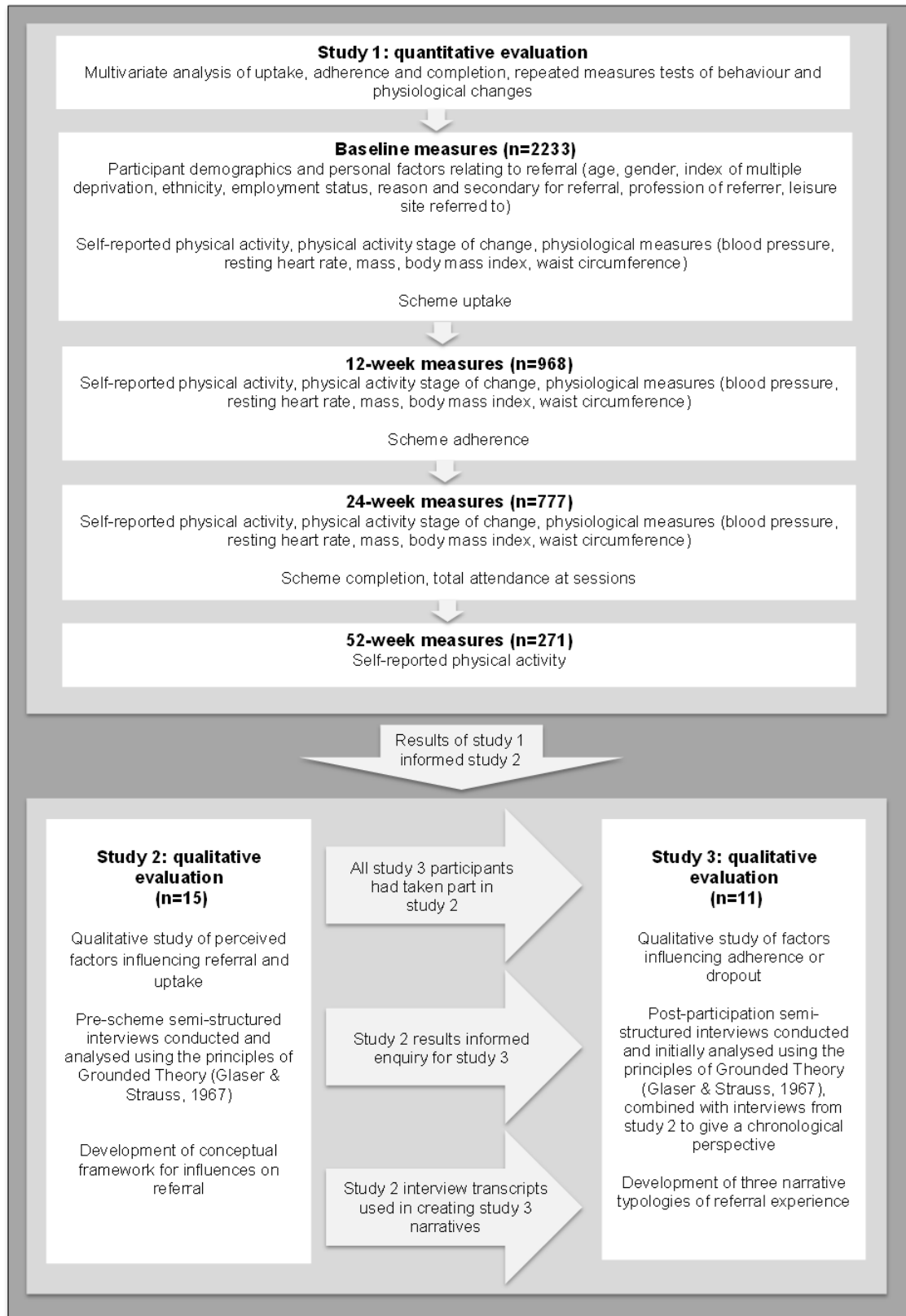


Figure 3-1 Flow diagram of studies in thesis

3.3 The development of quantitative methodology

Health research has predominantly followed a positivist model in both biomedical and social scientific research, incorporating approaches including RCTs, cross sectional studies and cohort studies (Saks & Allsop, 2012). The positivist approach seeks to explain human behaviour through the gathering of value-free, tangible facts that are used to generate and test theories. Exercise on referral evaluation and research has been predominantly positivist in nature. RCTs and evaluation studies have mainly considered quantitative data with a focus on initial uptake, adherence, and difference in physical activity levels as a result of participation (Lord & Green, 1995; Harrison, McNair & Dugdill, 2005; 2005; Gidlow *et al.*, 2007; James *et al.*, 2008; Sowden *et al.*, 2008; Murphy *et al.*, 2012; Tobi *et al.*, 2012). These studies have largely ignored the social aspects that may influence participation; having mostly sought to answer the question *do ERS work?* and to some extent *who do they work for?* There has been less focus on attempting to answer the question *why do they work?* Given that systematic reviews (Gidlow *et al.*, 2005; Morgan, 2005; Williams *et al.*, 2007; Pavey *et al.*, 2011; Pavey *et al.*, 2012; Campbell *et al.*, 2015) have questioned the effectiveness of ERS, a methodological approach that included an attempt to answer these questions was required in order to establish whether the Northumberland ERS was effective and acceptable.

Positivism has been criticised for not considering the experiences of the individual (Blaxter, 2010). The experimental approach favoured by positivists has also been criticised for not recognising that restricting the population and/or

treatment to achieve internal validity, as in a RCT, may lead to a reduction in external validity in complex social settings (Howe, 2004). The merits of RCTs versus evaluation studies for ERS have been previously discussed in chapter two, section 2.3 and this thesis does not include an RCT. Despite acknowledgement of Blaxter's (2010) criticism, the fact that the Northumberland ERS was pre-existing meant that an initial positivist evaluation approach was a pragmatic option.

The Northumberland ERS was a 24-week programme that consisted of a referral from primary care via a referral form, an initial, 12-week and 24-week consultation, and a programme of structured exercise sessions (Appendix 1). The scheme process is described in detail in chapter four, section 4.2.1. At the beginning of this programme of evaluation research it was agreed that quantitative data collection points would be on receipt of referral form, at the point of initial consultation, 12, 24, and 52 weeks after the initial consultation. Physiological measurements; mass (kg), stature (m), BMI (kg/m^2), and blood pressure (mmHg) were already recorded during initial, 12 and 24-week consultations. In addition to these data it was agreed that attendance at supervised scheme sessions would be reported and validated questionnaires for self-reported physical activity and stages of change were introduced during consultations. Physical activity questionnaires would also be administered via post to scheme completers at 52 weeks. The selection of physical activity questionnaire and stages of change questionnaire was based on recommendations from *A Tool Kit for the Design, Implementation & Evaluation*

of Exercise Referral Schemes (British Heart Foundation National Centre for Physical Activity and Health, 2010). The physical activity questionnaire used has been discussed in chapter 2, section 2.4.1 and the stage of change questionnaire in chapter 2, section 2.4.5.

Data collected would enable an examination of uptake, adherence at 12-weeks and completion at 24 weeks, attendance, changes in physiological indicators of health, self-reported changes in physical activity, and stage of change. It would also allow for an assessment of change in self-reported physical activity 52 weeks after starting the scheme. A Microsoft Access database for data collation was created by the leisure providers and stored on secure servers. Two administrators were responsible for data entry. The scheme provided an anonymised annual data download for the duration of the PhD.

It can be seen from the description in chapter four, section 4.2.1 that there was a clear and well documented process for the Northumberland ERS. Data collection was designed to be an integral part of ongoing scheme delivery. This meant that continued analysis would be possible and the future effect of any changes to delivery could be examined. High level involvement in the management of the scheme by the researcher ensured that staff collected data as required. Analysis of data collected over the 15 months after establishment of the database formed the basis of the first study of this thesis, allowing for an insight into how well the scheme worked and who it was more successful in engaging with.

Results of this study highlighted levels of uptake, 12-week adherence, 24-week completion, physiological changes, changes in self-reported physical activity, and stages of change. It also examined whether it was possible to use the data collected via the referral form to predict uptake, adherence and completion.

Results from this study raised the question *why are some referrals more likely to engage/continue to engage than others?* An in-depth answer to this question could not be gained using quantitative methodology and so a different approach was required.

3.4 The development of qualitative methodology

Not all ERS research has taken a positivist approach. There has been some attempt to explore social/individual influences on participation within ERS research via a number of studies that have included an interpretivist approach (Lord & Green, 1995; Singh, 1997; Taylor, Doust & Webborn, 1998; Martin & Woolf-May, 1999; Stathi, McKenna & Fox, 2004; Wormald & Ingle, 2004; Dugdill & Graham, 2005; Pentecost & Taket, 2011). These studies attempted to gain a better understanding of which elements of ERS encourage uptake, adherence, and change in physical activity behaviour. In contrast to positivism, interpretivism emphasises the meaningful nature of people's participation in social and cultural life (Seale, 2012). This approach subscribes to the view that the subject matter of the social world is fundamentally different to that of the natural sciences and so requires a different logic of research procedure with an emphasis on understanding, rather than explaining human behaviour (Bryman,

2004). For ERS this requires an exploration of participant experience in order to better understand the elements that produce success.

Critics of interpretivism have questioned the quality, trustworthiness, and authenticity of findings (Miles & Huberman, 1994) due to a dependence on the insight and conceptual capabilities of the analyst, potential research bias, and lack of generalisability of results (Patton, 2002). Proponents, however, have argued that social science operates in a constantly shifting environment, therefore the idea that it is possible to create a large body of truths that survive testing is in itself problematic (Howe, 2004). In fact Howe argued that a truthful generalisation may become fallible as a result of the dissemination of the research findings themselves, which change practice and therefore the social environment. In the case of ERS, for example, gaining a better understanding of which elements positively or negatively influence participation could lead to a change in scheme process. For instance if participants suggested that referrers seemed to lack awareness of the scheme, as reported by Wormald and Ingle (2004), then work might be done with referrers to raise the profile of the scheme. This change in practice may mean that the initial findings are no longer valid. The need to ensure referrers have a good awareness of the scheme would remain however.

Given the question *why are some referrals more likely to engage/continue to engage than others?* an approach that would allow for an in-depth investigation of participant experience was required to provide insight. As such a qualitative approach would enable the evaluation research programme:

'to get at the inner experience of participants, to determine how meanings are formed through and in culture, and to discover rather than test variables'
(Corbin & Strauss, 2008, pp12)

This needed to allow consideration of the perspectives of those taking part, increase understanding of why participants chose to engage, and explore their in-depth experiences of participation rather than making assumptions. I envisaged that there would be a need for two chronological stages of enquiry to answer the question raised above; one examining what affected referrals' decisions about whether to engage in the first instance and a second exploring participant experiences of the Northumberland ERS once they had engaged. The superficial nature of existing qualitative ERS literature meant that the chosen methodology needed to be exploratory in nature and develop, rather than test, established theory. This resulted in an approach using the principles of Grounded Theory (Glaser & Strauss, 1967) being adopted with semi-structured interviews being used as the data collection method. The development of the semi-structured interview guides is discussed in detail in chapter five, section 5.2.2.

Grounded Theory is a specific methodology developed by Glaser and Strauss (1967) in order to build theory from data. In contrast to quantitative methods of research where the data are derived from the theory or testing of a hypothesis, Grounded Theory involves generating, developing and processing concepts using a process that builds over time with the acquisition of data (Corbin & Strauss, 2008). Originally developed as a way of allowing health professionals to understand how to care for dying patients more effectively (Glaser & Strauss,

1965), the methodology involves four stages of constant comparison: comparing incidents and data that are applicable in the same category; integrating these categories and their properties; bounding the theory; and setting out the theory (Glaser & Strauss, 1967). In this context, theory denotes

'a set of well-developed categories that are systematically interrelated through statements of relationship so that they form a theoretical framework explaining some phenomenon' (Hage, 1972, pp 34)

The cohesiveness of the theory explains *'the what, how, where, when, and why of something'* (Corbin & Strauss, 2008, pp 55). In the present PhD, this methodological approach was used to develop a conceptual framework to explain factors affecting whether participants were likely or unlikely to initially engage with the Northumberland ERS. This was used to create recommendations as to how future practice might change to increase engagement. It was also used to gain an initial understanding of participant experience after referral.

Qualitative data collection in this thesis took place at two time points. The first, study two, was after referral but prior to commencing the Northumberland ERS and the second, study three, was three to five months after the initial interview. This chronological approach was chosen to allow for the development of a better understanding about influences on both initial and continued engagement with the ERS. At the initial time point direction of data collection was influenced by emerging theory in a process called theoretical sampling; *'a method of data collection based on concepts/themes derived from the data'* (Corbin & Strauss, 2008, pp143). In theoretical sampling data collection is followed by analysis,

followed by further data collection and analysis to create a simultaneous process. It is not fulfilled by sampling to address the initial research question, reflect population distributions, find negative cases, or until no new data emerges. Instead it is about sampling to explore emergent categories (Charmaz, 2014).

In study two of this thesis geographical and recruitment practicalities limited the opportunity to carry out theoretical sampling in its purest sense, although later recruitment was based on the development of theoretical categories. Corbin and Strauss (2008) acknowledged such issues but suggested that differences in data often emerge naturally due to variations in situations providing ample opportunity to sample theoretically based on emergent concepts. In study three, the participant population was defined by those who took part in study two since it was chronological. Grounded Theory (Glaser & Strauss, 1967) techniques were still used in the analyses of data, with developing theoretical categories being explored as interviews progressed.

Within Grounded Theory (Glaser & Strauss, 1967) there are two distinct approaches to analysing data. These developed because of the differing views of Glaser and Strauss in interpreting the relationship between data and theory via the concepts of '*emergence*' and '*theoretical sensitivity*'. Initially, Glaser and Strauss (1967) suggested that a general method of comparative analysis should allow categories to emerge from the data, at the same time as suggesting that researchers should reflect on data with the help of theoretical terms. Later Glaser (1978) attempted to clarify the concept of 'theoretical sensitivity' by

identifying two different types of coding; 'substantive coding' and 'theoretical coding'. Strauss (1987), in contrast, attempted to simplify the process of coding data by using a 'coding paradigm' consisting of 'conditions', 'interactions among the actors', 'strategies and tactics', and 'consequences'.

Kelle (2005) suggested that researchers with limited experience could use the concept of the 'coding paradigm' in the application of Grounded Theory methodology without the risk of 'drowning in the data'. For this reason the approach to analysis using the principles of Grounded Theory undertaken in this thesis is based on the methods suggested by Corbin and Strauss (2008), who emphasised that the coding paradigm should be used as a tool, rather than a set of directives, allowing the researcher to obtain a better understanding of the circumstances that surround an event, thereby enriching analysis.

Corbin and Strauss (2008) identified the two main strategies for analysis in this method as asking questions and making comparisons. Initial sensitising questions look at what the data might indicate is happening, issues, problems, meanings to, and actions of, actors involved. Theoretical questions help the researcher see process and variation, and make connections between concepts. Practical questions provide direction for theoretical sampling and help the development of theory structure. Finally guiding questions inform subsequent interviews. Constant comparisons between incidents identify similarities and differences, differentiate categories/themes, and identify properties and dimensions specific to each. Theoretical comparisons between incidents within the data and experiences or examples from the literature, assist

in definition and understanding of phenomenon. The practical application of these strategies is discussed in detail in chapter five, section 5.3.

In summary, qualitative methodology was considered to be the most suitable approach to answer the question '*why are some referrals more likely to engage / continue to engage than others?*' The use of Grounded Theory (Glaser & Strauss, 1967) methodological techniques described in this section were used as the research was exploratory in nature and a development of theory was required. Analyses of interviews with referrals were used to better understand context, process, actions/interactions, and consequences of the scheme from a participant perspective over the timeframe of referral and participation.

3.5 The use of narrative

Initially I intended that study three would explore experiences of participation in the Northumberland ERS and a semi-structured interview guide was developed to allow this. Participants in this study had previously participated in study two and during preparation for study three all initial interviews were re-read. This was to ensure that I was familiar with each participant, able to remind them of pre-scheme perceptions, and encourage reflection. During this process, which was undertaken in combination with initial analyses of study three interviews using a principles of Grounded Theory approach (Glaser & Strauss, 1967), it became apparent that in trying to grasp why some participants stayed while others did not, the individual context, unfolding events, and experiences over time were important. I decided that the continued use of the principles of Grounded Theory approach used in study two was not sufficient to evaluate this

complexity. It also became apparent to me that combining data from both sets of interviews would give a more in-depth understanding of participants' experiences since it introduced a greater chronological element. In keeping with my pragmatic approach of adopting the best methodology to provide the greatest possible understanding of ERS, a qualitative approach was needed that would allow for an exploration of the emerging complexity.

Narrative can be used to organise a sequence of events so that the significance of each can be understood through its relation to the whole (Elliot, 2005). It can be defined as clear sequential stories connecting events in a meaningful way. Such stories have an identified audience and offer an insight into the world and/or people's experience of it (Hinchman & Hinchman, 2001). The use of narrative facilitates empathy from the reader as it attempts to understand the meaning of behaviour and experiences from the perspective of the individuals involved (Elliot, 2005). Narrative has previously been used in an attempt to better understand health behaviours such as smoking (Moffat & Johnson, 2001), drinking alcohol (Tutenges & Rod, 2009), and physical activity (Carless & Sparkes, 2008; Buman, Daphna & Giacobbi, 2010). As such I considered that it would be an appropriate methodology to attempt to better understand participant experiences of ERS.

By combining data from both sets of interviews conducted during the programme of evaluation research in this PhD, it was possible to create participant stories that illustrated how context and personal experience affected the likelihood of engagement, and continued participation, with both ERS and in

physical activity. This stylistic change was an attempt to impart experiences in a way that allowed the reader to empathise with participants and draw their own interpretations. This decision was made in order to go beyond analysis of actions and facts by selecting a writing strategy that evoked experiential feeling as part of the analysis and evidence as suggested by Charmaz (2014).

The similarities between Grounded Theory and narrative studies are identified by Lieblich, Tuval-Mashiach and Zilber (1998) in that there are usually no prior hypotheses, and direction/theory emerges from reading collected material. Although the use of narrative as an explicit methodology in social sciences has been criticised for being more of an art than research (Lieblich, Tuval-Mashiach & Zilber, 1998), its popularity as a method developed during the 1980s (Elliot, 2005). In order to present the stories of participants in study three elements of narrative methodology were used to give an added perspective to analysis. A holistic-form-based mode of structure analysis (Lieblich, Tuval-Mashiach & Zilber, 1998) was used to focus on the plot of the narratives and understand personal constructions of participants' evolving experience. As discussed in Lieblich, Tuval-Mashiach and Zilber (1998) consideration was given to the narrative typology. Stories were grouped into narrative types in study three but minimal interpretation was applied to the actual telling of the stories. The practical details of this are described in chapter six, section 6.3. The creation of narrative typologies made it possible to suggest strategies that might improve engagement with groups of participants that had broadly similar experiences with regards to either participation or progression in ERS. This classification

was different to the initial study in that it was based on the social and environmental factors affecting participation.

In summary, in keeping with evaluation research, a variety of methodologies were selected as the thesis progressed to best answer the questions raised. This included both quantitative and qualitative elements. Since the thesis was based in the evaluation of practice, quantitative data collection was integrated into normal scheme delivery while qualitative analysis attempted to understand the experience of the participants.

3.6 Evaluating the methodology

The chosen methodology attempted to give the greatest understanding of the Northumberland ERS possible within existing budget and time restraints. Although systematic reviews consider RCT evidence to be the 'gold standard' approach as discussed in chapter two, section 2.3, this was not considered viable or desirable in this programme of evaluation research. There were several reasons for this. To date ERS RCTs have shown limited effect in changing long-term physical activity behaviour (Pavey *et al.*, 2011; Campbell *et al.*, 2015). Although anecdotally I considered that the Northumberland ERS was a well-structured example of such schemes, there was no reason to suppose that an RCT would produce substantially different results to those already published. I believed that there was a real possibility that if more RCTs were undertaken without more understanding of how to better target ERS, then future NICE guidance would recommend their decommissioning due to a lack of evidence. In order to guide future delivery, this thesis has therefore attempted to

examine who the scheme was more likely to be successful for and what particular elements influenced that success or failure. In doing this it has provided insight into how providers of ERS might change delivery mechanisms to improve effectiveness. It is hoped that this learning can be used in future RCTs that test different or more targeted models of ERS.

More pragmatic issues were also influential in directing methodology. As previously stated there was no budget identified to allow for an RCT to be implemented even had it been considered desirable. In addition the fact that the scheme was already well-established meant that both commissioners and providers felt that it would be difficult to convince primary care professionals to continue to refer when not all referrals would receive the intervention. Also an observational approach was considered to provide a higher level of external validity since it examined the real life ERS with minimal intervention from researchers. Although this study did not provide a control comparison, it did examine elements that were considered in the extant literature to be valid measures of success in ERS; uptake, adherence, change in physical activity behaviour, and change in physiological markers of health.

The clearly defined scheme process meant that definitions of uptake, adherence, completion, and attendance were consistent giving stability to these measures. The outcomes of self-reported physical activity and stage of change were measured using validated questionnaires that were reported to have acceptable internal reliability as discussed in detail in chapter two, sections 2.4.1 and 2.4.5. Although it would have been more accurate to use an objective

measure of physical activity such as accelerometers, as discussed in section 1.7 this was not considered viable due to cost, training, and the large number of participants in the study.

The development of a database for collation of data gave confidence in consistency and allowed for the large scale of data collection. The approach of making anonymised data available to commissioners to analyse was suggested in the latest NICE guidelines for exercise on referral (National Institute for Health and Care Excellence, 2014) giving credence to the methodology developed in this study. As the strategic manager of the ERS studied I was involved in the management of the scheme. This meant that I could ensure that quantitative data collection was consistently implemented and the same process followed across all leisure sites. The use of statistical techniques to analyse data ensured a lack of bias in reported findings.

In my role as both a manager and researcher undertaking qualitative research, potential bias was much more of an issue. In order to ensure that the research was credible, the expert knowledge that I brought to the research was situated within the context of extensive reading so that it built upon existing literature. This was combined with a clear articulation of how established methodology from Grounded Theory (Glaser & Strauss, 1967) was followed and the use of data extracts from transcriptions to support claims. Although there was the possibility that my existing knowledge would create bias due to preconceived ideas about what results might be, it can be argued that it is almost impossible to approach most research with a totally value-free approach. In an attempt to

mitigate this I kept a reflective diary after each interview that paid particular attention to potential bias created by my existing knowledge. In addition, issues were raised in supervisory meetings and through the sharing of interview transcripts with my qualitative supervisor. This allowed me to be reflexive in assessing what I knew, how I knew it, and what has shaped my perspective. Overall I considered that my prior knowledge added to the quality of the two qualitative studies rather than detracted from it.

Perhaps the defining strength of this programme of evaluation research is that it was allowed to develop to answer the most relevant questions that arose from the results of each study. This was regardless of challenges in adopting different methodological approaches. This allowed commissioners and providers to gain the best possible understanding of the scheme within the potential scope of the thesis.

4 The Northumberland exercise on referral scheme; who comes, who stays, and does it make a difference?

4.1 Introduction

Regular physical activity is associated with a wide range of health benefits (Jeon *et al.*, 2007; Nocon *et al.*, 2008; Harriss *et al.*, 2009; Mammen & Faulkner, 2013; Schottenfeld *et al.*, 2013). However 33% of men and 45% of women in England are not sufficiently active to benefit their health (Health and Social Care Information Centre, 2013). Exercise on referral schemes, initially established during the 1990s, are a popular method of promoting physical activity within primary care (Fox *et al.*, 1997). Such schemes generally consist of a referral by a primary care health professional to a third party, usually a leisure facility, followed by a series of consultations with an exercise specialist, and a programme of supervised physical activity over a 10-week to 12-week period (Department of Health, 2001). This short-term nature has been criticised however since such schemes are attempting to change long-term behaviour (Pavey *et al.*, 2011). Behaviour change theories such as TTM (Prochaska & DiClemente, 1983; Prochaska & Marcus, 1994) suggest that it takes six months to establish a habit. This being the case, there is a need to examine the effect of schemes that are approximately six months in duration. A validated method of measuring how established a behaviour is, for example, the Stages of Change Questionnaire (Prochaska & Marcus, 1994) would improve understanding of not only whether positive behaviour change was occurring but also how much further support may be required at the end of such schemes.

There is uncertainty about the effectiveness of ERS in promoting medium to long-term physical activity behaviour change as assessed via systematic reviews (Pavey *et al.*, 2011; Campbell *et al.*, 2015). It can be argued, however, that systematic review methodology fails to facilitate an understanding of the complexity of ERS, explain why it may work, or explore unintended but positive health outcomes (Dugdill, Graham & McNair, 2005). Indeed the use of RCT evidence as the primary way to assess effects of complex interventions has been criticised due to a failure to recognise individual and social influences, limiting a broader understanding of what works, for whom, and in what circumstances (Pawson *et al.*, 2005). In any case, it has been argued that evaluation of ERS by RCTs is not realistic given the number of established schemes in the UK (Sowden & Raine, 2008). Gidlow *et al.* (2005) highlighted the implications of potential differences between RCTs and 'real life' delivery limiting transferability of results. These authors suggested that more energy should be put into high quality applied research with existing schemes. In order to understand how and why such interventions work, however, it is first necessary to understand who they are successful in engaging with and whether this results in physical activity behaviour change.

A limited number of studies have been identified that have attempted to do this by using quantitative methods to examine routinely collected data from established schemes in England (Lord & Green, 1995; Dugdill, Graham & McNair, 2005; Harrison, McNair & Dugdill, 2005; Gidlow *et al.*, 2007; James *et al.*, 2008; Sowden *et al.*, 2008; James *et al.*, 2009; Tobi *et al.*, 2012). These

studies have examined how many of those who were referred initially participated in the scheme, defined as uptake (Dugdill, Graham & McNair, 2005; Harrison, McNair & Dugdill, 2005; Gidlow *et al.*, 2007; Sowden *et al.*, 2008) and for how long individuals engaged with the scheme, defined as adherence (Lord & Green, 1995; Dugdill, Graham & McNair, 2005; Gidlow *et al.*, 2007; James *et al.*, 2008; Sowden *et al.*, 2008; James *et al.*, 2009; Tobi *et al.*, 2012). Levels of uptake were reported to be between 58% and 79% and adherence, between 34% and 57%. Moreover, a systematic review (Pavey *et al.*, 2012) reported pooled uptake of 66% and pooled adherence of 49% across such studies.

In addition to analysing levels of uptake and adherence, studies have examined whether ERS is more successful for certain types of participants (Dugdill, Graham & McNair, 2005; Harrison, McNair & Dugdill, 2005; Gidlow *et al.*, 2007; James *et al.*, 2008; Sowden *et al.*, 2008; James *et al.*, 2009). There has been little consensus about the effect of factors such as age, gender, level of deprivation and reason for referral, other than increasing age being a predictor of adherence (Lord & Green, 1995; Dugdill, Graham & McNair, 2005; Gidlow *et al.*, 2007; Sowden *et al.*, 2008). Reasons for this lack of consensus in findings have not been explored, but it is possible there may be differences in the way in which referrals were recruited or the way that schemes were structured that might offer some explanation. Given this there is a need for further studies that contribute to the evidence base about who such schemes are successful in engaging with. These studies need to clearly define scheme processes, something which is lacking in the current literature.

Although the primary aim of ERS is to increase physical activity, to date there has been a lack of reporting of this variable within evaluation studies. Dugdill, Graham and McNair (2005) reported an increase in self-reported physical activity after one year compared to baseline but other studies have used attendance at consultations as a proxy measure of adherence (Lord & Green, 1995; Gidlow *et al.*, 2007; Sowden *et al.*, 2008; James *et al.*, 2009; Tobi *et al.*, 2012). Some studies that used attendance at a final consultation as a measure of adherence (Gidlow *et al.*, 2007; James *et al.*, 2009; Tobi *et al.*, 2012) have indicated participants achieved 80% of target attendance but did not define number of attendances required to achieve 'target attendance'. This is not a validated way to measure whether such schemes increase physical activity. What is needed, therefore, is examination of adherence to consultations, attendance at sessions, and a validated measure of self-reported physical activity change.

A further limitation of evaluation studies published to date is a lack of information about the effect of such schemes on physiological markers of health. The only evaluation study identified to have examined these factors (James *et al.*, 2009) reported that completion of ERS was associated with body mass reduction and reduced blood pressure; that referrals of mixed ethnicity were significantly more likely to reduce BMI than those who were white; and that those in skilled manual employment were significantly more likely to reduce blood pressure than those who were unemployed. What this study did not do was report actual levels of change in these measures. It seems counterintuitive

that schemes where referrals are made because a patient is overweight would not measure whether there was a reduction in either mass or BMI.

The initial study of this thesis was an evaluation of routinely collected data from the Northumberland ERS, a 24-week scheme that had an intended primary outcome of increasing physical activity. This study was designed to investigate:

- The effectiveness of the scheme in engaging participants to attend three one-to-one motivational consultations over a 24-week period: pre-scheme, and at 12 and 24 weeks.
- The effectiveness of the scheme in engaging participants to take part in supervised physical activity over a 24-week period.
- The effectiveness of the scheme in changing participants' self-reported physical activity behaviour over a 24-week period and whether any change was maintained after 52 weeks.
- Whether engagement in the scheme consultations was influenced by age, gender, deprivation (as measured by IMD), employment status, pre-scheme BMI, reason for referral, profession of referrer, leisure site referred to.
- The effectiveness of the scheme in changing participants' blood pressure, resting heart rate, BMI, and waist circumference over a 24-week period.
- The effect of engagement in the scheme on the TTM stage of change for physical activity (Prochaska & DiClemente, 1983; Prochaska & Marcus, 1994).

4.2 Method

4.2.1 Study design

The study was an evaluation of longitudinal data from the Northumberland ERS, which was provided by BVAL and NCL. Data were collated in a bespoke database by the two leisure trusts and a data extract containing information about referrals made between July 2009 and Sept 2010 was provided for this study. Guidance from the NHS National Research Ethics Service stated that this was considered to be service evaluation and that ethical approval was not required under NHS research governance arrangements (Appendix 2).

The Northumberland ERS was a 24-week physical activity programme for referrals from primary and secondary care to nine local authority leisure sites. Referral from health professionals was via an agreed referral form (Appendix 3). The referral form included demographic and other information about participants; age, gender, postcode, employment status, ethnicity, reason(s) for referral, and profession of referrer. Although data were collected about ethnicity it has not been included in this study as over 98% of referrals were White British, which is reflective of ethnicity in Northumberland. The scheme consisted of three one-to-one consultations; pre-scheme, after 12 weeks and 24 weeks, and twice weekly attendance at supervised physical activity sessions such as use of the gym, exercise classes and racquet sports. Prior to the development of this programme of study, some physiological data were recorded at each consultation and registers were used to record attendance at ERS physical activity sessions.

Referrals could be made to local authority leisure sites managed in the initial phase of this thesis by BVAL and NCL and latterly by Active Northumberland. Completed referral forms (Appendix 3) were sent via post to the referral co-ordinator at the leisure trust responsible for the site where the referral wished to attend the scheme. Information contained on referral forms was deemed as being acceptable to pass between NHS and non NHS organisations without contravening Caldicott Guidelines (Department of Health, 1997). Referrals were made after signed consent from the patient at the point of referral.

After receipt of the referral form, a scheme administrator contacted the participant by telephone to arrange a start date. If contact could not be made by telephone, a letter was sent to the participant asking them to contact the scheme. If no reply was received within one month of the letter being sent, the participant was classed as a non-starter. Participants were asked to attend three separate one-to-one consultations at the leisure site where they had chosen to attend the scheme; the first pre-scheme, the second after 12 weeks and the third after 24 weeks. The pre-scheme consultation consisted of an explanation of the scheme, a discussion about reason for referral, previous physical activity choices, and barriers and facilitators to being active, an assessment of readiness to change physical activity behaviour (Prochaska & Marcus, 1994), completion of a self-reported physical activity questionnaire (Godin & Shepard, 1985), and a range of physiological tests: blood pressure (mmHg), resting heart rate (bpm), mass (kg), stature (m) and waist

circumference (cm). BMI (kg/m^2) was calculated from mass and stature measures.

At the end of the consultation, participants wishing to access the scheme agreed to attend supervised exercise sessions and/or take part in independent physical activity. Participants were given guidelines as to how much activity was appropriate based on 30 minutes, 5x per week of moderate activity (Haskell *et al.*, 2007) message that was current at the time of the study. Independent activity was not monitored by the scheme unless it took place within leisure sites. Participants were not asked to record independent exercise. Participants were excluded at initial consultation if blood pressure or resting heart rate readings were above exclusion criteria levels (Table 4.1) or because they decided that having taken part in the consultation they did not wish to participate in the scheme.

The 12-week consultation was offered to all participants who were not classed as dropouts, regardless of levels of attendance at scheme sessions. It consisted of a discussion around attendance at sessions to date, any barriers encountered, assessment of stage of change for physical activity behaviour (Prochaska & Marcus, 1994) and a blood pressure (mmHg), resting heart rate (bpm), mass (kg), BMI (kg/m^2), and waist circumference (cm) check.

Participants were given feedback about any physiological changes and the same physical activity message as at the initial consultation. They were encouraged to attend two supervised scheme sessions per week for the next 12 weeks and/or take part in independent physical activity.

The 24-week consultation was offered to all participants who were not classed as dropouts, regardless of levels of attendance at scheme sessions. The consultation consisted of a discussion around attendance at sessions, barriers encountered and physical activity choices made, assessment of stage of change for physical activity behaviour (Prochaska & Marcus, 1994), and completion of the a self-reported physical activity questionnaire (Godin & Shepard, 1985). Scheme staff repeated physiological tests from the initial consultation; blood pressure (mmHg), resting heart rate (bpm), mass (kg), BMI (kg/m^2), and waist circumference (cm). As part of the consultation, participants discussed an exit route strategy. Information about other suitable sessions in the leisure centres and other local activity options were provided. After completion of this consultation, participants were no longer eligible to attend ERS sessions. Re-referral to the scheme was not possible for a period of 18 months.

Participant attendance was monitored via session registers or from the leisure site electronic front desk systems. Dated attendances were recorded on the scheme database. The database generated lists of participants who had not attended sessions for a week. Scheme staff contacted these participants by telephone to enquire whether they intended to return to sessions. If participants could not be contacted by telephone after scheme staff had left a maximum of two messages, they were sent a letter asking them to contact the scheme. If participants said that they did not wish to return or did not respond within one month, they were recorded as dropouts, with reason for dropout stated.

Where possible, the scheme was uniform across the county. There were some differences in approach dependent on the provider however. For example, attendance at consultations was free of charge, but there was a variable cost for supervised physical activity sessions (Table 4-4). The scheme was unusual in that it was longer than many other schemes that have been examined. Until 2005, it was 12 weeks in duration as suggested in the National Quality Assurance Framework (Department of Health, 2001), when a longer scheme length was implemented with the intention of better establishing physical activity behaviour, as suggested in the TTM (Prochaska & Marcus, 1994). This gave the potential for an interesting comparison with schemes of a shorter duration in terms of effect.

A schematic representation of the Northumberland ERS process is shown in Figure 4-1 overleaf.

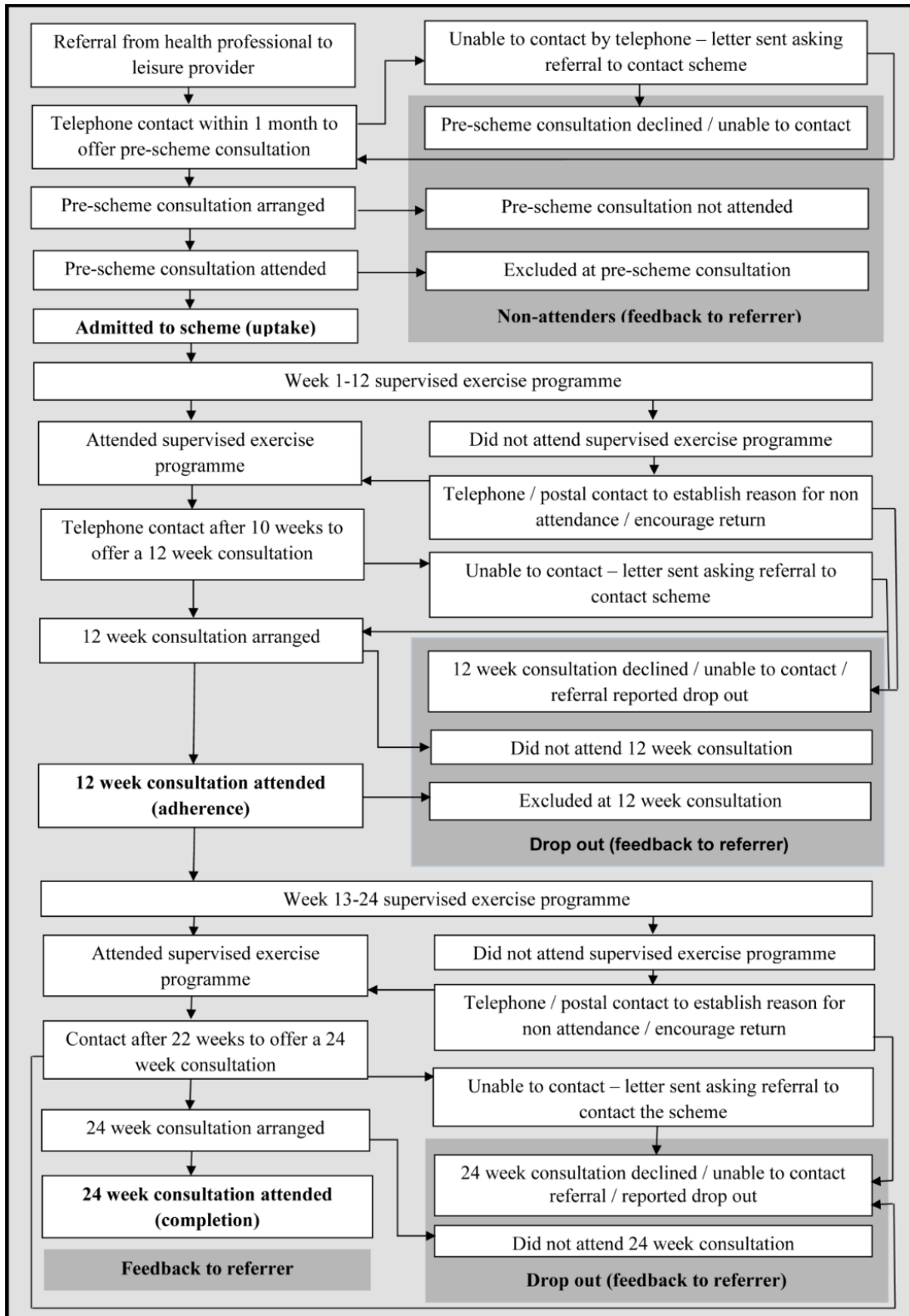


Figure 4-1 Northumberland ERS scheme process

The Northumberland ERS had established inclusion and exclusion criteria (Table 4-1). Inclusion criteria were jointly agreed by commissioners and ERS providers and were based on target groups identified by commissioners where provider staff had the knowledge and skills to deliver appropriate physical activity advice. Exclusion criteria were based on the British Association for Cardiovascular Prevention and Rehabilitation contraindications to exercise (Bohin *et al.*, 2014). Referrals were required to fulfil at least one of the inclusion criteria in order to be referred to the scheme.

Table 4-1 *Inclusion and exclusion criteria for the Northumberland ERS*

| |
|---|
| <p><i>Inclusion Criteria</i></p> <p>Cardiovascular disease (CVD) primary and secondary prevention <i>(hypertension, hypercholesterolemia, post-cardiac event or procedure and having completed phase III cardiac rehabilitation, established CVD with a clinical assessment within previous 6 months)</i></p> <p>Overweight / obesity <i>(BMI 25+ kg/m²)</i></p> <p>Mental health problems <i>(mild to moderate anxiety and depression where the referring health professional considered that group exercise would be suitable and beneficial)</i></p> <p>Metabolic / endocrine disease <i>(type two diabetes or impaired glucose tolerance)</i></p> <p>Musculoskeletal problems <i>(no definition provided)</i></p> <p>Respiratory conditions <i>(mild to moderate asthma and chronic obstructive pulmonary disease)</i></p> <p>Neurological conditions <i>(e.g. mild Parkinson's disease)</i></p> |
| <p><i>Exclusion Criteria</i></p> <p>Resting systolic blood pressure of ≥180 mmHg or diastolic blood pressure of ≥100 mmHg</p> <p>Unstable angina <i>(diagnosed within the previous month, following no established pattern, occurring at rest or with minimal exertion, not relieved by rest or oral medication taken at the onset of symptoms)</i></p> <p>Uncontrolled tachycardia <i>(resting heart rate ≥100 bpm)</i></p> <p>Uncontrolled arrhythmias <i>(no definition provided)</i></p> <p>Significant drop (≥15 mmHg) in blood pressure during exercise</p> <p>Severe anxiety and depression <i>(no definition provided)</i></p> <p>Severe neuromuscular disorders <i>(no definition provided)</i></p> <p>Unstable or acute heart failure <i>(excessive breathlessness, unexplained weight gain of more than 2 kg over a five day period, ankle oedema)</i></p> <p>Uncontrolled diabetes <i>(poorly controlled blood sugar levels)</i></p> <p>New or worsening breathlessness, palpitations, dizziness or lethargy</p> <p>Aged under 16 years</p> |

All members of staff were required to hold a minimum of a Register of Exercise Professionals recognised level three qualification. Members of staff dealing with exercise programmes for those with established cardiovascular disease were required to hold a Register of Exercise Professionals recognised level four cardiac rehabilitation instructor qualification. All staff received internal training from the scheme manager around motivational interviewing techniques for personal consultations, taking physiological measurements and use of questionnaire measurement tools. There was an established review process of delivery skills, where staff members were observed in practice by more senior members of staff.

4.2.2 Data collection

Data were collected routinely by scheme administrators and by delivery staff via paper-based standardised referral forms (Appendix 3) completed by referring health professionals, the Stages of Change Questionnaire (Marcus *et al.*, 1992) (Appendix 4), and the GLTEQ (Godin & Shepard, 1985) (Appendix 5).

Questionnaires were completed and physiological measurements were taken during scheme consultations by delivery staff. Dependent on leisure trust and venue, physiological data were either entered directly into the database or recorded on a paper-based consultation sheet (Appendix 6). Attendances at physical activity sessions were recorded via leisure centre electronic front desk systems or paper-based registers if sessions took place in a community venue. Two scheme administrators were responsible for ensuring that all paper based data and front desk system data were entered into the database. The database

was designed to identify IMD quintile from analysis of postcode using 2007 IMD data tables.

Initial data collection is shown in Table 4-2:

Table 4-2 *Quantitative data collection*

| Demographics and factors associated with referral (collated from referral forms) | Pre-scheme | 12 weeks | 24 weeks | 52 weeks |
|---|---|-----------------|-----------------|-----------------|
| Age | √ | | | |
| Gender | √ | | | |
| Postcode & index of multiple deprivation (IMD) quintile | √ | | | |
| Employment status | √ | | | |
| Profession of referrer | √ | | | |
| Primary reason for referral | √ | | | |
| Secondary reason for referral | √ | | | |
| Leisure site referred to | √ | | | |
| Behaviour (collated from attendance records and validated questionnaires) | Pre-scheme | 12 weeks | 24 weeks | 52 weeks |
| Attendance at one-to-one consultations | √ | √ | √ | |
| Self-reported physical activity (Godin Leisure Time Physical Activity Questionnaire) | √ | | √ | √ |
| Stage of change (Stage of Change Questionnaire) | √ | √ | √ | |
| Attendance at scheme sessions | Measured at each attendance via front desk system and recorded in scheme database | | | |
| Physiological measures (taken by scheme staff at one-to-one consultations) | Pre-scheme | 12 weeks | 24 weeks | 52 weeks |
| Blood pressure (mmHg) | √ | √ | √ | |
| Resting heart rate (bpm) | √ | √ | √ | |
| Waist circumference (cm) | √ | √ | √ | |
| Mass (kg) | √ | √ | √ | |
| Stature (m) | √ | | | |
| BMI (kg/m ²) | √ | √ | √ | |

The GLTEQ (Godin & Shepard, 1985) was used to assess self-reported physical activity pre-scheme, after 24 weeks, and after 52 weeks. Pre-scheme and 24-week questionnaires were completed during consultations and 52-week questionnaires were sent via post to all those who had completed a 24-week

questionnaire. Participants were asked to report the number of times they participated in light, moderate and vigorous activity for at least 15 minutes over a typical seven day period. The number of incidences of light activity was multiplied by 3.0, moderate incidences by 5.0, and vigorous incidences by 9.0, which related to METS for each activity intensity. These individual scores were then added together to give an overall Godin weekly activity score (Godin & Shepard, 1985).

4.2.3 Protocols for measurements taken during consultations

All measurements were taken during the three scheme consultations by trained scheme staff using the protocols shown in Table 4-3.

Table 4-3 *Measurements taken during consultations*

| Measure | Measurement Protocol |
|---|--|
| Godin Leisure Time Exercise Questionnaire | Staff conducting the consultation read out exact wording on questionnaire and recorded answers. |
| Stages of Change Questionnaire | Staff conducting the consultation read out exact wording on questionnaire and recorded answers. |
| Blood pressure (mmHg) and resting heart rate (bpm) | Measured using an Omron M7 arm blood pressure monitor, after participants had been seated for approximately 15 minutes and had been instructed not to talk during the measurement. |
| Waist circumference (cm) | Measured against bare skin at the point of the participants' natural waist using a fabric anthropological measuring tape. Tapes were not standardised across sites. |
| Mass (kg) | Measured using SECA 761 scales. Participants were asked to remove shoes, coat, and any bulky items from pockets. No allowance was made for clothing. |
| Stature (m) | Measured using a SECA Leicester portable stature measure. Measurements were taken without shoes. Participants were instructed to stand up tall before measurements were taken. |

| | |
|-------------------------------|--|
| BMI (kg/m²) | Calculated based on mass and stature measurements. |
|-------------------------------|--|

All physiological measurements were singular with the exception of blood pressure and resting heart rate readings, which were repeated three times at five minute intervals if the initial reading was at or above scheme exclusion criteria levels.

4.2.4 Attendance at physical activity sessions

Participants were asked to attend two supervised physical activity sessions per week if possible. They were also encouraged to take part in independent activity such as walking, cycling, or attending volunteer-led walking groups that were coordinated by the leisure providers. This was in order to promote activity levels in line with the physical activity guidelines (Haskell *et al.*, 2007). There was a cost for scheme supervised sessions. Free volunteer-led walking groups were available in all areas, but were not classed as an ERS supervised session. Type/price of activity sessions were not standardised across sites (Table 4-4). Prices reflected a differing approach to pricing between different leisure providers. Concessionary prices, where offered, were for those who were claiming certain benefits: council tax benefit, unemployment benefit, incapacity benefit, pension credit and housing benefit.

Dated attendances were recorded in the scheme database as detailed in section 4.2.1.

Table 4-4 *Variations in session type, length and cost between sites*

| Area | Cost per session | | Concession cost per session | | Activities offered |
|----------------------------------|------------------|------------|-----------------------------|------------|---|
| Area 1 (Site C, D & F) | £2.90 | | N/A | | Group exercise class, gym, racquet sports, swimming |
| Area 2 (Site B & G) | £2.50 | | N/A | | Group exercise class, gym, racquet sports, swimming |
| Area 3 (Site A) | £3.15 | 60+ | £1.55 | 60+ | Group exercise class, gym, swimming |
| | £4.20 | Under 60s | £2.10 | Under 60s | |
| | £2.50 | FT Student | £1.25 | FT Student | |
| Area 4 (Site E, H & I) | £4.30 | 60+ | £2.15 | 60+ | Group exercise class, gym, swimming |
| | £5.70 | Under 60s | £2.85 | Under 60s | |
| | £3.50 | FT Student | £1.75 | FT Student | |

4.3 Statistical analysis

Data were downloaded from a Microsoft Access databases at each leisure site and combined. Analyses were performed using PSAW Statistics V.20. Referrals were classified as having exited the scheme at several points along a four stage timeline (Table 4-5).

Table 4-5 *Classification of stage of exit*

| Stage of Exit | Definition |
|---------------|--|
| Stage 1 | Did not take up scheme - did not attend pre-scheme consultation or was excluded at first assessment as not meeting referral criteria |
| Stage 2 | Attended pre-scheme consultation, was admitted to the scheme, but dropped out before 12 weeks |

| | |
|---------|---|
| Stage 3 | Attended 12-week consultation but dropped out between 12 and 24-week consultation |
| Stage 4 | Attended 24-week consultation and completed the scheme |

4.3.1 Uptake, 12-week adherence and 24-week completion

Numbers of referrals classed as exiting the scheme at stage two, three or four were combined to calculate uptake; numbers of referrals classed as exiting the scheme at stage three or four were combined to calculate 12-week adherence, and number of referrals classed as exiting the scheme at stage four was used to calculate 24-week completion. Uptake, adherence, and completion were calculated for individual leisure sites and for the scheme as a whole.

Descriptive statistics of referrals relating to demographic/personal characteristics and the referral process (gender, age, IMD, employment status, initial BMI, profession of referrer, reason for referral, secondary reason for referral, and leisure site) were classified into categories; for example IMD quintiles, 10-year age groups. Number and percentage of referrals in each category were examined for all referrals, non-starters, starters, 12-week adherers, and 24-week completers.

Three binary logistic regressions were used to identify whether personal/demographic characteristics (gender, age, IMD, employment status, and initial BMI) and characteristics relating to the referral process (profession of referrer, reason for referral, secondary reason for referral, and leisure site) were predictors of the three binary outcomes of starting the scheme after referral, 12-week adherence, and 24-week completion. Seven common independent

variables were entered into each regression (age, gender, IMD, profession of referrer, reason for referral, secondary reason for referral, and leisure site). Initially employment status was also included but it was removed as it did not improve the fit. In addition, pre-scheme BMI was available for entry into regressions two and three. Goodness-of-fit tests (Cox & Snell, Nagelkerke and Hosmer & Lemeshow) were used to assess whether the regressions were good fits of the data.

4.3.2 Self-reported physical activity and attendance at scheme sessions

Scores from the GLTEQ (Godin & Shepard, 1985) were tested for normality at each time point via the Shapiro-Wilk test. Median and interquartile range scores (IQR) were calculated pre-scheme and after 24 weeks for completers. A Wilcoxon-signed rank test was used to examine whether there were any significant differences between scores.

To allow for a comparison with the data presented by Dugdill, Graham and McNair (2005), an extrapolation was used to give an equivalent weekly amount of moderate activity. This was calculated by dividing the average weekly activity score by its metabolic equivalent for moderate activity (5.0 METs) and multiplying the resultant score by 15 minutes (the minimum amount of time for each bout of activity reported) in order to determine an estimation of overall typical weekly duration of moderate activity. The moderate benchmark was used in order to provide comparison with the then current guidelines of 30

minutes of moderate activity on at least five days per week (Haskell *et al.*, 2007).

In addition, the updated methodology suggested by Godin (2011) was used to assess mean levels of moderate and vigorous exercise pre-scheme and after 24 weeks for completers. The number of incidences of moderate activity were multiplied by 5.0 and vigorous incidences by 9.0, which related to METS for each activity intensity. These individual scores were then added together to give an overall moderate/vigorous Godin weekly activity score (Godin, 2011).

Normality of data were tested at each time point via the Shapiro-Wilk test.

Median and IQR scores were calculated pre-scheme and after 24 weeks for completers. A Wilcoxon-signed rank test was used to examine whether there were any significant differences between scores. These scores were compared to criteria identified by Godin (2011) to assess level of activity and whether any resultant health benefits were achieved.

A smaller sample of one year data was also available and collated for analysis. Data were analysed for normality via the Shapiro-Wilk test. Median and IQR for Godin weekly scores (Godin & Shepard, 1985) and moderate/vigorous Godin weekly scores (Godin, 2011) were calculated pre-scheme, after 24 weeks, and after 52 weeks for completers. A Friedman test was used to determine whether there were any significant differences in Godin weekly scores and moderate/vigorous Godin weekly scores pre-scheme, after 24 weeks, and after 52 weeks. Where differences were apparent, a Wilcoxon-signed rank test was used to explore what these were. A Bonferroni adjustment was applied to

ensure that a Type 1 error was avoided. Moderate/vigorous scores were compared to criteria identified by Godin (2011) to assess level of activity and whether any resultant health benefits were achieved.

Distribution of attendance data for those who started the scheme was assessed for via the Shapiro Wilk test. Median and IQR of scheme session attendance were calculated for participants at each stage of exit.

4.3.3 Physiological changes

Physiological data were tested for normality via the Shapiro-Wilk test. Median and IQR were calculated for all physiological variables; blood pressure, resting heart rate, waist circumference, and BMI pre-scheme, after 12 weeks, and after 24 weeks. For each variable a Friedman test was used to examine whether there were any significant differences between pre-scheme, 12-week and 24-week measures. Where differences were apparent, Wilcoxon signed-rank tests were used to explore what these were. A Bonferroni adjustment was applied to ensure that a Type 1 error was avoided.

4.3.4 Stage of change

Each stage of change was given an ordinal rank (pre-contemplation=1, contemplation=2, preparation=3, action=4, maintenance=5). Somers' *d* was used to determine the association between stage of exit and initial stage of change. Median and IQR were calculated for pre-scheme, 12-week, and 24-week measures. A Friedman test was used to examine whether there were significant differences between pre-scheme, 12-week and 24-week scores for

completers. Where differences were apparent, a Wilcoxon signed-rank test was used to explore what these were. A Bonferroni adjustment was applied to ensure that a Type 1 error was avoided.

4.4 Results

4.4.1 Participant flow through the scheme

A total of 2233 referrals were made between July 2009 and September 2010 (Figure 4-2). Of these 19% (n=422) were non-starters. The majority of non-starters (n=409) did not attend a consultation and 13 were excluded after the pre-scheme consultation. Eighty-one per cent (n=1811) of referrals were admitted to the scheme after the initial assessment (uptake). Of these 46.5% (n=843) dropped out in the first 12 weeks, 53.5% (n=968) attended the 12-week consultation, 10.5% (n=191) dropped out between weeks 13 and 24, and 42.9% (n=777) attended the 24-week consultation.

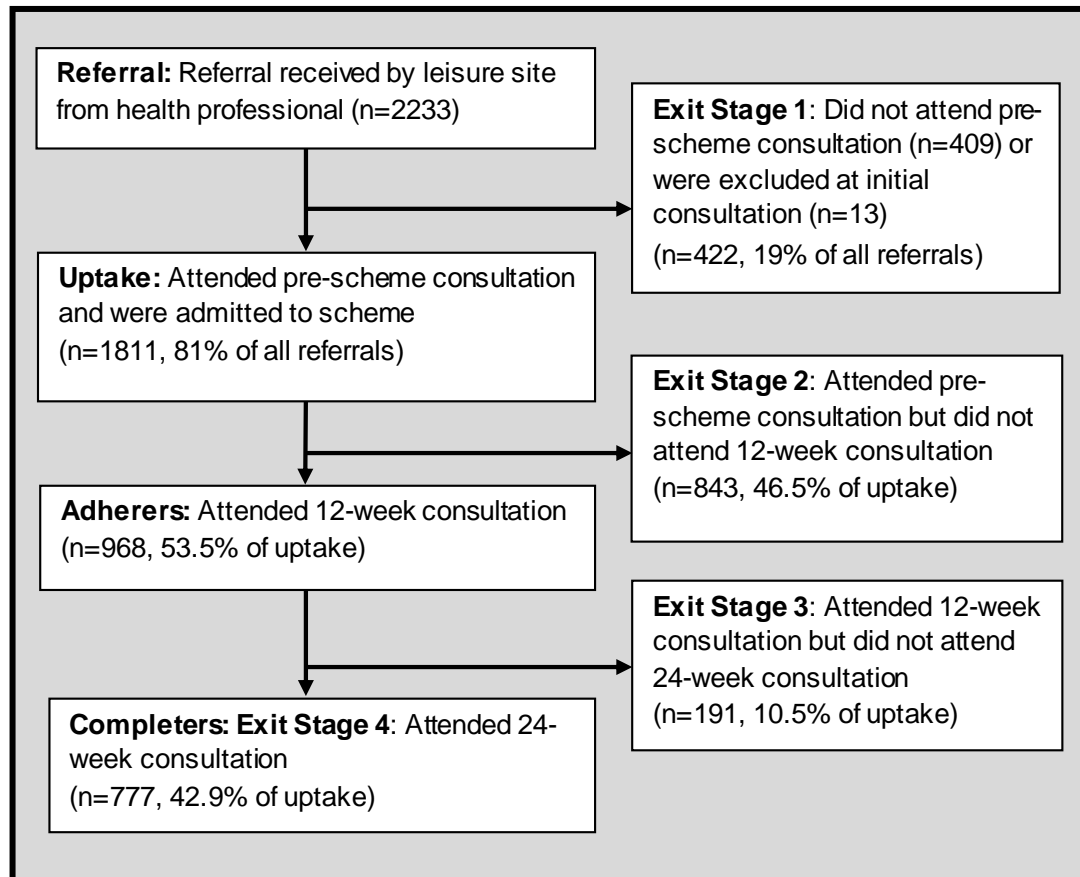


Figure 4-2 Participant flow through the Northumberland ERS

4.4.2 Referral characteristics

Table 4-6 shows personal and referral characteristics of all participants, starters, non-starters, 12-week adherers and 24-week completers.

Referrals were predominantly female (59%), with a mean (SD) age of 53 (15.9) years. The main referrers were general practitioners (58%, n=1278) and the most common reasons for referral were overweight/ obesity (42%, n=913) and cardiovascular disease primary/secondary prevention (CVD) (30%, n=649).

There were significant differences in demographics and referral characteristics between starters and non-starters in age, IMD, employment status, reason for referral, secondary reason for referral, and leisure site;

- Age $t(2231)=-9.60$, ($p<0.001$), mean (SD) age for starters 54.5 (15.5) years compared to 46.6 (15.8 SD) years for non-starters;
- IMD $t(2211)=-5.40$, ($p<0.001$), mean (SD) IMD quintile for starters of 3.0 (1.43), compared to 2.6 (1.43) for non-starters;
- Employment status $\chi^2=40.43$, ($p<0.001$), 89% of those who were retired started, compared to 71% claiming job seekers allowance, 73% claiming incapacity benefit, 78.7% of those who were employed and 76.2% of those in full-time education;
- Reason for referral $\chi^2=31.2$, ($p<0.001$), 85.2% of those referred for CVD primary and secondary started, compared to 79.0% referred for overweight/obesity, 73.4% referred for mental health, 80.5% referred for metabolic/endocrine problems and 90.1% referred for other reasons

Table 4-6 Personal and referral characteristics in relation to referral, uptake, adherence at 12-weeks, and completion at 24 weeks

| | All referrals | | Non starters | | Starters | | 3 month adherers | | Completers | |
|---|--|------|--------------|------|----------|------|------------------|------|------------|------|
| | n | % | n | % | n | % | n | % | n | % |
| Age (n=2233) | | | | | | | | | | |
| 16-24 | 122 | 5.5 | 43 | 10.1 | 79 | 4.4 | 23 | 2.4 | 17 | 2.2 |
| 25-34 | 220 | 9.9 | 72 | 16.9 | 148 | 8.2 | 43 | 4.5 | 34 | 4.4 |
| 35-44 | 322 | 14.5 | 70 | 16.5 | 252 | 13.9 | 94 | 9.7 | 65 | 8.4 |
| 45-54 | 408 | 18.3 | 94 | 22.1 | 315 | 17.4 | 131 | 13.5 | 101 | 13.0 |
| 55-64 | 571 | 25.6 | 86 | 20.2 | 486 | 26.8 | 304 | 31.4 | 243 | 31.3 |
| 65-74 | 447 | 20.0 | 50 | 11.8 | 398 | 22.0 | 278 | 28.7 | 239 | 30.7 |
| 75+ | 143 | 6.2 | 10 | 2.4 | 133 | 7.3 | 95 | 9.8 | 78 | 10.0 |
| Gender (n=2233) | | | | | | | | | | |
| Female | 1327 | 59.4 | 239 | 56.2 | 1089 | 60.1 | 566 | 58.5 | 441 | 56.8 |
| Male | 906 | 40.6 | 186 | 43.8 | 722 | 39.9 | 402 | 41.5 | 336 | 43.2 |
| Index of Multiple Deprivation (n=2213) | | | | | | | | | | |
| 20% Most Deprived | 511 | 23.1 | 135 | 32.1 | 376 | 21.0 | 183 | 19.0 | 156 | 20.2 |
| 21-40% | 479 | 21.6 | 100 | 23.8 | 379 | 21.1 | 187 | 19.4 | 156 | 20.2 |
| 41-60% | 413 | 18.7 | 68 | 16.2 | 345 | 19.2 | 191 | 19.8 | 158 | 20.3 |
| 61-80% | 378 | 17.1 | 54 | 12.9 | 324 | 18.1 | 190 | 19.7 | 148 | 19.1 |
| 81-100% Least Deprived | 432 | 19.5 | 63 | 15.0 | 369 | 20.6 | 213 | 22.1 | 156 | 20.2 |
| Employment Status (n=1447) | | | | | | | | | | |
| Retired | 525 | 36.3 | 58 | 22.0 | 467 | 39.4 | 351 | 52.3 | 320 | 55.1 |
| Incapacity Benefit | 190 | 13.1 | 51 | 19.4 | 139 | 11.7 | 58 | 8.7 | 48 | 8.3 |
| Employed | 404 | 27.9 | 86 | 32.7 | 318 | 26.9 | 150 | 22.4 | 118 | 20.3 |
| Job Seekers Allowance | 93 | 6.4 | 27 | 10.3 | 66 | 5.6 | 23 | 3.4 | 19 | 3.2 |
| Full Time Education | 21 | 1.5 | 5 | 1.9 | 16 | 1.4 | 1 | 0.1 | 1 | 0.2 |
| Other | 214 | 14.8 | 36 | 13.7 | 178 | 15.0 | 88 | 13.1 | 75 | 12.9 |
| Profession of Referrer (n=2190) | | | | | | | | | | |
| General Practitioner | 1278 | 58.4 | 253 | 60.7 | 1025 | 57.8 | 508 | 53.4 | 407 | 53.2 |
| Practice Nurse | 590 | 26.9 | 117 | 28.1 | 473 | 26.7 | 257 | 27.0 | 200 | 26.1 |
| Cardiac Rehabilitation Nurse | 185 | 8.4 | 21 | 5.0 | 164 | 9.2 | 130 | 13.7 | 117 | 15.3 |
| Other | 137 | 6.3 | 26 | 6.2 | 111 | 6.3 | 57 | 5.9 | 41 | 5.4 |
| Reason for Referral (n=2161) | | | | | | | | | | |
| CVD | 649 | 30.0 | 96 | 23.6 | 553 | 31.6 | 365 | 38.8 | 308 | 40.8 |
| Overweight / Obesity | 913 | 42.2 | 192 | 46.9 | 721 | 41.2 | 343 | 36.5 | 271 | 35.9 |
| Mental Health | 297 | 13.8 | 79 | 19.4 | 218 | 12.4 | 95 | 10.1 | 72 | 9.5 |
| Metabolic / Endocrine | 149 | 6.9 | 29 | 7.1 | 120 | 6.8 | 60 | 6.4 | 45 | 6.0 |
| Other | 153 | 7.1 | 14 | 3.0 | 139 | 8.0 | 77 | 8.2 | 58 | 7.8 |
| Secondary Reason for Referral (n=2233) | | | | | | | | | | |
| No Secondary reason | 1649 | 73.8 | 327 | 76.8 | 1325 | 73.2 | 715 | 73.9 | 594 | 76.5 |
| CVD | 34 | 1.5 | 3 | 0.7 | 31 | 1.7 | 18 | 1.9 | 14 | 1.8 |
| Overweight / Obesity | 222 | 9.9 | 41 | 9.7 | 181 | 10.0 | 94 | 9.7 | 67 | 8.6 |
| Mental Health | 130 | 5.8 | 35 | 8.3 | 95 | 5.2 | 41 | 4.2 | 31 | 4.0 |
| Metabolic / Endocrine | 105 | 4.7 | 7 | 1.7 | 98 | 5.4 | 53 | 5.5 | 39 | 5.0 |
| Other | 93 | 4.2 | 12 | 2.8 | 81 | 4.5 | 47 | 4.8 | 32 | 4.1 |
| Pre-Scheme BMI (n=1773) | | | | | | | | | | |
| Normal weight (18.5-24.9 kg/m ²) | Not available for those who did not start the scheme | | | | 215 | 12.1 | 131 | 13.6 | 110 | 14.2 |
| Overweight (25-29.9 kg/m ²) | | | | | 457 | 25.8 | 273 | 28.3 | 228 | 29.5 |
| Obese (30-34.5 kg/m ²) | | | | | 498 | 28.1 | 272 | 28.2 | 210 | 27.2 |
| Morbidly Obese (35+ kg/m ²) | | | | | 603 | 34.0 | 288 | 29.9 | 225 | 29.1 |
| Leisure Site (n=2233) | | | | | | | | | | |
| A (Leisure provider 2) | 113 | 5.1 | 22 | 5.2 | 91 | 5.0 | 67 | 6.9 | 60 | 7.7 |
| B (Leisure provider 1) | 186 | 8.3 | 57 | 13.4 | 129 | 7.1 | 75 | 7.7 | 71 | 9.1 |
| C (Leisure provider 1) | 332 | 14.9 | 83 | 19.5 | 249 | 13.7 | 152 | 15.7 | 117 | 15.1 |
| D (Leisure provider 1) | 103 | 4.6 | 20 | 4.7 | 83 | 4.6 | 39 | 4.0 | 34 | 4.4 |
| E (Leisure provider 1) | 428 | 19.2 | 89 | 20.9 | 339 | 18.7 | 186 | 19.2 | 168 | 21.6 |
| F (Leisure provider 1) | 501 | 22.4 | 81 | 19.1 | 420 | 23.2 | 224 | 23.1 | 196 | 25.2 |
| G (Leisure provider 2) | 73 | 3.3 | 10 | 2.4 | 63 | 3.5 | 27 | 2.8 | 20 | 2.6 |
| H (Leisure provider 2) | 156 | 7.0 | 18 | 4.2 | 138 | 7.6 | 54 | 5.6 | 24 | 3.1 |
| I (Leisure provider 2) | 341 | 15.3 | 45 | 10.6 | 299 | 16.5 | 144 | 14.9 | 87 | 11.2 |

- Secondary reason for referral $\chi^2=20.8$, ($p<0.001$), 80.2% with no secondary reason for referral started, compared to 91.2% of those with prevention of CVD as a secondary reason for referral, 81.5% with overweight/obesity as secondary reason for referral, 73.1% with mental health as secondary reason for referral, 93.3% with metabolic/endocrine problems as secondary reason for referral, and 87.1% with other reasons as secondary reason for referral.
- Leisure site $\chi^2=38.0$, ($p<0.001$) for starters compared to non-starters, with 80.5% of those referred to site A starting, compared to 69.4% from site B, 75% from site C, 80.6% from site D, 79.2% from site E, 83.8% from site F, 86.3% from site G, 88.5% from site H, and 86.8% from site I.

4.4.3 Predictors of uptake, 12-week adherence, and 24-week completion

Three logistic regression analyses as detailed in Table 4-7 were conducted to examine factors associated with likelihood of engagement in the Northumberland ERS.

Table 4-7 Binary outcome variables for logistic regressions

| Logistic regression | Binary outcome | | Binary outcome 1 |
|----------------------------|-----------------------------------|----|--------------------------|
| 1 | Non-starter (n=422) | vs | Starter (n=1811) |
| 2 | Dropout (before 12 weeks) (n=843) | vs | 12-week adherers (n=968) |
| 3 | Dropout (12–24 weeks) (n=191) | vs | Completers (n=777) |

The first logistic regression analysis was conducted to predict uptake of the ERS using age, gender, IMD quintile, reason for referral, secondary reason for referral, profession of referrer, and leisure site as predictors for uptake. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between acceptors and decliners of the offer ($\chi^2 (31)=168.53$) ($p<0.001$). Nagelkerke's R^2 of 0.12 and Cox & Snell R^2 of 0.08 indicated an adequate relationship between prediction and grouping. Prediction success overall was 81.5% (99.5% for starters and 4.3% for non-starters). The Wald criterion demonstrated that age (35–44 years, $B=0.705$, $SE=0.247$, 45–54 years, $B=0.657$, $SE=0.240$, 55–64 years, $B=1.113$, $SE=0.249$, 65–74 years, $B=1.429$, $SE=0.274$, 75+ years, $B=2.002$, $SE=0.421$), gender (female $B=0.341$, $SE=0.122$), IMD quintile (61–80%, $B=0.533$, $SE=0.215$, 81–100% least deprived $B=0.348$, $SE=0.204$), secondary reason for referral (metabolic/endocrine $B=1.104$, $SE=0.409$) and leisure site (site F, $B=0.855$, $SE=0.304$, site H, $B=0.925$, $SE=0.387$, site I $B=0.664$, $SE=0.315$) made significant contributions to the model.

A second logistic regression analysis was conducted to predict 12-week adherence among starters using the same predictors as in regression one, but with the addition of pre-scheme BMI. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between dropouts and 12-week adherers ($\chi^2 (34)=261.82$), ($p<0.001$). Nagelkerke's R^2 of 0.19 and Cox & Snell R^2 of 0.14 indicated an adequate relationship between prediction and grouping. Prediction

success overall was 66.9% (62.1% for dropouts and 70.8% for adherers). The Wald criterion demonstrated that age (55–64 years, $B=1.382$, $SE=0.302$, 65–74 years, $B=1.734$, $SE=0.302$, 75+ years, $B=1.173$, $SE=0.354$), IMD (61–80%, $B=0.412$, $SE=0.195$, 81–100% least deprived $B=0.671$, $SE=0.199$), profession of referrer (cardiac rehabilitation nurse, $B=0.829$, $SE=0.254$), BMI (≥ 35 kg/m² $B=-0.437$, $SE=0.218$) and leisure site (site G, $B=-1.393$, $SE=0.391$, site H, $B=-1.185$, $SE=0.341$, site I, $B=-0.961$, $SE=0.299$) made significant contributions to the model.

The final logistic regression was conducted to predict 24-week completion among 12-week adherers using the same predictors as regression two. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between those who dropped out between 12–24 weeks and completers ($\chi^2(34)=159.16$), ($p<0.001$). Nagelkerke's R^2 of 0.25 and Cox & Snell R^2 of 0.19 indicated an adequate relationship between prediction and grouping. Prediction success overall was 82.2% (24.2% for dropouts and 96.5% for adherers). The Wald criterion demonstrated that BMI (30–34.9 kg/m² $B=-1.164$, $SE=0.377$, ≥ 35 kg/m² $B=-0.921$, $SE=0.395$) and leisure site (site G, $B=-1.336$, $SE=0.377$, site H, $B=-2.102$, $SE=0.533$, site I, $B=-1.709$, $SE=0.473$) made significant contributions to the model (Table 4-8).

Table 4-8 Predictors of uptake, 12-week adherence, and completion (continued)

| | Model 1 | | Model 2 | | Model 3 | |
|--------------------------------------|-------------------------|--------|-------------------------|--------|------------------------|-------|
| | OR (95% CI) | P | OR (95% CI) | P | OR (95% CI) | P |
| Age | | <0.001 | | <0.001 | | 0.004 |
| 16-24 | 1.000 (ref) | | 1.000 (ref) | | 1.000 (ref) | |
| 25-34 | 1.161 (0.711 to 1.896) | 0.551 | 1.049 (0.556 to 1.981) | 0.882 | 1.118 (0.279 to 4.475) | 0.875 |
| 35-44 | 2.023 (1.247 to 3.281) | 0.004 | 1.501 (0.838 to 2.688) | 0.172 | 0.558 (0.165 to 1.890) | 0.349 |
| 45-54 | 1.928 (1.204 to 3.088) | 0.006 | 1.697 (0.954 to 3.017) | 0.072 | 1.022 (0.301 to 3.467) | 0.972 |
| 55-64 | 3.042 (1.866 to 4.959) | <0.001 | 3.984 (2.254 to 7.045) | <0.001 | 1.601 (0.488 to 5.247) | 0.437 |
| 65-74 | 4.175 (2.442 to 7.137) | <0.001 | 5.665 (3.136 to 10.234) | <0.001 | 2.505 (0.740 to 8.484) | 0.140 |
| 75+ | 7.402 (3.244 to 16.890) | <0.001 | 5.544 (2.771 to 11.093) | <0.001 | 1.894 (0.500 to 7.168) | 0.347 |
| Gender | | | | | | |
| Male | 1.000 (ref) | | 1.000 (ref) | | 1.000 (ref) | |
| Female | 1.406 (1.106 to 1.787) | 0.005 | 1.189 (0.952 to 1.486) | 0.128 | 0.823 (0.554 to 1.221) | 0.333 |
| Index of Multiple Deprivation | | 0.119 | | 0.012 | | 0.807 |
| 20% Most Deprived | 1.000 (ref) | | | | | |
| 21-40% | 1.215 (0.869 to 1.699) | 0.254 | 1.191 (0.847 to 1.675) | 0.314 | 0.960 (0.501 to 1.842) | 0.903 |
| 41-60% | 1.416 (0.948 to 2.113) | 0.089 | 1.335 (0.913 to 1.951) | 0.136 | 1.281 (0.622 to 2.638) | 0.502 |
| 61-80% | 1.704 (1.118 to 2.599) | 0.013 | 1.510 (1.031 to 2.211) | 0.034 | 0.894 (0.445 to 1.795) | 0.753 |
| 81-100% Least Deprived | 1.546 (1.019 to 2.347) | 0.041 | 1.956 (1.325 to 2.887) | 0.001 | 0.955 (0.481 to 1.898) | 0.896 |
| Profession of Referrer | | 0.301 | | 0.012 | | 0.353 |
| General Practitioner | 1.000 (ref) | | 1.000 (ref) | | 1.000 (ref) | |
| Practice Nurse | 0.802 (0.610 to 1.055) | 0.114 | 1.129 (0.878 to 1.451) | 0.346 | 1.006 (0.643 to 1.573) | 0.979 |
| Cardiac Rehabilitation Nurse | 1.243 (0.708 to 2.183) | 0.449 | 2.291 (1.392 to 3.769) | 0.001 | 2.045 (0.915 to 4.572) | 0.081 |
| Other | 0.999 (0.616 to 1.620) | 0.998 | 1.146 (0.738 to 1.779) | 0.544 | 0.924 (0.455 to 1.874) | 0.826 |
| Reason for Referral | | 0.157 | | 0.751 | | 0.113 |
| CVD Primary / Secondary | 1.000 (ref) | | 1.000 (ref) | | 1.000 (ref) | |
| Overweight / Obesity | 0.819 (0.560 to 1.199) | 0.304 | 0.937 (0.673 to 1.303) | 0.697 | 1.475 (0.832 to 2.616) | 0.183 |
| Mental Health | 0.751 (0.484 to 1.163) | 0.199 | 0.823 (0.544 to 1.244) | 0.355 | 0.753 (0.360 to 1.572) | 0.449 |
| Metabolic / Endocrine | 0.873 (0.521 to 1.462) | 0.605 | 0.806 (0.511 to 1.272) | 0.354 | 0.571 (0.261 to 1.247) | 0.160 |
| Other | 1.652 (0.866 to 3.153) | 0.128 | 0.789 (0.501 to 1.244) | 0.308 | 1.018 (0.467 to 2.218) | 0.965 |

Table 4-8 continued Predictors of uptake, 12-week adherence, and completion

| | Model 1 | | Model 2 | | Model 3 | |
|--|------------------------|--------|------------------------|--------|-------------------------|--------|
| | OR (95% CI) | P | OR (95% CI) | P | OR (95% CI) | P |
| Secondary Reason for Referral | | | | | | |
| No Secondary reason | 1.000 (ref) | 0.031 | 1.000 (ref) | 0.667 | 1.000 (ref) | 0.820 |
| CVD Primary / Secondary | 2.125 (0.618 to 7.304) | 0.231 | 1.001 (0.450 to 2.228) | 0.998 | 1.529 (0.392 to 5.961) | 0.541 |
| Overweight / Obesity | 0.829 (0.526 to 1.305) | 0.418 | 0.869 (0.580 to 1.302) | 0.496 | 1.233 (0.633 to 2.405) | 0.538 |
| Mental Health | 0.818 (0.522 to 1.284) | 0.383 | 0.888 (0.554 to 1.423) | 0.621 | 1.268 (0.531 to 3.028) | 0.594 |
| Metabolic / Endocrine | 3.016 (1.354 to 6.719) | 0.007 | 0.894 (0.555 to 1.440) | 0.644 | 0.778 (0.368 to 1.644) | 0.511 |
| Other | 1.497 (0.779 to 2.877) | 0.226 | 1.445 (0.856 to 2.441) | 0.168 | 0.797 (0.367 to 1.730) | 0.566 |
| Pre-Scheme BMI (kg/m²) | | | | | | |
| Normal weight 18.5-24.9 | | | 1.000 (ref) | 0.214 | 1.000 (ref) | 0.012 |
| Overweight 25-29.9 kg/m ² | | | 0.749 (0.506 to 1.111) | 0.151 | 0.598 (0.298 to 1.197) | 0.147 |
| Obese 30-34.5 kg/m ² | | | 0.775 (0.511 to 1.175) | 0.230 | 0.312 (0.149 to 0.654) | 0.002 |
| Morbidly Obese 35+ kg/m ² | | | 0.646 (0.421 to 0.990) | 0.045 | 0.398 (0.184 to 0.863) | 0.020 |
| Leisure Site | | | | | | |
| A (Leisure provider 2) | 1.000 (ref) | <0.001 | 1.000 (ref) | <0.001 | 1.000 (ref) | <0.001 |
| B (Leisure provider 1) | 0.839 (0.440 to 1.601) | 0.595 | 0.625 (0.320 to 1.217) | 0.167 | 2.670 (0.705 to 10.117) | 0.148 |
| C (Leisure provider 1) | 1.253 (0.685 to 2.294) | 0.464 | 0.972 (0.528 to 1.788) | 0.927 | 0.532 (0.207 to 1.365) | 0.189 |
| D (Leisure provider 1) | 1.675 (0.781 to 3.589) | 0.185 | 0.518 (0.249 to 1.078) | 0.079 | 1.324 (0.347 to 5.052) | 0.681 |
| E (Leisure provider 1) | 1.667 (0.905 to 3.071) | 0.101 | 0.991 (0.535 to 1.835) | 0.978 | 2.362 (0.801 to 6.967) | 0.119 |
| F (Leisure provider 1) | 2.351 (1.296 to 4.263) | 0.005 | 0.875 (0.487 to 1.573) | 0.656 | 1.464 (0.552 to 3.883) | 0.443 |
| G (Leisure provider 2) | 1.690 (0.708 to 4.030) | 0.237 | 0.248 (0.115 to 0.534) | <0.001 | 0.263 (0.073 to 0.950) | 0.041 |
| H (Leisure provider 2) | 2.521 (1.181 to 5.381) | 0.017 | 0.306 (0.157 to 0.596) | 0.001 | 0.122 (0.043 to 0.347) | <0.001 |
| I (Leisure provider 2) | 1.943 (1.048 to 3.600) | 0.035 | 0.383 (0.213 to 0.688) | 0.001 | 0.181 (0.072 to 0.458) | <0.001 |

4.4.4 Differences in physical activity levels between pre-scheme and 24-week measures

Godin Leisure Time Exercise Questionnaire data were available pre-scheme and after 24 weeks for 85.7% (n=666) of completers. Godin physical activity scores were not normally distributed, as assessed by the Shapiro-Wilk test ($p<0.001$), with a skewness of 10.986 and a kurtosis of 8.605. Median (IQR) pre-scheme weekly Godin activity score was 15.0 (5.0 to 21.0) units per week and median (IQR) 24-week score was 25.0 (9.0 to 31.0) units per week.

Participants who completed significantly increased their self-reported weekly Godin activity scores compared to baseline ($z=12.639$ $p<0.001$). Using the formula suggested by Dugdill, Graham and McNair (2005) this was extrapolated to equate to 45 minutes of moderate activity per week pre-scheme and 75 minutes after 24-week completion. The median increase was 10 units per week, equivalent to 30 minutes of moderate exercise per week.

Using the updated method of analysis suggested by Godin (2011) the median (IQR) pre-scheme moderate/vigorous weekly activity score for completers was 0.0 (0.0 to 10.0) units per week and the median (IQR) post-scheme score was 14.0 (0.0-28.0) units per week. Participants who completed significantly increased their self-reported moderate/vigorous Godin weekly activity scores compared to baseline ($z=12.869$, $p<0.001$). For this sample, scores achieved at 24 weeks were classified as being moderately active and having some health benefit (14-23 units) by Godin (2011).

4.4.5 Differences in physical activity levels pre-scheme, post-scheme, and 52 weeks after starting

Godin Leisure Time Exercise Questionnaire data were available at 52 weeks for a smaller subsample (n=271). Median Godin weekly activity score differed statistically significantly between time points $X^2(2)=79.188, (p<0.001)$.

Compared to baseline, completion of the Northumberland ERS elicited a statistically significant positive change in weekly Godin scores at both 24-weeks ($z=9.082, p<0.001$) and 52-weeks ($z=6.680, p<0.001$) after starting. Scores decreased between weeks 24 and 52, but this was not significant (Table 4-9).

Table 4-9 Change in self-reported physical activity for completers after 24 and 52 weeks

| | Pre-scheme | 24 weeks | 52 weeks |
|--|----------------------------------|----------------------------------|----------------------------------|
| Median Godin Weekly Score (IQR) (n=271) | 15.0 ^{ab} (6.0-15.0) | 27.0 ^a (14.0-41.0) | 24.0 ^b (10.0-41.0) |
| Estimated moderate physical activity per week | 45 mins | 81 mins | 72 mins |
| Median increase in Godin weekly score (IQR) (n=271) | | 10.0 (0.0-25.0) | 8.0 (-4.0-21.0) |
| Estimated Median increase from baseline in moderate physical activity per week | | 30 mins | 24 mins |

A letter denotes a significant difference between two values (p<0.001)

Using the method suggested by Dugdill, Graham and McNair (2005) these results were extrapolated to estimate that, where one year data were available, pre-scheme levels of activity equated to 45 minutes of moderate activity, 24-week levels equated to 81 minutes of moderate activity, and 52-week levels

equated to 72 minutes of moderate activity. The median increase in activity reported after one year compared to baseline was 8 units, equating to 24 minutes per week.

Similarly, median Godin moderate/vigorous weekly activity score differed statistically significantly between time points ($X^2=99.587$, $p<0.001$). Completion of the Northumberland ERS elicited a positive change in median (IQR) weekly Godin moderate/vigorous scores both 24 and 52 weeks after starting; pre-scheme 0.0 (0.0 to 15.0) units per week, after 24 weeks 15.0 (10.0 to 33.0) units/week, and after 52 weeks 15.0 (0.0 to 28.0) units per week. At 24 weeks, scores were significantly different from pre-scheme scores ($z=12.869$ $p<0.001$). This was also the case at 52 weeks ($z=7.521$, $p<0.001$). For this sample, scores achieved at 24 weeks were classified as being moderately active and having some health benefit (14-23 units) by Godin (2011), which was maintained at 52 weeks

4.4.6 Attendance at supervised sessions

Participants were asked to attend two sessions per week, giving a total target of 48 sessions in the 24-week period of the ERS. Attendance data were not normally distributed as assessed by the Shapiro-Wilk test ($p<0.001$); skewness $z=10.551$, kurtosis $z=-4.230$. Attendances were recorded for 1246 (68.8%) of the 1811 starters. Median attendances are shown in Table 4-10. The median (IQR) of 23.0 (13.0 to 32.0) sessions attended by completers equated to 47.9% of potential attendances (maximum 48), however, there were large variations

between sites in both compliance in recording attendance and in attendance where it was recorded.

Table 4-10 *Median attendances by stage of exit*

| Attendances (n=1246) | | | | |
|--------------------------------|------------------------|---------------------------|-------------------------------|----------------------------|
| Stage of Exit | Not admitted (Stage 1) | Before 12 weeks (Stage 2) | Between 12-24 weeks (Stage 3) | Completed scheme (Stage 4) |
| n | 425 | 461 | 112 | 673 |
| Median Attendance (IQR) | No attendance | 2.0 (0.0-5.0) | 11.0 (5.0-16.0) | 23.0 (13.0-32.0) |

The site with the highest attendance for completers corresponded with the highest rate of completion and the site with the lowest attendance also had the lowest completion rate. Comparisons between sites can be seen in Table 4-11.

Table 4-11 *Median attendance by leisure site*

| Leisure Site | No of completers | 24-week completion | No of completers with attendance recorded (%) | Median Attendance for completers (IQR) |
|---------------------|-------------------------|---------------------------|--|---|
| Site A (Provider 1) | 60 | 65.9% | 60 (100.0%) | 31.0 (22.0-44.0) |
| Site B (Provider 2) | 71 | 55.0% | 71 (100.0%) | 21.5 (13.3-31.8) |
| Site C (Provider 2) | 117 | 47.0% | 117 (100.0%) | 22.0 (13.0-30.0) |
| Site D (Provider 2) | 34 | 41.0% | 34 (100.0%) | 17.0 (12.0-34.0) |
| Site E (Provider 2) | 168 | 49.1% | 149 (88.7%) | 19.0 (7.5-31.0) |
| Site F (Provider 2) | 196 | 46.7% | 182 (92.9%) | 26.0 (13.0-34.0) |
| Site G (Provider 1) | 20 | 31.7% | 2 (10.0%) | 22.5 (15.0) |
| Site H (Provider 1) | 24 | 17.4% | 6 (25.0%) | 11.0 (9.5-27.8) |
| Site I (Provider 1) | 87 | 29.1% | 36 (41.4%) | 24.0 (16.0-25.0) |

With the exception of site A, where the scheme was introduced after the initiation of the shared management agreement, the sites managed by provider 2 had much higher rates of compliance in recording attendance.

4.4.7 Changes in physiological measurements

Availability of physiological measurement data for completers at all time points varied. There was a high level of compliance in staff recording mass, BMI and waist circumference measures, but there were fewer recorded blood pressure and resting heart rate measurements at 12 weeks. BMI results were available at all time points for 82.75% (n=643) of completers, and waist circumference for 83% (n=645) of completers. In comparison blood pressure results were available for 68.3% (n=531) of completers, and for resting heart rate 70.8% (n=550) of completers. Data were not normally distributed as assessed by the Shapiro-Wilk test (Table 4-12).

Table 4-12 *Skewness and kurtosis of physiological data*

| | Shapiro-Wilk test | Skewness | Kurtosis |
|---|-------------------|----------|----------|
| Initial systolic blood pressure | p=0.001 | 3.625 | 2.472 |
| Initial diastolic blood pressure | p<0.001 | -3.469 | 0.693 |
| Initial resting heart rate | p<0.001 | 3.344 | -1.433 |
| Initial BMI | p<0.001 | 11.281 | 6.268 |
| Initial waist circumference | p<0.001 | 7.109 | 4.685 |

Median BMI and waist circumference were statistically significantly reduced between time points but there was no significant change in blood pressure or resting heart rate (Table 4-13).

Completion of the Northumberland ERS led to statistically significant reductions in BMI between pre-scheme and 12-week measures $z=-7.156$ ($p<0.001$), and pre-scheme and 24-week measures $z=-6.840$ ($p <0.001$), but not between 12-week and 24-week measures. The median (IQR) reduction in BMI at 12 weeks

was -0.2 (-0.8 to 0.3) kg/m² and at 24 weeks was -0.3 (-1.1 to 0.4) kg/m². For waist circumference, statistically significant reductions were found between pre-scheme and 12-week measures $z=-11.342$ ($p<0.001$), and pre-scheme and 24-week measures $z=-11.101$ ($p<0.001$), and between 12-week and 24-week measures $z=-3.487$ ($p<0.001$). Median (IQR) reduction in waist circumference at 12 weeks was -1 (-4 to 0) cm and at 24 weeks was -2 (-5 to 0) cm.

Table 4-13 *Physiological changes for completers*

| | Pre Scheme | 12 Weeks | 24 weeks | χ^2 (df)=value | Sig. |
|--|---|--|--|---------------------|---------|
| Median systolic blood pressure (IQR) (n=531) | 131 mmHg (119-144) | 132 mmHg (120-145) | 131 mmHg (119-143) | (2)=1.690 | p=0.429 |
| Median diastolic blood pressure (IQR) (n=531) | 81 mmHg (72-90) | 82 mmHg (73-89) | 81 mmHg (73-89) | (2)=0.109 | p=0.947 |
| Median resting heart rate (IQR) (n=550) | 73.0 bpm (64.-81.3) | 73.0 bpm (64.0-83.0) | 72.0bpm (63.0-81.0) | (2)=4.925 | p=0.085 |
| Median BMI (IQR) (n=643) | 30.1 kg/m ² ^{ab} (26.7-35.4) | 30.1 kg/m ² ^a (26.5-34.7) | 29.7 kg/m ² ^b (26.5-34.8) | (2)=45.15 | p<0.001 |
| Median waist circumference (IQR) (n=645) | 104.0 cm ^{ab} (95.0-116.0) | 103.0 cm ^{ac} (94.0-114.0) | 102.0 cm ^{bc} (93.0-113.0) | (2)=185.14 | p<0.001 |

A letter denotes a significant difference between two values

4.4.8 Differences in stage of change measures

Initial stage of change data were available for 50.4% (n=912) of those who started the scheme. The majority, 50.4% (n=460) were classed as

contemplators (Table 4-14). Somers' *d* determined that initial stage of change was not significantly associated with stage of exit ($d=0.021$, $p=0.510$).

Table 4-14 Initial frequency of stage of change category for starters

| Stage Of Change | Pre-scheme Stage of Change | Not admitted | Dropped out before 3 months | Dropped out between 3-6 months | Completed the scheme |
|--------------------------|----------------------------|--------------|-----------------------------|--------------------------------|----------------------|
| Pre-contemplation | 8 (0.9%) | | 2 | | 6 |
| Contemplation | 460 (50.4%) | 2 | 185 | 39 | 234 |
| Preparation | 186 (20.4%) | | 78 | 15 | 93 |
| Action | 61 (6.7%) | | 19 | 3 | 39 |
| Maintenance | 197 (21.6%) | 2 | 73 | 17 | 105 |
| Total | 912 (100%) | 4 | 357 | 74 | 477 |

Stage of change data were available for all three time points for only 47.1% of completers ($n=366$). There was a significant difference in stage of change at different time points in the scheme $\chi^2(2)=228.596$ ($p<0.001$). Stage of change was statistically significantly different between pre-scheme and 12-week measures ($z=10.931$, $p<0.001$), pre-scheme and 24-week measures ($z=10.538$, $p<0.001$), and 12 and 24-week measures ($z=2.452$, $p=0.0167$). For this group of completers median (IQR) values for stage of change were pre-scheme =3 (2 to 4) equating to preparation (contemplation to action); 12-week =4 (3 to 5) equating to action (preparation to maintenance); and 24-week =5 (3 to 5) equating maintenance (preparation to maintenance).

4.5 Discussion

4.5.1 Main findings

The study had several objectives. First it examined the influence of demographics and other factors such as reason for referral on four stages of the Northumberland ERS pathway; initial referral, uptake, adherence at 12 weeks, and completion of the scheme at 24 weeks. Second it examined whether completion resulted in a change in self-reported physical activity six months and one year after initial engagement with the scheme. Third it examined whether completion of the Northumberland ERS resulted in significant changes to physiological health indicator measures (blood pressure, BMI and waist circumference). Finally it examined whether participation in the scheme affected the stage of change construct from the TTM (Prochaska & DiClemente, 1983).

Eighty one percent of those referred started the scheme, 53.5% adhered at 12 weeks, and 42.9% completed the scheme at 24 weeks. Participants who completed significantly increased their self-reported physical activity levels at 24-weeks, $z=12.639$, ($p<0.001$). A subsample of data revealed that completion elicited a statistically significant increase in self-reported physical activity levels 52 weeks after starting the Northumberland ERS, ($X^2(2)=79.188$, $p<0.001$). Both 24 and 52-week scores were significantly different from pre-scheme scores ($p<0.001$). Completers attended a median of 23.0 of a target 48 supervised sessions over the 24-week duration of the scheme.

Increasing age, lower deprivation, being female, having metabolic/endocrine disease as a secondary reason for referral, and leisure site were associated with uptake. Increasing age, lower deprivation, a BMI of less than 35 kg/m², being referred by a cardiac rehabilitation professional, and leisure site were associated with 12-week adherence and a BMI of less than 30 kg/m² and leisure site were associated with 24-week completion. Each regression significantly increased the prediction accuracy of stage of exit (non-starters vs starters 81.5%, dropouts before 12 weeks vs 12-week adherers 66.9%, and dropouts between 13 and 24 weeks 82.2%).

Overall, for those who completed, there were small but statistically significant reductions between pre-scheme and 24-week measurements in median waist circumference (-2.0 cm, $p < 0.001$), and median BMI (-0.3 kg/m², $p < 0.001$).

Finally there was a statistically significant positive difference in stage of change dependent on time spent adhering to the scheme, ($\chi^2 (2) = 228.596$ $p < 0.001$).

4.5.2 Uptake, adherence, completion and attendance

Uptake for this ERS was 81%, which compared favourably with other evaluation studies of routinely collected data (Dugdill, Graham & McNair, 2005) 68%, (Harrison, McNair & Dugdill, 2005) 79%, (Gidlow *et al.*, 2007) 66%, (Sowden *et al.*, 2008) 58%, but was lower than the 85% uptake reported by the most recent UK RCT (Murphy *et al.*, 2012). The 53.3% 12-week adherence in this study was not dissimilar to results of a systematic review (Pavey *et al.*, 2012), which reported a pooled adherence level of 49% across observational studies. The added measure of completion in this study indicated further attrition of 10.5% in

weeks 13–24. Since the highest levels of dropout occurred in the first 12 weeks (46.5% of uptake), understanding barriers to, and facilitators of, attendance in the earlier stages of the scheme would make the most difference to improving sustained engagement. Although the use of quantitative methodology in this study has given an in-depth understanding of who the Northumberland ERS is successful in engaging with, statistical models have only minimally increased prediction accuracy for uptake, adherence, and completion. There is therefore a requirement for a different approach to examine what other factors contribute to success in engagement.

Understanding why and how such schemes appeal, or otherwise, to participants is best achieved by exploring the experiences of those who are referred. As discussed in chapter three, section 3.2, the use of qualitative methodology is appropriate to answer how and why questions. There are a growing number of studies that have considered participant perceptions of ERS (Lord & Green, 1995; Singh, 1997; Taylor, Doust & Webborn, 1998; Martin & Woolf-May, 1999; Stathi, McKenna & Fox, 2004; Crone, Smith & Gough, 2005; Wormald *et al.*, 2006; Pentecost & Taket, 2011; Mills *et al.*, 2012) using qualitative methods but the majority of these have been superficial (Williams *et al.*, 2007). There is therefore a requirement for future studies to explore these issues in-depth.

Using adherence/completion as a measure of success assumes that attendance at consultations is the result of participation in scheme sessions and that this participation accounts for an increase in physical activity levels. Some published evaluations of ERS (Dugdill, Graham & McNair, 2005; Sowden *et al.*,

2008) have typically made judgements about success based on adherence to pre and post-scheme consultations, rather than the reporting of comprehensive attendance data for physical activity sessions. If participants were only invited to consultations based on attendance at a minimum percentage (for example 75%) of a target number of physical activity sessions retention rates might fall. This presents a quandary for those involved in the delivery of ERS in that future commissioning is likely to be linked to expectations of performance. It is unknown whether schemes place an emphasis on getting participants to attend consultations regardless of attendance at physical activity sessions. The Northumberland ERS attempted to eliminate non-attenders being invited to consultations through the scheme process by classifying all those who did not attend for a period of one month as a dropout. Although comprehensive attendance data were reported, testing the fidelity of scheme process was not within the scope of the study and therefore it is unknown how many participants were invited to a 12 or 24-week consultation despite not attending any sessions in the month prior to the appointment. This is a limitation of the way in which the evaluation was set up and would be worthy of further investigation at service level.

Median (IQR) attendance at the Northumberland ERS for completers was 23.0 (13.0 to 32.0) sessions, 47.9%, of possible attendances. This represents approximately once a week attendance, rather than the two times that were the target. This compares poorly to other studies (Gidlow *et al.*, 2007; James *et al.*, 2009; Tobi *et al.*, 2012) that indicated participants achieved 80% of target

attendance. However, these cited studies did not report data about actual levels of attendance per week. The present results are similar to those reported in the RCT in Hailsham (Taylor, Doust & Webborn, 1998) where completers attended on average 45% of exercise sessions.

It was noticeable that attendance varied between sites with the highest median (IQR) attendance for a site being 31.0 (22.0-44.0) sessions (64.5% of possible sessions) and the lowest being 11.0 (9.5 to 27.8) sessions (22.9% of possible sessions). The site with the highest attendance at sessions also had the highest adherence to attendance at 12 and 24-week consultations (73.6% and 65.9% respectively); conversely the site with the lowest attendance at sessions also had the lowest adherence to at 12 and 24-week consultations (39.1% and 17.3% respectively). These findings indicated that using attendance at consultations as a proxy measure for attendance in scheme physical activity sessions is simplistic, but is perhaps not inappropriate. The striking differences in both attendance and retention between the best and poorest performing sites require further investigation. Regression analysis indicated that differences were not explained by a difference in demographics of those referred, or in reason for referral. This would suggest that delivery at a local level has a great impact on scheme success. From a service delivery perspective, providers may wish to examine staff adherence to protocols, and whether quality of consultations/activity sessions are equal across venues.

Finally, given that the Northumberland ERS only achieves average attendance rates of one session per week (potentially 60 minutes of moderate exercise)

there is a need to investigate whether participants increase other activity in order to make an assessment of whether they achieve the UK government recommended 150 min of moderate exercise or 75 minutes of vigorous exercise, or a combination of both (Department of Health, 2011).

4.5.3 Changes in self-reported physical activity

A noticeable weakness of most ERS evaluation studies has been that although it is a primary measure of effect, few have reported on differences in physical activity levels as a result of participation. Inclusion of this measure has been predominantly in RCTs using self-report questionnaires with Murphy *et al.* (2012) reporting positive significant intervention effect after 12 months for those referred for CHD only, and Stevens *et al.* (1998) reporting a significant change in moderate and overall levels of physical activity after eight months. In contrast Harrison, Roberts and Elton (2005) reported a significant intervention effect for participation in at least 90 minutes of moderate activity at six months, but not at 12 months. Of the published evaluation studies only Dugdill, Graham and McNair (2005) considered this aspect of ERS. Although these authors reported an increase in activity post-scheme and after one year, unfortunately level of significance was not reported.

In the current study self-reported physical activity was measured pre-scheme, after 24 weeks and 52 weeks via the GLTEQ (Godin & Shepard, 1985). The sample size, cost, and staff training required to use a direct measure such as accelerometry meant that a self-report PAQ was considered the most viable option to measure physical activity change. Analysis revealed a significant

positive change in activity levels $z=12.639$ ($p<0.001$); pre-scheme median (IQR) score for completers was 15.0 (5.0 to 21.0) units per week and post-scheme was 25.0 (9.0 to 31.0) units per week. One of the criticisms of the GLTEQ is that it is difficult to interpret, since the scores are correlated to the two main determinants of physical fitness, maximal oxygen uptake and percentage body fat rather than giving a value of time spent being physically active. Although the methodology used by Dugdill, Graham and McNair (2005) was used during analysis to calculate an estimated amount of activity per week, this was done for the purposes of comparison rather than as a measure of actual activity undertaken. Results were similar, with an estimated 30 minute increase in activity over 24 weeks reported in this study compared to a 27 minute increase at three months (Dugdill, Graham & McNair, 2005). In this calculation an average intensity level of moderate (5 METS) is assumed for the total score, which may not be the case. As such caution should be exercised in presuming that this is an accurate representation of increase in time spent being active.

In an updated publication Godin (2011) suggested using only the moderate and vigorous scoring to calculate a revised score, which could be interpreted as meaningful for health benefits (Godin, 2011). Using this methodology, participants significantly increased their moderate/vigorous physical activity between baseline and 24-weeks, $z=12.869$ ($p<0.001$), to a level (median 14.0 units per week, IQR 0.0-28.0) that was classed as being moderately active and having some benefits for health. Furthermore, in a smaller subsample of data ($n=271$) self-reported activity was reported to be significantly higher after 52

weeks compared to baseline $z=7.521$, ($p<0.001$). This was also at a level, (median 15.0 units per week IQR 0.0 to 28.0), classed as being moderately active and having some benefit to health. This would indicate that the Northumberland ERS was successful in increasing physical activity to a level that is beneficial to health at both 24 weeks and 52 weeks after starting the scheme. At the time of this analysis there were limited data for 52-week physical activity behaviour but the scheme is continually collecting data, meaning that there is the potential for a more powerful analysis in the future. No analysis was made as to whether respondents had continued to engage in activity at the leisure site where they participated in the scheme. Future examination of this would lead to a better understanding of the longer-term benefits of the scheme, not only for participants but also in terms of financial impact for providers. This may be particularly important if funding is reduced and providers wish to adopt a more commercial delivery model. In addition a more in-depth analysis of self-reported physical activity data for the scheme could lead to a better understanding of whether participation in the scheme resulted in different levels of activity for certain subgroups of the population, as reported by Murphy *et al.* (2012).

4.5.4 Predictors of uptake and adherence

The present study also analysed whether demographic/other factors relating to the referral were predictors of uptake and stage of exit from the scheme. As in previous studies (Dugdill, Graham & McNair, 2005; Gidlow *et al.*, 2007; Sowden *et al.*, 2008) increasing age was associated with uptake and adherence. In the

present study, however, almost half of the referrals (48%) were under 55 years. In the short-term, retention to this ERS could be increased by focusing referrals on those over 55 years. Attention could then be focussed on what might be a more appropriate ERS intervention for those who are less than 55 years. Further qualitative studies that improve understanding about why ERS is more successful for those who are older and not as successful for those who are younger could lead to the development of more appropriate interventions for those under 55 years.

Apart from increasing age being a predictor, there has been little consensus about how demographics are associated with uptake and adherence to ERS. This is possibly due to the relatively small number of UK studies (Lord & Green, 1995; Harrison, McNair & Dugdill, 2005; Gidlow *et al.*, 2007; Sowden *et al.*, 2008; Murphy *et al.*, 2012; Tobi *et al.*, 2012) that have examined the associations between referral demographics and engagement, and a lack of standardisation of data collection between studies. No other study has been identified where pre-scheme BMI has been considered as a predictor of uptake or adherence. In the present study, age, being female, lower deprivation, having a metabolic/endocrine secondary reason for referral, and leisure site were reported to be significant predictors of uptake. Lower deprivation, a pre-scheme BMI of less than 35 kg/m², being referred by a cardiac rehabilitation nurse, and leisure site were reported to be significant predictors of 12-week adherence. As 12 weeks was the mid-point of the scheme in this study, unlike most other studies, an additional element of 24-week completion was used. A pre-scheme

BMI of less than 30 kg/m² and leisure site were found to be significant predictors for this.

Not only were females more likely to be referred in this study, but in agreement with three previous studies, being female was significantly positively associated with uptake (Lord & Green, 1995; Sowden *et al.*, 2008; Murphy *et al.*, 2012). In contrast Gidlow *et al.* (2007) and Harrison, McNair and Dugdill (2005) reported no association. Two previous studies (Dugdill, Graham & McNair, 2005; Gidlow *et al.*, 2007) reported that males were more likely to adhere, but this study reported no statistical difference for starters in stage of exit, in agreement with three other studies (Lord & Green, 1995; Sowden *et al.*, 2008; James *et al.*, 2009). It is not possible to assess why such differences may have been found from the data available in the studies. Qualitative investigation may help to provide further insight. For example, studies could investigate whether particular activities offered that appeal more to one gender, or whether there are other factors that particularly influence males or females in the decision to attend.

Only two other evaluation studies have examined whether deprivation is associated with likelihood to complete; Sowden *et al.* (2008) reported it was not a significant predictor of likelihood to complete, while (Gidlow *et al.*, 2007) reported those from deprived areas were less likely to start and adhere to ERS (as did this study). As with gender, it is not possible to assess the reasons for such differences in findings from the quantitative studies. There are several questions that may add further understanding. For example, future studies could investigate perceived barriers to attendance for those who live in more

deprived areas. In addition it would be valuable to investigate whether there is a cost difference between those schemes where increasing deprivation is negatively associated with uptake/adherence and those where it is not.

Primary reason for referral was not found to be a significant predictor of uptake or stage of exit for starters; however those referred by a cardiac rehabilitation nurse (CVD secondary prevention) were more likely to adhere at 12 weeks and those with a pre-scheme BMI of ≥ 35 kg/m² were less likely to adhere at 12 weeks, while those with a BMI of ≥ 30 kg/m² were less likely to complete at 24 weeks. Other studies have reported referral for CVD to be significant; Sowden *et al.* (2008) reported that those referred for prevention of diabetes or cardiovascular disease were significantly more likely to complete than those referred for musculoskeletal/neurological, respiratory and mental health conditions; and Dugdill, Graham and McNair (2005) reported that those referred for a myocardial infarction were almost twice as likely to adhere as those referred for a mental health condition. Additionally, James *et al.* (2009) reported that those referred for overweight/ obesity, musculoskeletal, and mental health issues were less likely to take up a referral than those with cardiovascular disease, but did not find an association between reason for referral and completion for those who started. Given that this study has found that those who access the scheme through the cardiac rehabilitation pathway are more likely to adhere, examining what influences attendance in this subgroup in more detail may lead to a better understanding of influences on the likelihood of successful engagement.

In this study 42% (913) of referrals were made for overweight/obesity but 62% of recorded BMIs for starters were obese. It is therefore probable that weight loss will be a goal for participants. Analyses have shown that those who are obese are more likely to dropout of the Northumberland ERS however. Given an identified requirement to address obesity (Public Health Policy & Strategy Unit/NHS Commissioning Unit, 2013) and the known benefits of physical activity for those who are obese (Lee, Sui & Blair, 2009) there is a need to understand why the current intervention is not as successful in encouraging this group to adhere and what approach might result in more sustained engagement.

Additionally in this study leisure site was found to be a significant predictor of uptake, 12-week adherence and 24-week completion. The only other evaluation study to compare performance between two sites reported a 12% difference in adherence, which was suggested to be due to differences in implementation (Dugdill, Graham & McNair, 2005). The striking differences in results in this study have already been highlighted in section 4.5.2, but reasons for performance varying by site are likely to be complex. At the time of data collection, differing provision of leisure services in Northumberland created a challenge in providing a standardised scheme. Prior to local government reorganisation in 2009, Northumberland was a two tier authority with six district councils and as a result leisure services were provided by five different organisations. Since 2009 all ERS in the urban south east of the county were delivered by BVAL (represented by areas 1 and 2 in this study) and in the north and west by NCL (represented by areas 3 and 4 in this study). The two

organisations worked together to try to ensure standardisation of practice, but the situation was further complicated by the fact that two sites were managed by another provider, with staff from either NCL or BVAL providing the ERS service. Difference in provider appeared to be too simplistic to explain variations, since NCL sites account for both the highest and lowest adherence. The site with the highest level of adherence (site A) was the only site where ERS had been introduced since the joint management arrangement was agreed. It is possible that the apparent good practice there was a result of shared learning between the organisations.

Although there is a standardised protocol for both delivery of ERS and collection of data across the county, this study has not attempted to analyse how closely sites adhered to the delivery protocol. There were, however, some notable differences in the quality of data collection between sites as discussed in section 5.4.2 in relation to attendance reporting, which may indicate that there is a difference in the way that the scheme is implemented. On both a practical level and in terms of future evaluation, examining what elements influence difference in performance between sites would lead to a better understanding of factors influencing success.

A limitation of the quantitative data presented in this study is that it lacks insight into why age, deprivation, gender, BMI, and leisure site influence engagement in ERS. The findings clearly highlight the need to better understand why particular sub-groups are more or less likely to take part. Consideration should be given to in-depth methods such as participant interviews or focus groups, in

order to obtain rich data that might elucidate whether influences relate to the mechanisms of referral and/or to personal factors of those referred.

4.5.5 Changes in physiological measures

Health-related physiological measurements were also analysed in order to understand whether completion led to a beneficial changes. Of the evaluation studies, only James *et al.* (2009) reported the effect of completion on physiological measures, finding that it was associated with body mass reduction (OR=3.541; 95% confidence interval 2.721 to 4.608, $p < 0.001$) and reduced blood pressure (OR=1.680; 95% confidence interval 1.250 to 2.003, $p < 0.001$). In addition, those who reduced their BMI were more likely to reduce blood pressure (OR=1.292; 95% confidence interval 1.008 to 1.641, $p < 0.05$). It is difficult to make direct comparisons with the findings by James *et al.* (2009) due to differences in the methods of analysis and the fact that there is no detail of actual levels of BMI or blood pressure reduction. This study was similar in that it found that completion resulted in significant reductions in BMI, but dissimilar in that there was no reduction in blood pressure.

Although this study found a significant change in BMI this only represented a 1% reduction. Given this, it is reasonable to question whether the Northumberland ERS should include more targeted weight loss advice. In order to understand whether this would be beneficial, it is necessary to explore whether those referred because they are overweight or obese are expecting to see a BMI reduction as a result of participation. If this is the case, there is a need to better understand the effect that this small reduction has on likelihood

to continue to attend ERS. Such data may be best discovered via exploratory qualitative research to be undertaken with this group of participants.

There are some criticisms of physiological measurements taken during this study. Although they were taken by trained fitness instructors, accuracy may have been an issue. Members of staff were not International Society for the Advancement of Kinanthropometry trained and measurements were not always taken at the same time of day. It was not specified when tests should take place in relation to exercise sessions (retesting may have taken place after an exercise session). Data recording for this element of the study was the most inconsistent; however the large numbers of participants provide a good statistical power despite potential issues with measurement reliability.

4.5.6 Stage of change measures

This study found that initial stage of change did not predict adherence, in agreement with the only other identified ERS study that reported this (Jones *et al.*, 2005). In the current study 21.6% of those who started were reported to be in maintenance. Given that ERS is supposed to be an intervention for those who are inactive, this means that approximately one fifth of those referred in theory did not need the intervention. Although the scheme was based on the TTM (Prochaska & DiClemente, 1983; Prochaska & Marcus, 1994), the scheme process did not indicate that it was a staged matched intervention. All participants were expected to attend supervised sessions, regardless of identified stage of change. This may account for the fact that initial stage of change was not a predictor of adherence.

The study reported a significant positive increase in stage of change for adherers at both 12 and 24 weeks in comparison to baseline. This finding was in agreement with the only other identified ERS study that reported this element (Isaacs *et al.*, 2007). After 12 weeks the median stage of change reported was action and at 24 weeks it was maintenance. This is in keeping with the TTM and adds weight to the idea that a longer scheme is more likely to support the establishment of longer-term physical activity behaviour.

4.6 Strengths and limitations of this study

The commitment by the Northumberland ERS providers to routinely collect standardised and robust data has enabled a viable way of evaluating an intervention type that is already widespread but lacks evidence about effect. The approach has been vindicated in that since the completion of this study, NICE has recommended that all commissioned schemes collect a core set of data that should be made available for analysis (National Institute for Health and Care Excellence, 2014a). The involvement of commissioners and providers in the planning process has meant that the evaluation was seen as important by all. The resultant size of the dataset can give confidence in results, despite some of the limitations identified below.

Commissioners were very specific about the need to use certain measurement tools such as the GLTEQ (Godin & Shepard, 1985). There are some issues with accuracy of such questionnaires but due to the large number of participants, cost and staff training, the use of a self-reported PAQ was considered the only viable way to measure physical activity behaviour change. In addition, while

there has been a concerted effort to collect data in a standardised and robust manner, analysis of the data has revealed some inconsistencies in collection/reporting between sites. It was not within the scope of the study to investigate the reasons for this but there is the potential for improved reporting in the future if these issues can be addressed.

The study has attempted to identify who ERS was successful for in Northumberland. The factors analysed only minimally increased prediction accuracy levels. This would indicate that there are other factors that have not been considered in this study that are associated with how long participants engage with the scheme. There is a need to use other methods of enquiry to understand these factors.

4.7 Conclusions and recommendations for future research

In conclusion, over 80% of referrals attended an initial consultation for the ERS in Northumberland; 54% of those who started the scheme adhered at 12 weeks and 43% at 24 weeks. The scheme was successful in encouraging referrals that completed to attend supervised sessions on average once a week over a six-month period. There was a significant rise in self-reported physical activity levels for completers at both 24 and 52 weeks to a level that would provide some health benefit.

The scheme was more likely to be successful for those who were over 55 years and those who were referred for cardiovascular secondary prevention.

However, the scheme was less successful for those with a BMI of ≥ 30 kg/m²

and for those who were from areas of greater deprivation. Although females were more likely to be referred and to take up referral, there was no difference in completion between genders. All factors considered only minimally increased predictions accuracy levels. For those who completed the scheme, there were small but significant reductions in BMI and waist circumference.

There are several key recommendations resulting from the findings of this study¹ relating to both current practice in ERS and future research:

- Uptake of, and adherence to, ERS in its current format could be improved by restricting referrals to older age groups.
- There is a need for established ERS to create ongoing robust data routine collection and make these data available for analysis. In particular schemes should provide a long-term measure of physical activity behaviour.
- There is a need for an increased understanding of how closely ERS protocols are adhered to by providers and the effect that this has on uptake, adherence, and change in physical activity.
- There is a need for in-depth qualitative studies that explore what elements of ERS encourage or discourage successful participation. In particular there is a need to better understand why ERS is more

¹ Some of these data have been published *BMJ Open* 2013;**3**:e002849
doi:10.1136/bmjopen-2013-002849.

successful in engaging with those who are over 55 years old, but has less success with those who are younger, are overweight /obese and/or live in areas of greater deprivation.

5 Participant perspectives; why come, why stay, and what difference will it make?

5.1 Introduction

While the growing body of quantitative studies for ERS provide an insight into who is more likely to engage with such interventions, these studies fail to contribute to an understanding of *why* ERS are more appealing to certain population sub-groups than others. Given that questions have been raised about overall effectiveness of ERS (Pavey *et al.*, 2011; Campbell *et al.*, 2015) and that there is a policy impetus to better understand what elements of such schemes work best (National Institute for Health and Care Excellence, 2014a), there is a need to examine what key elements facilitate success.

Exploring *why* sub-groups are more or less likely to initially engage with, or continue to attend, ERS has value in informing more effective practice and future policy. This is because it will enhance understanding of the complex socio-demographic, environmental, economic, and cultural barriers that may inhibit physical activity behaviour change. Building on the knowledge gained in the first study of this thesis, which has highlighted groups who may be well or poorly served by ERS, with a qualitative exploration of participant's perspectives has the potential to provide detail on individual experiences and give insight into what influences engagement in such interventions.

The statistical analyses undertaken in study one were helpful in identifying who the Northumberland ERS was more likely to be successful in engaging: those

over 55 years old, those in the cardiac rehabilitation pathway, and females. It also identified those who it was less likely to be successful in engaging: those who live in areas of greater deprivation and those who are obese. This helped to highlight areas worthy of further investigation such as why ERS appears to be an intervention that is appealing to older adults, a finding that has been consistent across several other studies (James *et al.*, 2008; Sowden *et al.*, 2008; Murphy *et al.*, 2012; Tobi *et al.*, 2012). As this is a population sub-group where physical activity levels are known to be lower (World Health Organisation, 2010), a greater understanding of what encourages participation would be beneficial. While published literature specific to the field of ERS is lacking, knowledge from other community-based health initiatives for older adults may have some synergy in informing practice. For example, group sessions, peer support, scheduled follow-up meetings, personalised plans, and goal setting were reported to be important elements in successful community-based nutrition initiatives for older adults (Bandayrel & Wong, 2011).

Quantitative results from the initial study were treated with some caution in understanding determinants of participation however, as prediction accuracy was limited. This indicated that other factors not considered in study one were associated with whether participants engaged with the scheme and if they did, how long they engaged for. This finding resonates with the large number of studies of physical activity in the general population that have shown that the determinants of participation are likely to be much more complex than demographics alone. For example, factors known to discourage participation

include lack of money, feeling too tired, dislike of exercise (Reichert *et al.*, 2007), perceived ill-health (Pan *et al.*, 2009), work commitments, not being the 'sporty type', and looking after others (Zunft *et al.*, 1999). In contrast, weight management, social interaction/support, enjoyment, staving off the effects of older age, (Allender, Cowburn & Foster, 2006), maintaining good health, and releasing tension (Zunft *et al.*, 1999) were identified as reasons to participate. Pan *et al.* (2009) reported that higher levels of self-efficacy were consistently associated with higher levels of physical activity, regardless of demographics. In addition, Kern, Reynolds and Friedman (2010) suggested that physical activity needs to be understood within the context of an individual's personality and long-term trajectory rather than just current motives.

There is a need to better understand the complexity of physical activity behaviour within the context of participation in ERS, which particularly targets those who are inactive and have long-term medical conditions. Further research is required to establish whether determinants of participation in ERS are different to general participation in physical activity. It is possible, for example, that having a medical condition positively affects the decision to participate in ERS when it might discourage other physical activity. There is also a need to explore which elements of such schemes act as a catalyst to bring about behaviour change.

One way of attempting to understand physical activity behaviour has been the application of theoretical models of behaviour change. These have been discussed in detail, as has the evidence about their application to ERS, in

chapter two, section 2.4.5. From the limited number of studies relating to ERS, it is not possible to conclude whether the key behaviour change theory concepts of self-determination (Deci & Ryan, 1985; 2000), stage of change (Prochaska & DiClemente, 1983), or self-efficacy (Bandura, 1977) are predictors of uptake or adherence. Studies have reported however, that self-determination (Edmunds, Ntoumanis & Duda, 2007; Morton, Biddle & Beauchamp, 2008), and self-efficacy and stage of change (Jones *et al.*, 2005) increased during participation for those who continue to attend. Realistic pre-scheme expectations were also reported to be a predictor of adherence (Jones *et al.*, 2005). An examination of how and why decisions about referral and participation are made may provide an understanding about whether key concepts/recommendations from any of the behaviour change theories are being applied in ERS. This may also aid understanding of how different models of health and health behaviour interact at a personal level and affect individuals' lives.

Despite many of the theories above including components relating to perceptions of others, only a few studies have examined perceptions about participation for those taking part in ERS (Lord & Green, 1995; Singh, 1997; Taylor, Doust & Webborn, 1998; Martin & Woolf-May, 1999; Stathi, McKenna & Fox, 2004; Wormald & Ingle, 2004; Dugdill & Graham, 2005; Pentecost & Taket, 2011). GP recommendation was reported to be an influencing factor in the decision to participate (Stathi, McKenna & Fox, 2004). Reported facilitators to adherence were professional, supportive staff; reported improvements in mental or physical health; and social support from other participants (Singh, 1997;

Taylor, Doust & Webborn, 1998; Martin & Woolf-May, 1999; Stathi, McKenna & Fox, 2004; Wormald & Ingle, 2004; Pentecost & Taket, 2011). Barriers to adherence were reported to have included inconvenient operating hours, intimidating exercise environment, insufficient staffing, and narrow range of activities available (Taylor, Doust & Webborn, 1998; Wormald & Ingle, 2004; Dugdill & Graham, 2005), poor organisation (Lord & Green, 1995), and transport, illness, and time (Martin & Woolf-May, 1999). The poor quality of many of these studies was criticised by Williams et al., (2007) due to their superficial nature and the fact that most participants were adherers and so likely to be positively-biased. Given this, there is a need for further studies that address the issues of adequate depth and participation bias.

One way to combat such bias is to target participants for studies after the point of referral but before the start of the scheme and examine their perceptions before they take part. There has been no research identified that has explored the pathway to, and motives for, referral from a participant perspective prior to starting. Given that approximately one-third of referrals do not take up ERS (Pavey *et al.*, 2012), understanding what happens prior to, and immediately following referral could help to improve uptake.

The first study of this thesis found that those who dropped out attended a median of 2.0 (IQR 0.0 to 5.0) sessions out of a possible 48, which indicated that referrals were either lacking in motivation or ability to participate in the first place, or that what happened in the first few sessions was very important in affecting decisions about whether to adhere or dropout. Exploring perceptions

before participation may help to clarify whether motivation/ability to participate are important determinants. This second study therefore targeted participants after referral but before taking part in the initial consultation. While bias may result from the initial referral process, the practicalities of identifying and recruiting study participants who did not know about ERS but were eligible to be referred were beyond the scope of this programme of evaluation research.

In summary therefore, the second study of this thesis was designed to gain an understanding of participants' perspectives about the decision to be referred to the Northumberland ERS and what they expected to achieve by attending. Although study one provided some focus for further examination, a lack of existing ERS literature meant that chosen methodology needed to be exploratory in nature and develop, rather than test, established theory. This resulted in a qualitative design that used the principles of a Grounded Theory approach (Glaser & Strauss, 1967). Semi-structured interviews were used to allow for an inductive process of theory development, with data collection, analysis and theory development standing in a reciprocal relationship with one another (Corbin & Strauss, 2008). Specifically this study investigated:

- How and why participants engaged with the scheme in the first instance
- Pre-scheme perceptions of ERS
- How past experience of physical activity and other lifestyle factors affected views about participating in the Northumberland ERS
- Perceptions about what might encourage participation
- Perceptions about what might discourage attendance

5.2 Method

5.2.1 Study design

The study used qualitative methods in order to facilitate an in-depth study of participant perspectives without being constrained by pre-determined categories (Patton, 2002). It was an emergent exploratory design using the principles of a Grounded Theory approach (Glaser & Strauss, 1967), which is discussed in detail in chapter three, section 3.6. The study focused on participant perspectives of the Northumberland ERS after referral but prior to starting the scheme for referrals made between May and June 2013 to two leisure centres in Northumberland. In doing this it aimed to better understand why some participants are more likely to engage and continue to engage in ERS than others.

5.2.2 Semi-structured interviews

Charmaz (2014) recommended the use of interview guides within a Grounded Theory approach (Glaser & Strauss, 1967), particularly for inexperienced researchers, in order to avoid asking awkward, poorly-timed, intrusive questions that may contain unexamined preconceptions. A semi-structured interview guide was therefore designed to allow freedom to explore, probe, and ask questions from defined topic areas in order to better understand the subject (Patton, 2002).

Initial interview questions were developed to explore past experiences of physical activity, experience of the referral route to date (how and why they had been referred), what participants expected to happen during their time on the scheme, and whether they perceived there were any factors that would either particularly encourage or discourage attendance. Gender, age, and reason for referral were also recorded at this interview. All interviews began with the question 'Could you start by telling me a bit about what sort of physical activity you have taken part in in the past?' This approach, similar to that discussed by DiCicco-Bloom and Crabtree (2006), was used as a way of reducing participant apprehension, validating the relevance and worth of their previous experiences, and building rapport. It helped to provide an insight into wider social context before the interview moved onto more specific questions about how the participant came to be referred to the scheme, what they had experienced of the referral process to date, what they expected from the scheme, and finally what they perceived might affect their attendance at the scheme.

It was considered important to understand if participant perceptions were based on misunderstandings, for example whether they expected to pay to take part. As a result, any misconceptions were discussed before interviewees were provided with information about the ERS that might have an effect on whether they decided to engage. For example, when discussing cost, if a participant was not aware that they would have to pay to attend, they were informed that there was a cost and the amount that they would be expected to pay. The interview schedule can be found in Appendix 7.

5.2.3 Ethics

Ethical approval was granted by the institutional ethics committee and written informed consent was obtained from all participants. Details of the consent form, participant information sheet and participant debrief sheet can be found in Appendix 8. Participants were asked to take part in an individual semi-structured interview prior to starting the Northumberland ERS to explore their motives to be referred, experience of referral, expectations, and perceived influences on participation in the scheme.

5.2.4 Participant recruitment

Adults who were referred to the Northumberland ERS between May and June 2013 to two leisure centres in South East Northumberland were invited to join the study. Only two of the nine leisure sites studied were chosen from which to sample referrals due to practical limitations such as time taken to travel long distances between sites. Referrals to the two sites were representative of the whole spectrum of participants for the Northumberland ERS; that is a broad adult age range, of both genders, from a range of economic circumstances, and with referrals covering different medical conditions included in the referral criteria. Initial sampling of participants was done by convenience (Corbin & Strauss, 2008). Whoever agreed to participate from referrals made early in the recruitment period took part in initial interviews, with later sampling based on emergent theoretical categories (Strauss, 1987). This allowed for a more in-depth exploration of concepts that emerged during the initial interviews such as pathway to referral.

In the first instance the administration officer for the ERS asked all referrals being invited for an initial consultation during the recruitment period if they wished to participate in the study. Later guidance was provided from emergent themes as to the characteristics of further participants. These were mainly related to age and reason for referral. This was because these two factors appeared to be important in forming perceptions of ERS. Referrals were contacted via telephone by the administration officer to arrange their initial consultation. During this call they were told about the study and invited to take part. Those who expressed an interest were sent further information in the post and asked to sign the consent form (Appendix 8) in order to register for the study. Appointment times for interviews were arranged by the administration officer. Recruitment continued throughout the period of time that referrals made in May and June 2013 to the selected leisure centres were being invited for initial consultation.

Fifteen adults agreed to participate in the study. Of these, six were male and nine female; the mean (SD) age was 52 (14) years, with an age range of 23-70 years; primary reasons for referral were three for mental health, three for CVD secondary prevention, one for diabetes, two for musculoskeletal problems and six for overweight/obesity. Most of the participants presented with several co-morbidities. Three of the participants were referred from cardiac rehabilitation and 12 from primary care. Three of the referrals from primary care had previously participated in the ERS. Participants were labelled P1 – P15 in order

to maintain anonymity. Table 5-1 below shows a breakdown of participant characteristics.

The sample broadly reflected an equal profile of those who were most likely to dropout and those who were likely to adhere based on the findings of study one. Fifty percent of the sample were aged 55 years or over. Male/female split also reflected the gender split of referrals in the initial study (40% male / 60% female).

Table 5-1 Participant characteristics for study two

| Characteristic | | P1 | P2 | P3 | P4 | P5* | P6 | P7 | P8 | P9 | P10 | P11 | P12 | P13* | P14 | P15* |
|---------------------|--------------------------|----|----|----|----|-----|----|----|----|----|-----|-----|-----|------|-----|------|
| Demographic | Gender | M | M | M | F | F | M | F | F | M | F | F | F | F | M | F |
| | Age | 50 | 24 | 52 | 70 | 65 | 66 | 23 | 51 | 59 | 44 | 60 | 42 | 69 | 60 | 45 |
| Reason for referral | Mental health | ✓ | ✓ | | | ✓ | | | | | | | | | | |
| | CVD secondary prevention | | | ✓ | ✓ | | ✓ | | | | | | | | | |
| | Overweight / obesity | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | | | ✓ |
| | Musculo-skeletal | | | | | | | | | | | | | ✓ | ✓ | |
| | Diabetes | | | | | | | | | | | | ✓ | | | |
| Source of referral | Primary care | ✓ | ✓ | | | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Cardiac rehabilitation | | | ✓ | ✓ | | ✓ | | | | | | | | | |

*previously participated in ERS

5.2.5 Data collection

Data were collected through individual semi-structured interviews. All interviews were conducted privately. As previously discussed I was employed by the provider as the strategic manager of the ERS but was not involved in delivery of

the scheme at this point. While in the past an outsider, objective stance was considered desirable in research terms to guard against identification, insider insight can now be considered to be both legitimate and desirable due to the potential for increased empathy with participants (Gair, 2012). From a participant perspective, the only contact was in a research capacity. Interviews took place at the leisure site where the participant would join the scheme and were arranged to be prior to the initial consultation. The decision about when and where to conduct interviews was made for the convenience of participants, who would already be attending the leisure centre on this day. Interview length ranged from 22-58 minutes (mean 41 minutes) and all sessions were audio-recorded. Participants were assured that interviews were confidential prior to starting.

5.3 Data analysis

Digital recordings were transcribed verbatim. Initial analysis began at this stage alongside ongoing interviews. The principles of a Grounded Theory approach (Glaser & Strauss, 1967) were applied and in early analysis no clear categories were pre-defined. Instead attention was paid to areas that were identified by participants, which helped to raise awareness of the presence of similar themes in subsequent iterations. Recordings were listened to several times to increase familiarity and check transcripts for accuracy. This 'immersion' in the data (Corbin & Strauss, 2008) helped to gain a sense of what the data was saying and allowed ideas and themes to emerge. As discussed in chapter three, Corbin and Strauss (2008) identify two key aspects in grounded theory analysis:

asking questions and making comparisons. In initial analysis of the data, six sensitising questions (Corbin & Strauss, 2008) emerged and were used to guide analysis:

1. 'What were interviewees saying about their history of participation in physical activity?'
2. 'How and why did participants make their decision to agree to referral?'
3. 'What had been participants' experience of the referral process to date?'
4. 'To what extent did experience of the referral process affect perceptions of ERS?'
5. 'What was the perceived importance of the structure of ERS in decisions about attendance?'
6. 'How important did participants perceive that achieving personal change would be in decisions about attendance?'

An open approach to the coding process (Glaser, 1978) began with the development of descriptive codes through making constant comparisons between themes identified both within and between scripts. Early codes reflected initial themes of influences on the decision to be referred; perceptions of what benefits would be achieved by attending; and perceived potential barriers and facilitators to participation. For example, influences on the decision to be referred included codes such as 'health issues', 'previous positive experience of physical activity', 'getting out of the house', 'being healthy for others in the family' and 'suggested by a health professional'.

Following initial coding of the data, the coding paradigm suggested by Strauss (1987) consisting of 'conditions', 'interactions among the actors', 'strategies and tactics', and 'consequences' was used in conjunction with further reading of the literature. For each sensitising question, careful consideration was given to what participants were saying about the four areas identified within the coding paradigm. For example when considering what participants' experience of the referral process to date had been, conditions included lifestyle factors and health problems that led to referral. Interactions among actors included participants' contacts with their referrer and with ERS staff. Strategies and tactics included current approach to/participation in physical activity, and consequences included expectations of ERS.

Interviews typically elicited comments about positive or negative experiences of physical activity in interviewees lives, the health and often social context that led to referral, experience of the initial referral process, what they hoped to achieve, and how some, or all, of these factors were perceived to be potential influences on decisions about whether the participant would continue to participate in the scheme. This resulted in the development of four categories of data; *'lifestyle'* prior to referral including past experience of physical activity and social context, *'motives'* to be referred, *'expectations'* of participation in the scheme and *'perceived influences'* on participation. It became apparent that, lifestyle aside, emerging categories could be split into two contexts (1) structural factors relating to the referral process; (2) personal factors affecting the participant. In considering the question *'how and why did participants make their decision to*

agree to referral? for example; the *'how'* was reported to be influenced by structural motives (the process of referral) while the *'why'* was reported to be influenced by both structural and personal motives.

Having developed categories and themes based on the sensitising questions and use of the coding paradigm, along with consideration of associated literature, rereading of the transcripts led to two theoretical questions:

1. 'Did lifestyle affect the likelihood of referral and if so how?'
2. 'Was there a temporal link between the concepts of motives, expectations and perceived influences on participation?'

These questions helped to identify process, variation, and make links between concepts. For example if an interviewee's main motive for referral was reported to be weight loss, did expectations centre on weight loss? If so, was weight loss, or lack of, the main perceived influence on participation? Conversely, if an interviewee perceived that they would enjoy participating; did they also perceive that this might change their expectations of weight loss as the main motive to attend? Consideration of these questions, along with the earlier analysis led to the development of a variation of a conditional/consequential matrix (Clarke, 2005) (Figure 5-1) overleaf.

This conceptual guide recognised the complex nature of the interaction between the emerging elements and allowed for a process of ordering to take place.

There was a temporal link between themes, with motives for referral influencing expectations, and both motives and expectations influencing perceived

influences on participation. The decision to be referred was influenced by the complexity of past experience of physical activity and the social context, values and beliefs of the participant. Figure 5-2 shows a schematic representation of this.

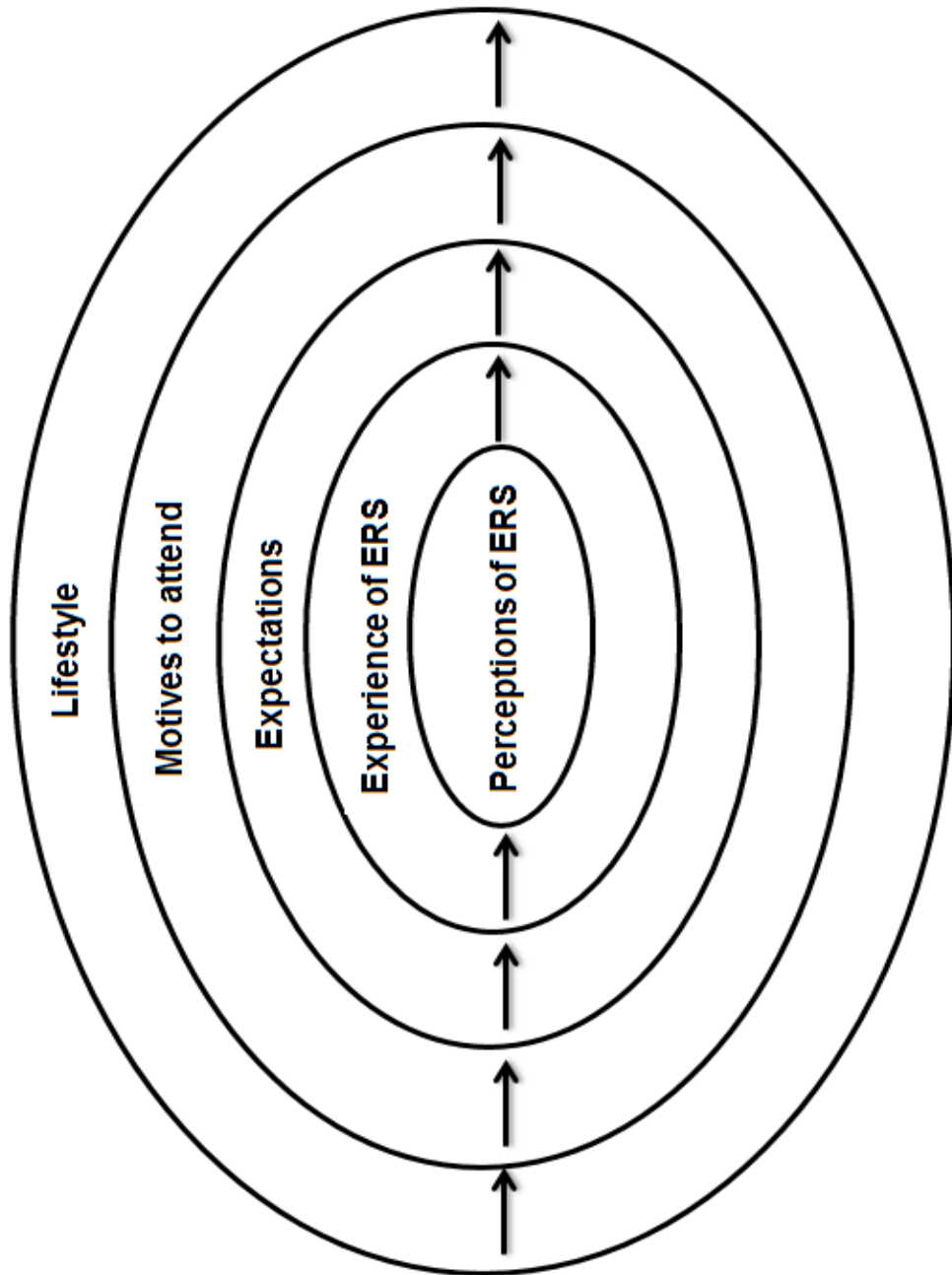


Figure 5-1 Conditional/consequential matrix for participation in ERS

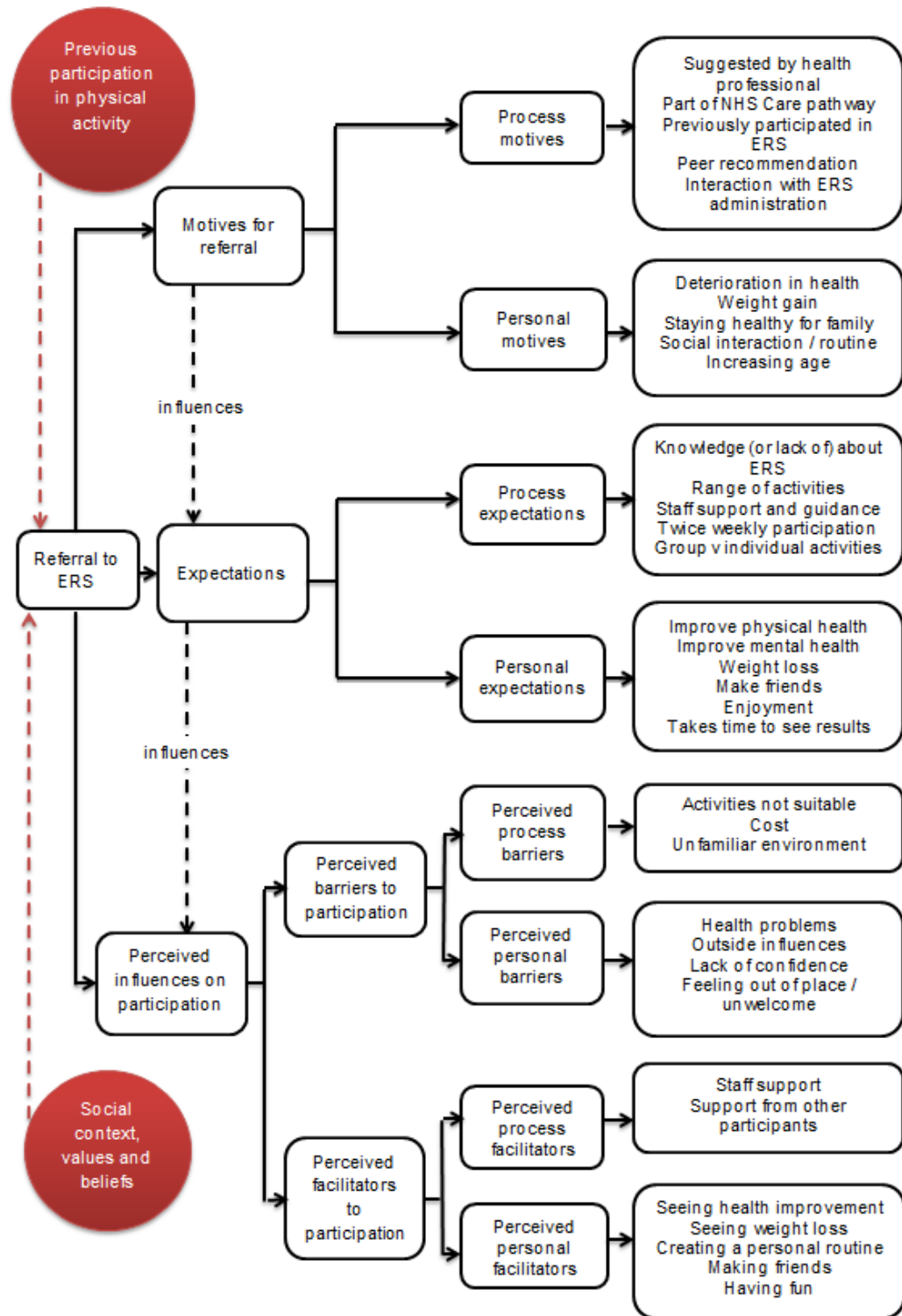


Figure 5-2 Themes from participant perspectives prior to starting the Northumberland Exercise on Referral Scheme

5.4 Results and discussion

This study aimed to investigate what influenced participant decisions about whether to engage with the Northumberland ERS in the first instance, what they expected from taking part, and what they perceived might influence decisions about whether to continue to attend. From Figure 5-2 it can be seen that lifestyle and previous participation in physical activity aside, the key themes of motives, expectations and perceived influences emerged during analysis. Within each, the sub-contexts of process and personal factors were apparent. The results are split into five sections that consider (i) lifestyle and physical activity prior to referral; (ii) the context of process in motives for referral, (iii) the context of process in the formations of expectations of, and perceived influences on participation in, ERS, (iv) the context of personal factors in motives for referral, (v) the context of personal factors in the formation of expectations of, and perceived influences on participation in, ERS.

5.4.1 Lifestyle and physical activity prior to referral

Lifestyle factors strongly influenced participant's perceptions about physical activity in general and more specifically about why they were not currently active. Study participants did not report that these were direct influences on the decision to be referred, however they provided context and demonstrated the complexity of influences on physical activity behaviour choices for those referred to ERS. Issues raised were often reflective of those identified in the existing non ERS-based physical activity literature. Commonalities included negative school sports experience (Allender, Cowburn & Foster, 2006),

work/study commitments, and looking after others (Zunft *et al.*, 1999) being reported as barriers to physical activity. Social support and networks were also reported to have an effect on physical activity. This could be either a barrier or facilitator to exercise dependent on context (McNeill, Kreuter & Subramanian, 2006).

Participants stated that early experiences of physical activity tended to revolve around physical education at school. For some school sport was a positive experience, which encouraged lifelong participation:

'Well I used to run ... erm ... and do long jump at school ... I loved sport ... and when I was a bit older I used to cycle to work ... and I did yoga ... and I love walking around ... and on and off I've come to the gym doing different things.'
(P4, female, aged 70)

For others it provided a chronic negative experience of exercise and a dislike of sport that has continued throughout life:

'Well when I was at school I hated sport ... I couldn't do any ... and I have just never ever been into sport ... and as I got older I just actually hate it ...' (P5, female, aged 65)

Those who reported previous positive experiences of physical activity were more positive about the idea of taking part in the activities offered by ERS. Negative school sport experiences did not prevent referral to ERS in this study, but it did influence perceptions about whether participants expected to enjoy the activities on offer. Since enjoyment was reported to be a perceived facilitator to adherence, it is possible that those who did not enjoy sport/physical activity prior to referral may be less likely to adhere to the scheme as they did not anticipate enjoying taking part.

Current personal circumstances were also reported to influence levels of physical activity. Participants gave examples of how they perceived lifestyle issues affected their ability to be active. These were often expressed as barriers to participation. Commitments such as work or caring for others limited the time available to take part in physical activity:

'well its silly shifts ... I'm a cleaner ... erm start at half past one in the morning til 10 ... what I tend to do is when I get back at 10 o'clock I'll go to bed til maybes 12, 1 o'clock ... and then but I'm back to bed by half past nine, 10 o'clock at night ... so I am limited' (P1, male, aged 50)

With the exception of one participant, all those under 50 years old had children and would require childcare during school holidays in order to continue to attend sessions. Some of the older participants were involved in childcare for grandchildren or were committed to an element of care for elderly relatives:

'I look after my grandchildren in the summer holidays so I mean I wouldn't be able to do it until the end of the holidays...' (P13, female, aged 69)

'my dad is due to have a knee replacement ... If he needs somebody to stay with him it will probably be me ... I went there yesterday and it's a good hour to get there depending on when you are going in the day so if I had to go there after work it would be difficult...' (P8, female, aged 51)

Although caring for others/work commitments were seen as a potential barrier in terms of time available to attend, being fitter in order to enjoy time with children/grandchildren or partners was also seen as a perceived benefit of potential participation. As with perceived potential enjoyment versus perceived health benefits, participants were required to make a decision about whether perceived benefits are great enough to prioritise time to attend.

For some, social support and networks influenced the amount of physical activity undertaken prior to referral. Where activity was not the norm within a social circle, it was not seen as a priority lifestyle choice:

'It was when I bought my own house and I started to live on my own and I started to like going out ... Socialising rather than the keep fit bit of it ... it seems I got my own house and I found this social life ... and now I am married and you settle down' (P12, female, aged 42)

Interviewees were not specifically asked about financial circumstances, but two participants who stated where they lived (an area of high deprivation) referred to lack of support from their family in becoming more physically active:

'because my daughter keeps saying to me "mam you ought to go swimming with me" and then I get all keyed up to go swimming and then she doesn't appear' (P10, female aged 44)

Other participants, in contrast, spoke of the support of family and friends to take part in the scheme but how this related to level of affluence was not explored during these interviews. Although this was not developed as a theme, given that study one found higher deprivation to be a predictor of both uptake and adherence, this is an area worthy of further study in the future.

5.4.2 The context of process in motives for referral

Participants found out about the scheme in several ways. For some, a recommendation by a health professional to participate in the scheme explained both how and why they had been referred. These participants were either already in an NHS care pathway (cardiac rehabilitation) or were

opportunistically referred by a health professional during a surgery-based appointment:

'I was at the doctors for my blood pressure review and she took my blood pressure and it was raised ... the usual story ... and then she said I've got to ask you about exercise ... do you take any exercise? ... and I says not really, not since all of this with my hip ... and she said how do you feel about going for this exercise? ... and I said oh well I will try anything ...' (P11, female, aged 60)

For those who were opportunistically referred, a reported lack of information given by the referrer meant that little was known about what would happen when participants attended the scheme:

'I don't think she told me very much to be honest ... she said there was a form to fill in and to sign ... and that would be sent over to here (the leisure centre) and then I would get a phone call to go for an assessment' (P8, female, aged 51)

The scheme provided information for referrers to give to patients, but only one referral had been given a leaflet in primary care. Participants expressed views that health professionals either did not know much about, or did not have time to explain, the ERS. This meant that there were limited opportunities to make an informed decision about the desirability of participation until attendance at the initial consultation. Reasons for this lack of information giving are not clear. A limited number of studies have examined ERS from a health professional perspective, but those that have identified lack of time and low prioritisation of physical activity promotion during consultations as barriers to referral (Graham, Dugdill & Cable, 2005; Din *et al.*, 2014). It is possible that although health professionals in Northumberland are willing to use the service, they are not sufficiently aware of the scheme, or engaged enough in the promotion of

physical activity to prioritise time to give more in-depth details to those they refer. This is an area that requires further investigation.

In contrast, those who were already in a cardiac rehabilitation NHS care pathway that resulted in a referral to ERS appeared to be well-informed about the scheme and reported a smooth transition. After finishing cardiac rehabilitation one week, these participants were moving straight onto the ERS the following week.

'It was just through the class (cardiac rehabilitation) that I have been doing over the last eight weeks they just said there is another class if you want to go on to it after your eight weeks is finished ... and I thought why not?' (P3, male, aged 52)

The three interviewees who accessed the scheme in this way had already attended eight weeks of sessions in the same leisure centre. Members of leisure staff were common to both interventions and these participants tended to be more informed about the scheme than others in the study:

'She said well it's just the same like the warm up, the cool down ... what she says you do different things in between what you aren't doing in the first one ... then she said well you can go into the gym if you want or you can go into the aqua fit' (P6, male, aged 66)

Cardiac rehabilitation participants used phrases such as '*moving onto the next stage*' and how they had '*really built confidence up again*' so that they felt '*ready to move on*'. Bock *et al.* (1997) reported that those who participated in a 12-week cardiac rehabilitation programme made positive decisional balances about exercise at the start of the programme, while self-efficacy increased after participation. Such findings resonate with the findings of the current study. This

group may have a different psychological perspective to those referred in a more preventative capacity however. Participants reported that they had undergone what was perceived to be a life threatening event and were therefore inclined to make positive healthy lifestyle changes. In addition, consistent engagement with health professionals alongside fitness professionals during cardiac rehabilitation had helped to embed the importance of being active.

Of the 15 participants in this study, six sought referral rather than having it suggested to them. For this group personal reasons were more influential in the decision to be referred than the process of referral itself. There were two subgroups; three participants who had previously accessed the scheme:

'I did do the programme a long time ago, it must have been over 10 year... it was when it nearly first started' (P15, aged 45)

and three where it was recommended by a peer:

'There was a lady at work who mentioned it because her husband was on it' (P12, aged 42)

All six of these participants were focused on the health gains that they hoped they would achieve by attending the scheme.

As with the opportunistic referrals, those who sought referral were given little information about the scheme by primary care. Unlike those who were referred opportunistically however, this was not necessarily seen as being problematic. This was due to knowledge gained through previous participation or from peers:

'She didn't really need to (tell me about the scheme) because I knew about it' (P5, female, aged 65)

Since this study considered perceptions prior to participation it is not known whether those who sought referral were more likely to adhere than those who were opportunistically referred, a view that was expressed by ERS professionals (Moore, Moore & Murphy, 2011a). This is an area that is worthy of further investigation as a better understanding may influence referral practices.

5.4.3 The context of process in the formations of expectations of, and perceived influences on participation in, exercise on referral

Knowledge gained via the referral process helped to frame expectations, or lack of, about the way that the scheme was structured. The lack of information from referrers has been discussed in the previous section. In addition the information given by the ERS itself when arranging the initial consultation influenced expectations. Most participants thought that they would attend ERS twice a week, but other than that were unsure about what to expect:

'I didn't know nothing about it ... I mean I knew I had a meeting and then obviously that was it ...' (P2, male, aged 24)

'I don't know (what I want to do) because I don't know really what there is ...' (P11, female, aged 60)

Participants from cardiac rehabilitation had appointments for the initial ERS consultation arranged during cardiac rehabilitation sessions. All others were telephoned and invited to attend. The amount of information given during this telephone call varied. In one case the call had further informed expectations:

'It was actually the person on the phone that told us ... I asked her what I would be doing ... She explained that it would be I think twice a week for two hours

and that it would be one hour doing something and then it would be one hour in the gym I think it was' (P7, female, aged 23)

For the majority, however, information seemed to have been limited to details of the initial consultation. Some were left confused about what to expect:

'I don't know what the assessment is... When I was speaking to (administration staff) ... and she said obviously I will get an assessment ... erm ... just to wear comfy shoes. I don't know if it was a step test or something ... She said everything will be explained to you when you go in' (P12, female, aged 42)

In particular many participants reported that they did not realise that they would be required to pay to attend activity sessions. The cost per session was £3.20 and for some this was an immediate barrier to attendance:

'I did not realise that no (that there was a cost for sessions) I thought that when you were referred you didn't ... I cannot afford it either ... I mean that's a lot of money ... if I come in the few times a week ...' (P2, male, aged 24)

Others stated that cost would not prevent them from attending, but they had expected that the scheme was free since it involved a referral from the NHS:

'Well it seems funny... because that's a funny thing... I mean I don't mind paying at all... but I'm saying it's like fitness on prescription and we are entitled to free prescriptions you know what I mean ... and we are doing it for our own good so that we don't put a strain on the NHS for the rest of our lives ... so you know but ...' (P15, female, aged 45)

Cost has been well documented as a potential barrier to participation in physical activity (Allender, Cowburn & Foster, 2006; Reichert *et al.*, 2007). In a study of perceived exercise barriers, enablers, and benefits among exercising and non-exercising adults with arthritis (Wilcox *et al.*, 2006) cost emerged as a barrier to exercise for both groups, but seemed to be especially prohibitive among non-exercisers who lived on a limited income. Since ERS targets, among others,

those on a limited income who are inactive, cost is potentially a barrier for this sub-group. Whether this is a perceived or actual barrier is debatable however. For example, although P15 stated that having to pay would not prevent attendance, she discussed strategies to ensure that she had enough money to attend. These involved not attending other activities in order to pay for ERS. Given the concerns expressed, it is reasonable to assume that for this participant paying for sessions could be an actual, rather than perceived, barrier to attendance.

Some participants expressed the view that ERS should be free as it was an NHS treatment. This raises further issues about whether such a referral is an extension of the social care structure or a way of empowering patients to take responsibility for lifestyle decisions. The views expressed in this study indicate that ERS is seen as an extension of the medical/social care system rather than a behaviour change empowerment tool. Despite the name, most ERS are not a referral in the NHS sense of being free at the point of delivery. It is possible that an empowerment approach taken by health care professionals at the point of referral, such as that now well established for the prevention and treatment of type two diabetes (Anderson & Funnell, 2010), could lead to better targeting of such schemes. This would not remove the barrier of cost, however, and at the very least potential participants need to be made aware of charges at the point of referral. Achieving such an approach is potentially problematic as it has already been identified that healthcare professionals do not spend time discussing ERS in any detail.

Those participants who were referred by cardiac rehabilitation or sought referral tended to have more realistic expectations about how the scheme was structured. Where process knowledge was lacking during interviews, participants were informed about the activities offered; gym usage, circuit classes, racquet sports, and swimming. Reactions to this varied from those who said that they were willing to try anything:

'Swimming and I could try tennis ... Oh yes I would go into the gym ... that's not a problem ... I wouldn't mind that either (circuit class)' (P10, female, aged 44)

to those who had very set ideas about what they would take part in:

'To be quite honest the likes of badminton and tennis and that, I've never really had any interest in that sort of activity ... I'd rather watch paint dry to be quite honest ... more the gym and circuit training to be quite honest' (P1, male, aged 50)

Perceptions about the appeal of activities varied between participants in this study and previous research has indicated that a narrow range of activities provided a barrier to ERS (Taylor, Doust & Webborn, 1998; Wormald & Ingle, 2004; Dugdill & Graham, 2005). The option to take part in a range of appropriate activities that appeal to participants, rather than adopting a 'one size fits all' approach could encourage adherence.

In addition to the actual activity, the leisure centre environment was a perceived barrier from some participants; who worried that they would not feel comfortable:

'I just feel weird... Like I'm not in my usualI've never worn trainers for a good six years so I just feel awkward' (P7, female, aged 23)

I think if I didn't feel comfortable then I would not come back (P13, female, aged 69)

For one participant in particular (P11), the idea of having to exercise in a leisure centre reduced her to tears:

'I am absolutely terrified... I'm worried about everything... I'm not really worried about being with other people... it's more the environment' (P11, female, aged 60).

Schemes should be mindful of the fact that those who are sedentary may never have been in a leisure centre prior to attendance at ERS. Discussing anxieties and addressing any issues about what constitutes suitable activities should be an important part of the initial consultation process in order to facilitate attendance at the first few activity sessions.

All participants, with the exception of one, expected to attend in a group although it was not necessarily their preferred option:

"Well that is partly what made us go for it (attending in a group) because I was considering just going to the gym but I didn't have anyone to go with ...' (P7, female, aged 23)

'Well I'm not wild about it (being in a group) but I've got to be realistic and I know that it is not going to be one to one ... So I will just have to grin and bear it ...' (P11, female, aged 60)

From existing qualitative studies of ERS (Singh, 1997; Wormald & Ingle, 2004; Pentecost & Taket, 2011), the support of peers was seen as important. This is common to other literature about physical activity participation (Allender, Cowburn & Foster, 2006). Many of the participants in this study perceived a

high value to being in a group and commented on the social aspect of the scheme:

'I don't think that I would be as motivated as much going by myself ... Whereas if I go into a group and I managed to find someone to talk to then I think it would make it a lot easier' (P7, female, aged 23)

'I like to go in a group and talk about things and then as a group have fun ...' (P10, female, aged 44)

In addition participants felt that being with others who had similar problems would provide support and help them to feel comfortable:

'... Just probably people in the same situation as me that don't do lots of exercise I suppose... Whatever you do they're not going to laugh at you if you can't do it and things like that ... I suppose it is being with like-minded people who are in the same situation' (P13, female, aged 69)

Although schemes may wish to take a flexible approach for those who express the desire to attend individually, it is possible that perceived social support is one of the key determinants of the likelihood of success. Suitability for group sessions is identified in the referral inclusion criteria for the Northumberland ERS but does not always appear to have been considered by health professionals.

In addition to social support, members of staff were perceived to be a key support mechanism. Participants expected that they would knowledgeable and be able to prescribe safe activities:

'I don't expect somebody to wave a magic wand ... but maybe somebody could show me how to do the exercises properly ... I know that there is a right way and a wrong way but I never been exercise minded ... I don't know if I'm doing it right ...' (P10, male, aged 59)

Encouragement from staff was perceived to be important facilitator to attendance:

'Encouragement ... make sure we are all safe within our limits and push them when they are needed ... just basically have fun ... (P15, female, aged 45)

'Well I could do it on my own but it's much easier to do it if someone is encouraging you or supporting you to do it ...' (P8, female, aged 51)

Lack of confidence or knowledge about what was safe had previously been a barrier to participation for some:

'That is why I've never done anything ... There's never been anyone to tell me what I can do safely...' (P11, female, aged 60)

These findings are similar to those of four qualitative studies of ERS, which identified staff support as a key feature in adherence (Singh, 1997; Stathi, McKenna & Fox, 2004; Wormald & Ingle, 2004; Pentecost & Taket, 2011), especially in the first few weeks of attendance. This is further supported in the study by Moore, Moore & Murphy (2011a), in which fitness professionals described their role as helping referrals to overcome anxieties about the exercise environment, while providing education and personal support in order to increase confidence and motivation. In the current study expectations of staff support were more than being able to give safe and effective exercise advice. They were also expected to possess 'softer skills' such as being caring and good fun. For those who were almost tearful at the idea of taking part support, understanding, and empathy from staff, particularly in the initial stages could be fundamental in encouraging attendance.

5.4.4 The context of personal factors in motives for referral

In addition to the influence of process in the decision to be referred to ERS, participants tended to have complex personal motives for referral. Most stated several interlinked personal reasons, ranging from deterioration in health, weight gain, staying healthy for family, social routine and increasing age. Deterioration in health was an almost universal subtheme. This is perhaps not surprising since the scheme was for people who had, or were at high risk of developing, long-term conditions. Issues ranged from recent diagnosis of an illness:

'I've got glucose intolerance or whatever it is ... yes, pre-diabetic and I thought that if I can get it under control and not get it at all ... of course that will improve me heart and the more exercise I can do then the better for me in the long run..'
(P15, female, aged 45)

to noticing symptoms that were reducing participant's ability to take part in the activities of everyday living:

'As I say, with being starting to get out of breath all of the time more and th at and ... well I just thought I'd try and do something about it you know' (P1, male, aged 50)

The literature identifies poor health as being a barrier to participation in physical activity (De Bourdeaudhuij & Sallis, 2002) but in the case of ERS, it appears that deterioration in health is one of the key motives to referral. This would indicate that if concerns about adherence and long-term increases in physical activity can be addressed, ERS could be an important intervention in tackling sedentary behaviour for those with long-term medical conditions.

It was apparent that those who were 50+ years old had become much more aware that they were likely to start suffering from ill-health:

'It's just like I've hit that age and it's like everything ... you know, you just hit a wall sort of thing ... I mean a couple of my uncles they died around about my age with heart attacks' (P1, male, aged 50)

'I would really like to lose some weight for my health more than anything I'm aware that it is a factor with cancers and they are more prevalent when you are older so it is important to me that I lose the weight ...' (P8, female, aged 51)

General studies of physical activity have shown that it decreases with age (Haskell, Blair & Hill, 2009; Pan *et al.*, 2009). In contrast, ERS is an intervention where it has been shown that uptake and adherence are more likely in those who are older (James *et al.*, 2008; Sowden *et al.*, 2008; Murphy *et al.*, 2012; Tobi *et al.*, 2012). The current study found that perceptions the immediacy of poorer health could be delayed by becoming more physically active. Given that poor health was identified as a motive for referral, this may be one of the key reasons why the scheme is more appealing to those who are older.

Staying healthy for other members of the family was also an important motive in the decision to be referred. Younger participants wanted to be fit enough do things with their children, while older participants wanted to be able to enjoy time with either their partners in retirement or with their grandchildren:

'Just like I say to be healthier so that I can do all the things that I want to do with my kids' (P7, female, aged 23)

A further theme that emerged for some participants in the decision to be referred was creating a sense of routine/purpose. These responses were

apparent from those who were suffering some sort of social isolation, living alone, unemployed, and/or had mental health issues:

'it is in another way of getting out of the house because all I ever do is sit and watch TV... and this would be good for me I might well be depressed and I don't know it ...' (P14, male aged 60)

'I need to get out ... I'm lying in bed until about 8 o'clock in the morning ... and then I get up and go on the settee, read the paper and then in the afternoon I have a sleep ... and then I watch the television ... and I don't want to go down the slippery slope, yes you know I need to nip it in the bud ...' (P5, female, aged 65)

Respondents spoke about using the scheme to *kick start* participation in other activities; social, work, and exercise. This would indicate that emphasising the benefits of establishing a routine may facilitate initial attendance in those with mental health problems.

5.4.5 The context of personal factors in the formation of expectations of, and perceived influences on participation in, exercise on referral

Expectations of what ERS would entail and perceived resultant benefits from being more active were closely linked to perceptions about what would encourage/discourage attendance. For example, some participations expected to gain mental health benefits and expressed the view that *'feeling better in themselves'* would facilitate further attendance. Personal expectations of what would be achieved by taking part in ERS tended to be high and linked to multiple motives, with participants often expecting to see multiple benefits.

Improvements in physical and mental health, feeling fitter, weight loss, social support, time taken to see results and enjoyment emerged as subthemes.

Improvements to both physical and mental health, and weight loss were reported to be the highest priorities in terms of expectations for change. For example, those who felt that their lifestyle was very affected by physical limitations, expected to see improvements to mobility:

'I really want to be able to move about a bit better ... I've got a real problem with my back and it stops me from doing things ... I can't stand for a long time so I'm sort of hoping that if I do exercise it will strengthen the muscles in my back and I will be able to do more things ...' (P13, female, aged 69)

Participants with mental health issues expected that taking part in exercise, and also coming to the leisure centre in itself, would lead to an improvement in how they felt:

'and I'm just getting to the point now where I'm like ... I want to try and get off them, (anti-depressants) ... don't want to be relying on a pill to make you happy sort of thing, so you know ... So I'm hoping that by coming here doing exercise and stuff like that ...' (P1, male, aged 50)

One participant reported that even though she had not liked the scheme during previous participation, she felt that the potential mental health benefits gained would outweigh any difficulties encountered due to lack of enjoyment. The initial study of this PhD did not find referral for mental health to be a predictor of adherence but other studies have found this to be a particular challenge (James *et al.*, 2008; Moore *et al.*, 2013). In addition Moore, Moore and Murphy (2011a) reported that fitness professionals perceived there were particular challenges in working with those who were referred with mental health issues. Given these findings, there is a need to further explore the actual ERS experiences of those

with mental health problems in order to understand whether there are any particular challenges in engaging those with mental health issues.

In line with participant expectations of health improvement, seeing tangible evidence of this was perceived to be the factor that was most likely to encourage further attendance:

'I mean obviously if I'm feeling better each time then I will probably come more and more' (P2, male, aged 24)

'And well if I start losing weight that ... well I think it's that you start feeling good after you've exercised don't you ... so I think that will help' (P4, female, aged 70)

These findings emphasise the importance of ERS setting realistic targets with participants and regularly reviewing these to see whether they are being achieved.

Regardless whether overweight/obesity was given as the reason for referral, many participants stated that wanting to lose weight was a key expectation. Interviewees thought that it would be realistic to lose one to two pounds of weight a week while they were on the scheme. When asked how much weight they expected to lose; most estimated between two and two and a half stones over the six-month period. The Northumberland ERS did not give dietary advice other than general healthy eating guidelines and so it perhaps not surprising that the initial study of this PhD reported only a modest BMI reduction.

When asked directly about whether not achieving weight loss goals would influence attendance, however, few mentioned that this would stop them attending. Rather they tended to concentrate on other positives:

'As long as I am losing something I don't expect to lose stones and stones and stones.... As long as I am losing something and I am feeling fitter then I will know that I am doing the right thing' (P12, female, aged 42)

'Well they say that you can put it on quickly but you can't take it off quickly ... so I know that it is going to be a long haul ... but in the long run it's going to make me fitter and better' (P6, male, aged 66)

These comments were contradictory to stated weight loss goals and raise questions about how confident participants feel about their ability to lose weight. Jones *et al.* (2005) reported that those who did not adhere to ERS had higher expectations of change, so a potential lack of weight loss would put these participants at higher risk of dropping out. Given this, and the fact that weight loss is a key motive for participation, the scheme should also consider the need to address dietary behaviour change.

Most participants did not expect to see immediate physical changes to their health in the first few weeks of attendance:

'I'm not expecting anything for a couple of months 'til I get myself into a as I'm saying I'm not expecting it to like come for like two sessions sort of thing and then like it be working' (P1, male, aged 50)

The scheme encouraged twice weekly attendance, but the initial study of this thesis found that for those who dropped out in the first 12 weeks, median (IQR) attendance over the whole 12-week period was 2.0 (0.0-5.0) sessions. The very limited adherence of dropouts appears to create a *'time required for perceived*

benefit' conflict. If dropout occurs very early, participants may not have attended for long enough to experience any of the expected benefits. Schemes may have the best chance of achieving prolonged engagement if participants are prepared by referrers/scheme staff from the outset that they may not see any changes to their health in the first few weeks and that they should not judge the scheme from just a few attendances.

As with other studies (Singh, 1997; Taylor, Doust & Webborn, 1998; Martin & Woolf-May, 1999; Stathi, McKenna & Fox, 2004; Wormald & Ingle, 2004; Pentecost & Taket, 2011) making friends, having fun, and social support were seen as key to encouraging continued attendance:

'Well if it is friendly..... and I can't imagine it not being friendly.... but if there're people who speak to you and things like that then I think that makes you feel like you want to come back.... And if I come regularly then I might make new friends and things like that' (P12, female, aged 42)

'The biggest thing is that if I am enjoying being with the group... And the banter ... keep the fun in the thing... it will keep me going ...it's got to be enjoyable....'' (P9, male, aged 59)

Only two participants (P2 and P14) indicated that social interaction was not important. Both of these participants were male and while they thought that the scheme would be beneficial to their physical and mental health, they saw it as a cheap or free way to access the gym facilities in the leisure centre. Creating a sense of belonging was important for most interviewees, indicating that ERS is more likely to be successful in continuing to engage with the majority of participants if group sessions are offered.

Participants were asked whether there was anything that they perceived might discourage attendance. Although poor health was seen as a motive for referral, it was also seen as being a potential barrier to being able to adhere:

'Yes only if I'm bad ... but I mean touch wood since I started (cardiac rehabilitation) I've been okay ... I mean I do have some off days but if I'm really bad then I would have to stop for a bit' (P6, male, aged 66)

'There are very few things that I would miss a session for ... I do come down with chest infections a lot ...' (P9, male, aged 59)

Given that all participants to this ERS have a medical condition it is possible that during the six-month scheme period they may suffer from some incidence of illness that prevents attendance. Therefore there is a need to have processes in place that actively encourage re-engagement after periods of non-attendance.

While some interviewees were happy to try any activity that they were asked to participate in, others were worried that activities offered would not be suitable for them:

'I think badminton or squash or anything like that would be too much impact on my ankle ... because I've got arthritis in my left ankle' (P3, male, aged 52)

Also that if they did not enjoy the sessions they would stop attending:

'Well it's like I say it obviously just depends on how I'm feeling on that day..... I mean if I don't like coming here I just won't come in' (P2, male, aged 24)

Although social support was perceived to be an important facilitator of adherence, issues with low self-esteem and lack of confidence meant that some participants were nervous about initial interaction and were worried that they may feel unwelcome:

'it's all this going in and not knowing people you know' (P5, female, aged 65)

'but I just don't want people like judging us ... just like looking at us ... thinking that I shouldn't be there really' (P7, female, aged 23)

Finally, respondents mentioned outside influences such as family commitments or the fact that they were looking for a new job as factors that would potentially prevent attendance:

'The only thing is if I'm back to work and I'm still coming here.... Or if I need to look after the little ones' (P1, male, aged 50)

'The only thing that I can think of is that my dad is due to have a knee replacement op possibly in September' (P8, female, aged 51)

As with other barriers identified, this reflects more general findings about lack of time and other commitments preventing physical activity participation. In order to address this issue, the scheme needs to be flexible about times when participants are able to attend and also to discuss strategies about including physical activity in the activities of daily living.

5.4.6 Potential applications of behaviour change theory in ERS

This study has identified a range of process and personal factors that may influence the likelihood of successful engagement with ERS. Although several routes to referral were identified it was not possible to determine whether these have an effect on actual participation due to the nature of the study. It was apparent that some referral routes, such as cardiac rehabilitation, better prepared participants to have realistic expectations of the scheme. Social support, having fun, tangible improvements in health, knowledgeable staff, and the ability to choose from a variety of activities were reported to be perceived

facilitators of attendance. Lack of health improvement, unsuitable activities, feeling unwelcome, the leisure centre environment, and cost were identified to be perceived barriers to attendance for some. This section discusses how behaviour change techniques from theories such as Social Cognitive Theory (Bandura, 1977) and SDT (Deci & Ryan, 1985; 2000), shown to be effective in physical activities settings, relate to identified factors and the potential to improve the likelihood of successful ERS engagement.

Flaws were identified in the referral process of the Northumberland ERS. These mainly related to a lack of information given to participants at the point of referral and/or at the point of initial first contact with the scheme. There were perceptions that in primary care, health professionals lacked both time to explain, and in-depth knowledge about the scheme. Of the participants in this study, the best prepared were those referred from the cardiac rehabilitation programme. Exercise sessions were combined with weekly education sessions. Two of these were physical activity based and aimed to increase perceived control and ensure that participants had realistic expectations of what might be achieved as a result of being more active. The cardiac rehabilitation programme employed a Social Cognitive Theory (Bandura, 1977) based approach that knowledge is the precursor to the possibility of behaviour change and that individuals must believe that they have the capability to change (Bandura, 2004). A potential increase in dissonance (Festinger, 1957) caused by educating those who were inactive about the risks of inactivity, appears to have led to behaviour change in cardiac rehabilitation. Having undergone an acute

event that was perceived to be potentially life threatening, however, these participants felt the potential for future fatal events justified the need to change in behaviour, as identified in terror management theory (Greenberg, Pyszczynski & Solomon, 1986).

It is possible that including similar education sessions within the first few weeks of ERS may lead to increased adherence. This might take the form of a group 'getting started' session and include teaching behaviour change skills. Enabling participants by improving goal setting skills, for example, may help to create an initial effect, as reported by Fjeldsoe, Miller and Marshall (2013). The potential benefits of specific education sessions must be balanced against an understanding that some referrals, such as those from cardiac rehabilitation, may have different motives from others and therefore be easier to engage in behaviour change. Such sessions are worthy of further investigation.

The support of peers within ERS emerged as an important perceived influence on adherence. This finding reflects SDT (Deci & Ryan, 1985; 2000) based recommendations that maximising social interaction may help facilitate long-term physical activity behaviour change (Teixeira *et al.*, 2012). Schemes should therefore ensure that adequate opportunities for social interaction occur. This may include allowing time in sessions for chat and introducing new members of the group to others in a comfortable environment such as the café before a session rather than during exercise. Consideration should be given to pairing new members with relatable others during early sessions and encouraging other participants to share their early experiences with new starters.

Participants in this study identified making friends and having fun as key perceived factors in facilitating continued attendance, in keeping with other ERS studies (Lord & Green, 1995; Wormald & Ingle, 2004). This is closely linked to social support and similarly, evidence from SDT-based (Deci & Ryan, 1985; 2000) physical activity studies suggests that interventions should seek to maximise experiential rewards such as enjoyment to promote long-term adherence (Teixeira *et al.*, 2012). Of particular importance for the ERS studied is the need to consider what factors may act as an early 'catch' to encourage continued attendance after the first few sessions given that early dropouts attended on average only 2 times. ERS should ensure that the fun factor is emphasised, rather than just educating participants about how to exercise safely in the first few weeks. This may also encourage continued attendance for those who have had previous negative experiences of physical activity, a factor that was found to be influential in forming expectations about participation in this study.

The concepts of intrinsic and extrinsic motives for participation from SDT (Deci & Ryan, 1985; 2000) are also worthy of discussion in the '*time required for perceived benefit*' conflict identified in this study. In the early stages of exercise participation Ingledew, Markland and Ferguson (2009) suggested that, in order to engage individuals, programmes could highlight desirable and attainable outcomes relevant to their motives. Given that in the case of this ERS, 42% of referrals were for overweight/obesity, this may be of particular relevance if early achievable weight loss goals are set. Longer-term, there is still a need to

concentrate on more internalised motives such as social engagement to encourage sustained activity (Ingledeu & Markland, 2008)

In order to address identified perceived barriers to attendance schemes should consider how to make sessions as accessible as possible. This includes offering a range of session times and activities so that there is flexibility about when participants can attend and what they can take part in when they do. If childcare is an issue, ERS may wish to consider the inclusion of intergenerational activities during school holidays. In order to encourage participants to make informed and independent choices about how and when to be active, interventions should focus on enhancing self-efficacy and teaching strategies such as goal setting, planning, and self-monitoring as recommended by Social Cognitive Theory (Bandura, 1977). These techniques have been shown to be effective in changing physical activity behaviour (Young *et al.*, 2014).

5.4.7 Practice-based considerations for ERS

This study has raised several practical implications for ERS that are worthy of further discussion; the role of the health professional in the referral process, the suitability of leisure centre settings for ERS and issues related to cost. This section discusses each of these issues.

The present study identified that minimal information about ERS is given by surgeries, while other studies have identified lack of time and low prioritisation of physical activity by health professionals as barriers to referral (Graham,

Dugdill & Cable, 2005; Din *et al.*, 2014). This is an area that requires further investigation to better understand how these barriers can be addressed. On a very practical level the Northumberland ERS needs to improve partnership working with referring surgeries to ensure health professionals are more aware of the actual structure of the scheme. It also needs to understand how appropriate information can be better given at the point of referral, bearing in mind the time restraints experienced in primary care. These factors could lead to positive changes in current practice so that participants are better prepared for what to expect from the scheme. Additionally there is a need to understand whether the route to referral is a predictor of success. This could be simply done by adding in a closed question at the initial consultation asking about route to referral, or by an additional tick box on the referral form. A greater understanding of this could lead to a different recruitment approach to such schemes.

The leisure centre environment itself was identified by some participants in this study as a potential barrier to attendance. Many providers of ERS in the UK are leisure trusts or local authority leisure departments (British Heart Foundation National Centre for Physical Activity and Health, 2010), who by their very nature want to encourage use of their facilities. Schemes should be mindful of the fact that those who are sedentary may have never been into a leisure centre prior to attendance at ERS, and ensure that if this is perceived to be a barrier it is discussed during the initial consultation. This may be via staff support, which participants in this study identified as being an important perceived facilitator of

attendance, and/or may include measures such as offering sessions at quieter times if using the gym or exclusive ERS sessions in the initial instance. The British Heart Foundation National Centre (2010) also reported that two-thirds of ERS offer activities in community and outdoor settings in addition to leisure centre-based activities. If schemes are able to offer a range of both venues and outdoor activities, this may help address issues around intimidating environment.

Addressing issues relating to cost is difficult. The Northumberland ERS receives limited funding from Public Health, which covers the cost of consultations and administration but does not cover the costs of staffing exercise sessions. Given the current austerity measures to public services in the UK, coupled with the fact that leisure is a non-statutory service, it is unlikely that there would be funding to offer free sessions to those in financial need. In addition if ERS was free to participants on low incomes, it is unlikely that continued use of leisure facilities would be free at the end of the scheme period. Such a situation could lead to increased physical activity during participation in ERS, which would be non-sustainable at the end of the scheme.

This presents a challenge to ERS providers in that if cost is a barrier and a charge is made for sessions; those most likely to be suffering from health inequalities may dropout. Further research is required to ascertain what intervention is most relevant for those where cost is a barrier in order to promote long-term physical activity. If group activities are one of the factors that strongly influence success, as previously discussed, future research needs to

investigate whether there is a way to achieve this without cost. In the short-term, however, the Northumberland ERS should consider what it can do to promote lifestyle activity for this sub-group and whether it is adequately promoting options for free activities such as walking groups to help mitigate the problem. If participants are not attending supervised sessions, the scheme should also consider how to support this group in their physical activity choices.

5.5 Strengths and limitations of this study

No other studies have been identified that have considered the views of participants after referral but before they started participating in ERS. This study therefore presented a unique opportunity to examine pre-scheme perceptions of ERS without the risk of participation bias. Where knowledge of ERS was lacking, the 'insider' status of the researcher meant that participants were provided with expert detail in order to be able to make better judgements about perceptions of future participation. What this study did not do, however, was allow for an understanding of actual, rather than perceived, influences on engagement.

Participants in the study broadly represented an equal demographic profile of those identified as being most likely to dropout and those were most likely to adhere, based on the findings of the first study of this thesis. This allowed for an in-depth insight of pre-scheme perceptions across the spectrum of referrals but only related to the individual participants in their context.

5.6 Conclusions and recommendations for future research

This study explored the experience of referral, motives for being referred, expectations and perceived influences to attendance at the Northumberland ERS prior to starting the scheme for a group of 15 referrals. Results revealed weaknesses in the referral process, which prevented potential participants from being able to make informed judgements about the suitability of the scheme prior to the initial consultation. It also highlighted the complexity of influencing factors. These included health, socio-demographic, environmental, economic, and cultural facilitators and barriers that might influence behaviour change.

Health professionals made appropriate referrals in reference to inclusion criteria, acting both opportunistically and as gatekeepers when requested to by potential referrals. Despite this, referrals from primary care were given very little information about the scheme and virtually none were given written information supplied by the scheme. Participant perceptions were that either there was a lack of knowledge and/or time to explain on the part of health professionals. In addition, there were further weaknesses in the information given by the ERS during initial contact, meaning that referrals often arrived at the pre-scheme consultation unsure about what to expect. Importantly, most participants did not realise that they would need to pay to attend sessions, which was perceived to be an issue by some but not all referrals. In contrast, referrals from the cardiac rehabilitation pathway felt well-informed and prepared to participate.

Participants tended to have multiple personal motives to be referred, which mostly related to preventing deterioration of and/or improving health, improving

fitness, and social interaction. Expectations of tangible benefits from participation tended to be high, especially in terms of weight loss. Interviewees perceived that knowledgeable staff, social support from peers, noticeable improvements in health and fitness, and enjoyment would be key facilitators to attendance. In contrast, future health problems, other commitments such as work or caring for others, feeling unwelcome/uncomfortable in a leisure centre environment, potentially unsuitable activities, and not enjoying sessions were perceived to be key barriers to attendance.

There are several key recommendations resulting from the findings of this study.

First in relation to current practice in ERS, schemes should:

- Ensure that referrers fully understand the scheme, including any cost implications, and are able to supply sufficient information for patients to make an informed choice about referral. Schemes should also ensure that they give a clear explanation of the scheme, including cost if appropriate, during initial contact.
- Ensure that opportunities for social interaction and enjoyment are maximised and that behaviour change techniques such as goal setting are integral to the scheme process. In particular attention should be paid to ensuring a positive experience in the first few weeks including ensuring good interaction with staff during this period.

- Think broadly about offering different solutions to providing physical activity opportunities that will help to overcome perceived barriers such as cost or lack of time due to work/caring commitments. These may range from more flexible programming in leisure facilities, to completely new and innovative ways of providing support for those who do not want to, or are unable to access leisure facilities.
- Ensure that elements of behaviour change theory such as goal setting are incorporated into planning, that members of staff are trained in behaviour change techniques and also in the softer skills associated with excellent customer care.

Second, due to limited in-depth knowledge about factors other than demographics that influence engagement in ERS, there is a need for more studies that:

- Further investigate motives, expectations and perceived influences on attendance at ERS prior to participation. By focusing on particular sub-groups such as those living in areas of greater deprivation, such work has the potential to improve uptake of schemes.
- Seek to better understand the mechanisms of the initial referral process and the experience/perceptions of referring health professionals.
- Give an in-depth understanding of the factors that influence actual rather than perceived engagement, or otherwise, in ERS. Two areas are of particular interest. The first is determining the key elements that affect

the decision to continue to participate or to dropout. The second is to increase understanding about the effect of attending on pre-scheme expectations.

This study has given an in-depth insight into how and why participants engaged with the Northumberland ERS, and how this influenced perceptions of the scheme. It has also given an increased understanding of perceived influences on participation prior to attending. This understanding is limited to one discrete time point however, and a more dynamic exploration of how different individuals might interact with and change during the scheme is needed.

6 Weight loss expectations and wellbeing rewards; changing expectations of success in the Northumberland exercise on referral scheme

6.1 Introduction

The continued popularity of ERS within primary care for the promotion of physical activity is despite a lack of evidence about effectiveness (Pavey *et al.*, 2011) or an in-depth understanding of what elements of such schemes are most likely to create physical activity behaviour change and for whom (National Institute for Health and Care Excellence, 2014a). There have been some qualitative studies that have focused on the experience of participants in ERS (Lord & Green, 1995; Taylor, Doust & Webborn, 1998; Martin & Woolf-May, 1999; Wormald & Ingle, 2004; Dugdill & Graham, 2005; Pentecost & Taket, 2011) and reasons for adherence or non-adherence. Facilitators to adherence were reported to be professional, supportive staff (Martin & Woolf-May, 1999; Wormald & Ingle, 2004), and the physical, social, and psychological benefits as a result of attending the schemes (Taylor, Doust & Webborn, 1998; Martin & Woolf-May, 1999; Wormald & Ingle, 2004; Pentecost & Taket, 2011); while barriers to adherence were reported to have included inconvenient operating hours, intimidating exercise environment, insufficient staffing, a narrow range of activities available (Taylor, Doust & Webborn, 1998; Wormald & Ingle, 2004; Dugdill & Graham, 2005), poor organisation (Lord & Green, 1995), transport,

illness and time (Martin & Woolf-May, 1999) and a lack of role models (Pentecost & Taket, 2011).

A recent systematic review of participant perceptions of barriers and facilitators to adherence in ERS that included unpublished PhDs identified additional environmental barriers such as the gym environment itself, lack of cultural awareness and language difficulties (Morgan *et al.*, 2016). Studies were assessed against the NICE criteria for quality (National Institute for Health & Clinical Excellence, 2012), with only two (Tai *et al.*, 1999; Carroll, Ali & Azam, 2002) reported to fulfil all criteria on the checklist. Criticism of qualitative ERS studies have been the superficial nature of both questions and analyses, and the fact that studies have tended to focus on those who adhered leading to a positive participation bias (Williams *et al.*, 2007). The previous study in this thesis attempted to address this criticism by recruiting participants after referral, but before attendance at the initial consultation of the ERS.

The principles of Grounded Theory approach (Glaser & Strauss, 1967) used for semi-structured interview analyses taken in study two established that there were several pathways leading to referral, and that social context and life experiences of participants affected perceptions of both physical activity and the ERS. In addition referrals often had a limited understanding of what was involved and high, multifaceted expectations about what could be achieved by participation. The second study did not examine participant experience of the scheme itself but provided a pool of participants who had agreed that they would also participate in a further set of semi-structured interviews after taking

part. This provided the basis for the third study of this thesis, which was planned to follow a similar methodology to study two. Since potential participants had been interviewed prior to starting, it was hoped that it would be possible to interview dropouts as well as adherers.

Based on the findings of the first two studies of this thesis, several questions were deemed worthy of investigation within the second set of semi-structured interviews in an attempt to better understand what circumstances ERS works from some individuals. First there was a need to investigate how pre-scheme expectations and motivations were affected by initial experience of the scheme. Second, given that those who dropped out in the first 12 weeks only attended on average twice, there was a need to understand what elements of the initial sessions affected the decision to continue to participate or to dropout. In addition since there were high expectations of health-related improvements as a result of participation, there was a need to investigate what happened if these expectations were not met. Given the exploratory nature of the study, it was expected that other themes would emerge.

In presenting the findings of the study it became apparent that there was a chronological element to experiences that could best be illustrated by combining the interviews from study two and this study in order to present participants' journeys. Since narratives have been widely used in the social study of health, in particular for those suffering from chronic disease by following their 'illness career' (Elliot, 2005) a decision was made to use this approach.

There are no identified ERS studies that have used such an approach to explore participant experiences. Exploring experiences of ERS through narrative therefore provides an original insight into an intervention that has been generally judged in terms of outputs, increased physical activity levels and health-related physiological indicators. The benefits in creating a richer understand of what works, for whom, and in what circumstances can lead to practical suggestions for the improvement of scheme processes to promote better uptake and adherence.

6.2 Method

6.2.1 Study design

Qualitative methods were used in order to facilitate an in-depth study of participant experiences of the Northumberland ERS after the initial consultation without being constrained by pre-determined categories (Patton, 2002).

Participants were recruited from those who had taken part in study two. Initially it was intended to use a similar principles of Grounded Theory approach (Glaser & Strauss, 1967). During analysis it became apparent that in order to better understand the complexities of the individual context of participant engagement, or non-engagement, experiences over time were important. A decision was made to present combined data from study two and study three in a series of narratives.

6.2.2 Semi-structured interviews

As with study two, a semi-structured interview guide (Appendix 9) was designed to allow freedom to explore, probe and ask questions from defined topic areas in order to better understand the subject (Patton, 2002). Prior to interviews taking place, initial interviews were re-read several times for re-familiarisation purposes. Notes were made about specific goals or concerns expressed. This provided background information and prompts to be used in conjunction with semi-structured interview questions. These prompts allowed participants to reflect on the views that they had previously expressed and for me to probe for any changes that may have occurred as a result of taking part in the scheme. Interviews started with the statement *'Tell me about your experience of the scheme'* to allow for free reflection of participation/non-participation. This was followed by more targeted questions about frequency and type of participation, facilitators and barriers to attendance, any changes in health and any suggestions about the scheme.

6.2.3 Ethics

Ethical approval was granted by the institutional ethics committee and written informed consent was obtained from all participants as part of consent for study two. Details of consent form, participant information sheet and participant debrief sheet can be found in Appendix 8. Participants were asked to take part in an individual semi-structured interview to explore their experiences of participation, or non-participation, in the Northumberland ERS. Interviewees were verbally reminded of the consent that they had given previously and asked

whether they gave continued consent to take part. They were also reminded that they were able to withdraw from the study at any time by informing the researcher and did not have to answer any questions that they did not wish to.

6.2.4 Participant recruitment

The study recruited participants from those who were referred to the Northumberland ERS in two leisure centres in south east Northumberland during May and June 2013 and had previously participated in study two of this thesis. All participants who completed study two were contacted by telephone by me to ask whether they would be willing to attend a face-to-face semi-structured interview at the leisure centre where they had attended their initial consultation. Attendance at scheme physical activity sessions was not a prerequisite to taking part in the study. Thirteen of the 15 participants from study two were successfully contacted and 11 consented to participate. The two participants who were contacted but did not agree to take part had dropped out of the scheme after attending only a few sessions. Both stated that lack of time as the reason for non-participation in the scheme and the study. One (female, aged 42, referred for diabetes) reported that she had a new job; the other (female, aged 45, referred for overweight/obesity) that her mother had become very ill shortly after the initial consultation and she had been unable to attend due to caring commitments. Both were asked whether they would be willing to take part in a telephone interview but declined. Where the researcher was unable to contact potential participants via the telephone (n=2) a text was sent asking them to contact the researcher. Neither (male, aged 24, referred for

mental health, and male, aged 60, referred for musculoskeletal issues) responded and so it was assumed that they did not wish to participate in the study.

Of the 11 participants who took part in the study, seven were female and four were male. The mean (SD) age of participants was 55.4 (13.1) years with an age range of 23-70 years. Two were non-starters, three were dropouts, and six were adherers. Participant characteristics are described in Table 6-1.

Pseudonyms have been used to protect their identities.

Table 6-1 *Participant characteristics for study three*

| Pseudonym | Referral reason | Age | Gender | Participation Status |
|------------------|--------------------------|------------|---------------|-----------------------------|
| Peter | CVD secondary prevention | 52 | Male | Adherer |
| Alice | CVD secondary prevention | 70 | Female | Adherer |
| Margaret | Mental health | 65 | Female | Dropout |
| Brian | CVD secondary prevention | 66 | Male | Adherer |
| Amy | Overweight/obesity | 23 | Female | Adherer |
| Jackie | Overweight/obesity | 44 | Female | Non-starter |
| Patricia | Overweight/obesity | 60 | Female | Adherer |
| Dorothy | Musculoskeletal | 69 | Female | Dropout |
| Paul | Overweight/obesity | 59 | Male | Non-starter |
| Dan | Mental health | 50 | Male | Dropout |
| Julie | Overweight/obesity | 51 | Female | Adherer |

Of the 13 people contacted, adherence and dropout rates were broadly as predicted by the initial study of this thesis. Only one participant was excluded at the initial consultation due to medical concerns. Of the other 12, seven (58.3%)

either did not attend or did not adhere, and five (41.7%) adhered. Those who were referred via cardiac rehabilitation adhered, while those referred for mental health dropped out.

6.2.5 Data collection

Data were collected through individual semi-structured interviews with the exception of two participants, a married couple, who would only consent to take part if they were interviewed together. Interviews were conducted privately by me at the leisure centre where interviewees had completed their initial consultation and took place between 12 and 24 weeks after the initial consultation. They were arranged at a time convenient to participants, to coincide with attendance at scheme sessions if appropriate. As previously discussed in section 6.2.5, this research was conducted from an insider perspective. I was careful to ensure that no reference was made to my position and that I made minimal comments about my perspective of the scheme process. This was felt to be of particular importance where negative comments were made about participant experience. As discussed by Costley (2010), particularly with insider research the researcher-participant relationship is influential in the power balance during the interview process. By not disclosing the fact that I worked for the organisation providing the scheme, I hoped to prevent participants presenting a more positively-biased view based on the perception that I had power in relation to members of staff.

Interviews lasted between 24 and 62 minutes (mean 46 minutes). Pre-participation interviews from study two of this thesis were combined with the

follow-up interviews conducted in this study to create narratives about participant experience. These have been used to form a collective case in an attempt to gain a better understanding of the subject being studied, as suggested by Thomas (2011).

6.3 Data analysis

Digital recordings were transcribed verbatim. I also made notes immediately after the interviews took place recording thoughts and reflections. During initial analysis the same process suggested by Corbin and Strauss (2008) that was used in study two was followed. Recordings were listened to several times to increase familiarity and check transcripts for accuracy. This was combined with re-reading initial interview transcripts, a process that I had undertaken in the first instance to remind myself of what each participant had said previously in order to encourage reflection during their second interviews. In developing the sensitising questions (Corbin & Strauss, 2008) that would be used to guide analysis, it became clear that there was a temporal aspect to the complex experiences. Sensitising questions included:

1. How did the reality of participation compare with perceptions of what the scheme would be like?
2. How important were pre-scheme perceived facilitators in affecting attendance in reality?
3. How important were pre-scheme perceived barriers in affecting attendance in reality?

4. Did participants achieve their personal goals by attending, and if not how did this contribute to whether they continued to attend?

It became apparent to me that combining data from both sets of interviews would give a more in-depth understanding of participants' experiences since it would introduce a chronological element. Having considered what might be the best methodology to provide the greatest possible understanding, I decided to adopt a narrative approach since this can be used to organise events so that the significance of each can be understood through their relation to the whole (Elliot, 2005).

6.3.1 Narrative analysis

There are similarities between Grounded Theory and narrative in that there is usually no prior hypotheses and direction/theory emerges from reading collected material (Lieblich, Tuval-Mashiach & Zilber, 1998). It therefore seemed a natural extension of the originally planned approach. A holistic-form-based mode of structure analysis was used to focus on the plot of the narratives and understand the participant's personal construction of their evolving experience (Lieblich, Tuval-Mashiach & Zilber, 1998). Narrative from each participant was condensed into a précis. Text within each précis was not necessarily presented in the order of narration. Instead, each précis consisted of a series of sentences taken from both interview transcripts. These were combined to give a short illustration of my interpretation to give an overall reflection of the holistic form of the story.

As discussed by Lieblich, Tuval-Mashiach and Zilber (1998) consideration was given to narrative typology. This is a way of classifying individual narratives into subcategories that represent a focus in terms of psychological, cultural, and social contexts so that a central issue is addressed (Mishler, 1995). In this study the central issue was what elements of ERS worked to promote behaviour change and in what circumstances. Narratives were classified into three narrative typologies. An exemplar of each has been presented and other narratives, which were classified as within the typology cited to clarify differences between subcategories of experience. Following this, progression of narrative (Gergen & Gergen, 1988), and cohesiveness of the narrative (Bruner, 1991) were also considered.

Although stories have been grouped into narrative types, minimal interpretation was applied to the actual telling of the stories. It is mostly possible to trace the text describing each participant's story directly to the speech of the narrators. This allows the reader to draw their own interpretation and conclusions in addition to considering my analysis.

Several symbols are used in the text as follows in order to present a précis of each story:

Three periods ... signify a pause in the flow of speech

Brackets [-] signify the addition of a missing word or a phrase by me

Parentheses (-) signify the addition or replacement of a descriptive, or explanatory word or phrase by me.

Three periods in brackets [...] signify the omission of a sentence, several sentences or a paragraph from the text.

6.4 Results and discussion

The results in this study represent three narrative types. These are '*the quest*', '*the struggle*' and '*the defeat*'. Stories have been presented partly in descriptive terms and partly in participant's own words using a précis of their interviews.

The intention was to give an overall illustration of types of participant experience. The stories represent what has occurred, or not occurred, in a relatively short period of time after the initial consultation of the Northumberland ERS. They should be considered in the context of the complex life stories of participants. Chronic conditions that have triggered referral to ERS may have been the result of years of particular lifestyle choices. It was apparent from study two that differing social contexts had contributed to physical activity decisions prior to referral and that pre-scheme expectations of changes in health were often high and multifaceted. This raised questions about what and how much is expected from participation in a relatively 'light touch' physical activity intervention.

6.4.1 '*The quest*': there is more to the journey than the destination

The first narrative was one in which ERS was seen as a 'quest'. These were the people for whom ERS in its current form works well. Participants were well motivated and focused on improving or maintaining health. Early experiences of sport had been mostly positive. Their journey may have begun with trepidation;

the participant may have been worried about ability to cope and/or the perception of others. Low self-esteem, body image and/or perceived physical limitations may have played a role in contributing to feelings of trepidation. The journey was not always smooth and there were elements of struggle. Personal situations, difficult experiences in attending, and/or lack of goal achievement may have contributed to the struggle.

Support may have been given by 'quest companions' in the form of staff, peers, and/or family along the way. Participation was mainly enjoyable and although results were not always as expected, in hindsight the journey was rewarding and there was a celebration of success.

6.4.2 Quest narratives

Alice was a 70 year old woman who had been referred to the scheme after completing phase III cardiac rehabilitation. Prior to taking part in cardiac rehabilitation she had suffered from angina and had a stent fitted. Although Alice came across as a vibrant and confident woman during her initial interview, she was anxious that she might have further episodes of angina if she went for a walk. She had been surprised to learn that she had a heart problem as she previously considered herself to lead a healthy lifestyle. Alice hoped that by attending she would get her fitness back, lose weight and keep herself moving into older age. She had recently put on weight and was convinced that this was due to the medication that she was taking. She was finding this weight gain very difficult to cope with.

At the time of her second interview, Alice had attended 91% of possible sessions. She was very positive about the benefits of the scheme and was no longer worried about angina. She talked about her confidence returning after two months of attendance. Staff and social support were important factors in encouraging adherence and she described the scheme as like being in a club. Alice felt she had developed a more positive outlook on life. This appeared to be principally from making downward social comparisons with others on the scheme. Alice had not lost weight, but now recognised that her weight gain was more to do with retiring from an active job and continuing to eat the same amount than medication that she had previously blamed. She now felt that being a stable weight was acceptable, although ideally would still have liked to lose weight.

Excerpts from first interview:

I loved sport [...] I used to cycle to work, then I started doing yoga, but I also like aqua fit, and I've walked for miles, I love walking around. On and off I've come to the gym doing different things. I had a heavy job as well because I ended up cleaning in the schools [...] I've really always had quite energetic life and so that's how I couldn't believe when I had something wrong with us [...] a heart attack [...] Going to that thing [cardiac rehabilitation] it's really built me confidence up again because I was, you know, in your head every little pain [...] You have this fear and it's funny because sometimes when I'm out for a walk and I'm panicking a little bit, and I'm thinking don't do that because you can go to cardiac rehab and run around, you're okay so you can [...] I don't walk anywhere where I'm going to fall down and nobody's going to see us [...] I found out [about ERS] from the cardiac rehab scheme nurses. I feel confident; I feel as though it will do us good [...] I'll move straight on (from cardiac rehabilitation).

I'm overweight now but it's all the medication [...] I used to look at people and think you're overweight because you eat too much or don't do enough exercise. I can't cope with it, putting all this weight on [...] I've got to lose at least a stone.

My mother was always active but then she had, where your bones go, and that's what I think made my mother go, she just couldn't get out. [...] You got to use it or lose it, I've always believed that and I'm pleased that I can use it again. [...] I'm stiffening up as I'm getting older and well me arm never did get back, it was broken at the top, just to keep moving. [...] It's very important to be keeping fit because I do not want to end up like my mother.

Excerpts from second interview:

I've really enjoyed it, I feel much healthier again, and I've made loads of new friends. I think the most important thing is I feel that I have got my confidence back. [...] It has definitely lifted all that was frightening, that has all gone all together now [...] I haven't lost weight but I haven't put any on [...] I would still love to lose that half a stone but I don't know how I could do really do it [...] I know for a fact that I don't do as much as I used to [...] the last job that I had was cleaning in the schools. I had to rush around to get everything done and then I used to walk home. It's quite a long way and I mean I did that for five days a week [...] I think I feel healthy, I am healthy now. I can do things that I had stopped being able to do and I think well is it worth it? I am more content with me life again.

I mean I know at my age what I should be eating and what I should be doing. At the weekend it was my birthday and I bought a chocolate cake and a big tub of cream and we ate it between the two of us. I am more realistic I think now. I know it seemed silly to blame the tablets but I've never ever had a weight problem. [...] [I know] how selfish this sounds but when (another participant) had put 5 pounds on, I thought 'oh well I'm not so badly off'.

I love the class, and I like the talking. Yes the mouth exercises, they are very good. So the social part I like. It is mentally helping you as well. It makes you feel as though you belong in a club [...] I'm enjoying this one more [than cardiac rehabilitation] because it's more friendly, everybody has got something different wrong with them. Everybody has got a different aspect to their training. I think

that talking to other people and looking at other people and thinking 'well come on you should be grateful for the way that you are'. [...] There's some younger people, maybe 50 or so, and I think well these people are having these problems now at that age... When I was that age I could of climbed a mountain and that sort of thing. This has definitely made us have a positive outlook on things.

(Staff member) is full of fun as well mind. She is a bit frightening in some ways but she's very good at their job. She does push you along. When people knew that she was on holiday they haven't turned up because they've known that somebody else is going to be taking the class. [...] I don't want to stop coming. I will come here as long as I can.

Alice represented an ERS success story that could be predicted from the previous two studies. Older, referred from cardiac rehabilitation and with positive past experience of physical activity, she fully embraced the activities and the social support that were offered. Understanding the potential for physical activity to help maintain health as she aged, she was determined to continue. Enjoyment, increased confidence in ability to be active, and improved health were important facilitators of attendance.

At 60 years old Patricia also fitted the older, previously active profile of predictable success but was referred by her GP for obesity, with a BMI that might predict dropout. Following a dislocation of her hip replacement she was terrified by the idea of using a gym and suffered from high levels of anxiety. She attended 78% of sessions and similarly to Alice described increased confidence in ability to be active and improved health as facilitators of attendance:

'I just think it has been wonderful, really good, I just can't believe. Everybody is so friendly, and they help you [...] Before I've virtually had to go up (the stairs)

on all fours because I can't manage but this time I managed to go upright [...] I started feeling better more or less straight away I think, it wasn't long'.

Unlike Alice, however, Patricia felt that supportive staff, rather than other participants were her quest companions. At the outset she said that she did not want to be part of a group but during her second interview reported feeling disappointed that she had not made friends. She attributed this to the fact that she was limited to attending the gym because of her hip problem.

I mean I just pass the time of day with most people, I have been talking to a lady quite a bit this week [...] I only do the second half of the class, everybody that does both bits sort of stick together [...] I just go in and get on with it [...] and just speak to people in passing as I go in [...] I would have preferred to get friendly with somebody but it just hasn't happened.

By not participating in the group activities of racquet sports or exercise classes, she felt that she had missed the opportunity to socialise. If social support is one of the most important influences on engagement, as reported in other studies (Wormald & Ingle, 2004; Pentecost & Taket, 2011; Mills *et al.*, 2012), then the Northumberland ERS should consider how to integrate all participants into group activities or, if this is not possible, how to help those who only take part in individual activities to engage better with other participants.

Amy, in contrast, was not typical of the profile that would predict success other than she had enjoyed sport at school. Aged 23, she was referred because she was overweight. She was particularly intimidated at the thought of attending the gym, which she perceived to be full of 'body beautiful' people. This lack of confidence was due to very low self-esteem as a result of weight gain after childbirth. Amy attended 82% of possible sessions and was much younger than

most other adhering participants. She described her success in terms of increased confidence and better overall health, rather than her original goal of weight loss. She attributed it to the support offered by other participants, who were much older than her:

There wasn't really any young people there but there is a group of guys that I have made friends with [...] I mean they came up to us and spoke to us straight away [...] They are as funny as anything and they encourage you as well [...] it's strange because obviously they are a lot older but they seem to be a lot fitter at the same time

She expressed her surprise and admiration at the fitness levels of those who were older and used these upward comparisons as a way to encourage herself to do more. These interactions give her a positive view of her own potential fitness as she aged.

The final participant in this typology was Julie, aged 51 and referred because she was overweight. Her experience of ERS was different to the others in that she worked full-time and chose to attend evening gym sessions where there was an ERS instructor available for support. She also paid to join the centre as a fitness member and attended classes such as Pilates. During her second interview she highlighted knowledgeable staff support as important in her journey. Unlike the others she felt that she was already exercising independently and so felt empowered to continue. It is possible that Julie's experience provides an alternative model that may be suitable for those who do not want, or are unable, to attend group sessions.

Overall these stories represent a progressive narrative, in that there was a steady improvement in perceptions about ability to be active, and the health and social benefits associated with this. Enjoyment was both an important facilitator of success and a positive outcome of participation. These findings were in keeping with both pre-scheme expectations about what would facilitate adherence (study two) and also with other ERS studies (Lord & Green, 1995; Wormald & Ingle, 2004). Similarly the support of empathic, knowledgeable staff and the social support of peers reported here as facilitators of attendance concur with other studies (Singh, 1997; Stathi, McKenna & Fox, 2004; Mills *et al.*, 2012). Comparisons with others were used to gain perspective and were a way of reducing anxiety about participant's own situations, a similar finding to that reported by Pentecost and Taket (2011). These authors suggested that this was an important mechanism in increasing exercise confidence and optimism about the future. In the present study, for those who were older the picture was more complex in that participants recognised that being physically active may be more about delaying a longer-term decline in health. The recognition of the need to take action to prevent the onset of ill-health, or delay a decline in health, was a major consideration for those who were older and is a possible reason why ERS are more successful for this population sub-group. The core ERS concept of linking physical activity to preventing the onset of, or controlling, a medical condition may be more suited to those who sense both the immediacy and importance of a health issue.

6.4.3 'The struggle': life is tough but the distraction is helpful

The second narrative was about regaining structure and control. The narrators were struggling with life events that had caused a breakdown in their social order, such as the death of a loved one or loss of a job. There was a struggle to overcome the issues that caused or were a result of this. Participants may have felt that they had regained control, but this was potentially transient. This narrative was more complex than the first and the resulting experiences more divergent. The scheme was perceived to have had a positive effect as a way to get their life 'back on track' but did not necessarily result in continued attendance. This was a group for whom ERS in its' current form works in the short-term, but there are potential issues with continued engagement. This may be because of life circumstances or health conditions. Since the evidence base currently reports only short-term effects in increasing physical activity (Pavey *et al.*, 2011), understanding how to engage differently with such participants during, or providing further support at the end of, such schemes may increase the likelihood of engagement in long-term physical activity. These stories do not provide ideas about what support might be effective, but future research could focus on this type of participant and different or enhanced approaches tested.

6.4.4 Struggle narratives

Brian was a widower of four years who was suffering from depression after the death of his wife. He fitted the profile for potential success in that he was older and referred from cardiac rehabilitation. He had multiple health problems and was socially isolated. Having suffered two heart attacks, he also had insulin-

dependent type two diabetes, was overweight, losing his sight, and suffered badly from arthritis. He was lonely and told me that he felt that life was a challenge. Brian was referred to ERS via phase III cardiac rehabilitation. Due to ongoing health problems, he had struggled to access the earlier stage of cardiac rehabilitation and was referred back for medical intervention several times before starting phase III. Having completed this he was determined; looking forward to '*moving on*', but nervous about causing further '*damage*' to his heart. He was hoping to use the gym and go swimming. He was very keen to get fit and lose weight.

At the time of his second interview Brian had attended 86% of possible sessions. His experience of ERS was very positive and he was pleased with the multiple health benefits that he had seen as a result of attending the scheme. He felt that his mental health had improved and he was much fitter. Despite his sight deteriorating so that he had to give up his driving licence; he was now able to walk further, which helped him cope with this loss. Brian mentioned that some days he 'felt down' and did not want to attend, but made himself go to sessions. While Brian did not seem to rate the social contact offered by the scheme highly, the fact that it gave some structure to an otherwise empty week was seen as important.

Brian felt that staff support was a key facilitator to his attendance. It was apparent that he had did not feel empowered to make decisions about his exercise capability and was very reliant on staff to tell him what to do. Brian was not confident about moving on at the end of the six-month period. Without the

support of the scheme he might struggle to maintain his exercise routine. To a large extent this seemed to be due to his reliance on staff for advice but he also commented that another participant had told him that the 'next stage' (referring to the exit route session) was too hard.

Excerpts from first interview:

'I used to do a lot of walking and swimming. I'm mainly at the computer now so it keeps me occupied, and do a lot of fishing as well [...] In the last four years because my wife had passed away I just stopped doing everything and now I am trying to get back into physical exercise. I've had two heart attacks and I just want to get myself fit. [...] Fishing [...] it's something to do because I think when something happens to you, you just automatically go into a downer and you just lose all interest and recently I was just sitting in the house. [...] Until I came to the first class [cardiac rehabilitation] [...] I mean I used to get very depressed but since I've been coming to the centre well it's better. I mean on Tuesday and Friday I get up and I think oh great something to do today.

I'm at the stage now where I've been referred on [...] I'm determined because I really want to find out how far I can go without causing any more damage. I don't want to really push myself without instructions about how far I can go. [...] What I'm trying to aim at is that I can come to the gym myself. [...] Stepping up to the next level; what can I achieve without being bad, taking another heart attack? It's still in the back of my mind because I had two. I know that the letter that I've got from the hospital says I've still got three arteries that are 75% blocked. I said what happens in the next level? (Staff member) says there's the gym you can go on the bikes, the treadmill, there's different things like this. She says there's like the racquets; well I said the racquets is out for me. I've lost some sight in my good eye, my eyes get hazy. If I come to play like tennis well I can't see the ball so I can't see it to hit it. [...] I'm at the stage where I've got to do something. I was just lying around, just sinking into a mood when you cannot be bothered. Since I came to the first classes I thought well it's structured. [...] My goal is to get the weight off and feel a lot healthier.'

Excerpts from second interview:

'Since I started I feel 100% better off [...] I feel healthier than what I thought I was going to be. It's been more than what I expected [...] because I didn't think that I would be able to do what is on the scheme. [...] I'm surprised at everything to be quite honest. I thought I wouldn't be able to do the gym. When I first started (staff) said like 10 minutes on the bike, and I thought 10 minutes! Well I'd never been on a bike for years and I thought well I'm going to be jiggered after this and I found that I wasn't. [...] Once you got into it, I found it alright; you could feel yourself starting to loosen up and feel yourself starting to feel a bit better.

It did knock us back when they told us that I couldn't drive [due to failing eyesight], but I thought well I am going to have to pick myself up. I didn't stop coming to the gym. I walk. I don't think I could walk from my house to here before I started the scheme. Now I just pick my bag up. If I want to go to (town) I just catch the bus or I walk. [...] I had it in me mind; I've started it I'm not going to pack up. [...] Last week I thought oh I can't be bothered, I was just in one of them real downers and I thought well I have to go to the class [...] that's what I says if I spend more time in the gym or if I can come to the swimming pool, it's going to put me time in more order because if I am in the house I am just sitting around. [...] I might be uptight when I go down but once I get there, I'll probably be alright.

'It makes you feel better, it loosens you all over, it's [arthritis] still there but it's eased it a lot because I am still moving. [...] The only thing when I look at meself I think I need to loss more weight. You are still taking the same amount of calories in and the programme tells you what calories you have lost on the [gym] machine. So you think well I must have lost some amount of calories. I've got to be losing it somewhere. [...] When I look in the mirror it doesn't look as though I have lost anything but I haven't gotten meself weighed or anything.

I mean I'm a loner anyway but I've mingled with them. Yeh, I speak to everybody but most of them have been there since before I was; they have all got their partners and friends. It doesn't bother me if I am alone as long as I can carry on doing the exercises. [...] It's positive to have a lot of people with

you because you are thinking, well if they can do that I can so you think I'll have to do a little bit more.

I'm letting (staff) set me programme in a sense because he knows the way I am and what's up with us. So rather than me saying I'm going to have a go on this and have a go on that and I might jigger meself up; and that's not going to look good on staff member because I'm in his class. [...] I'm waiting for the staff to say that I can either go onto the next one or I can stop where I am. I mean the scheme is fine; it's ideal I think. I would rather be on a set programme. [...] I've been asking him can I stop in the same stage instead of going up. Cos talking to one or two of the lads, they've done it years ago and they've said it's a quicker thing on the next thing. To be quite honest I think that I am alright where I am. [...] If he turns around and says well you can come on your own I would say well can you give us a list of what I can do extra?'

Peter also fitted this typology, attending 63% of potential sessions. At 52 years old, with previous positive experience of physical activity and a referral from cardiac rehabilitation the first study would have predicted him to be an adherer. He was unemployed at the time of his first interview and saw a potential return to work as a barrier to adherence. His intermittent attendance at the scheme was influenced by a course and a short period of employment. He also stated that cost was a barrier to attendance:

'It's pretty hard because I have got no wages coming in. I've just got Job Seekers Allowance and that doesn't even pay me mortgage so money is really tight. I did have a little insurance but that money has now run out and I really am starting to struggle. [...] It is fairly cheap but saying that when you haven't got a lot of money coming in then it is a lot of money to pay out.'

A man of few words, it was difficult to gauge his enthusiasm for attending. It appeared that he was coming because he had very little else to do and he said that if he was successful in finding a job then he would not have time to attend

anymore. Although Peter said that he would try to do some sort of racquet sports with his partner if he could no longer attend, his enthusiasm for this was questionable. Long-term change in physical activity behaviour therefore seemed to be unlikely.

The third person in this typology was Margaret. Aged 65 and referred for mental health problems she hated sport and had previously participated in the ERS. Although when she had attended previously she had not enjoyed it, she felt the benefits to her mental health would make attendance worthwhile. At the time of her second interview Margaret had attended 19% of possible sessions and did not intend to return to the scheme. Despite dropping out, she felt that the scheme had been beneficial:

'It was really good to start with because I needed a kick start to get out of the house [...] so it was really good at the beginning. [...] The depression is now contained. I'm still on the medication but it is contained. I've cleared out the garage; I've done the front garden. But then I've found that as I've become more active the scheme just wasn't helping. I don't want to stay on the scheme at all... but that's good, it means I have progressed so far, so quickly [...] coming to the scheme got us out of the house... it has been more of a catalyst to get me doing other things [...] I have achieved what I wanted to achieve... becoming less depressed and actually doing something physical'

During her interview Margaret acknowledged that suffering from depression was a long-term issue and that although she had succeeded in becoming more active by attending it was likely to return. The scheme therefore had a short-term effect but in the longer-term she was unlikely to continue to be active.

These stories all had a progressive element. Increases in physical activity were seen, along with health gains, but a continued positive progression was questionable. The establishment of routine and relief from boredom were considered to be important facilitators of attendance, a finding also reported by Pentecost and Taket (2011). Monitoring and support were considered important, but one participant struggled to relate to staff and other attendees. Other ERS studies (Singh, 1997; Stathi, McKenna & Fox, 2004; Pentecost & Taket, 2011; Mills *et al.*, 2012) have tended to focus on the positive aspects of support, without recognising that this might not be easily accessible to all. It is possible that this is because such participants normally dropout and so their voice is not represented in published studies that have mostly focused on adherers.

For this group of participants, the scheme is helpful while they attend but may not result in long-term lifestyle change unless either different/further support is given at the end of the scheme (Brian) or some sort of relapse support is available that could be accessed if and when these participants 'fall off the wagon' in their attempts to be independently active (Margaret and Peter).

6.4.5 'The defeat'; the fence is too high and climbing is not my forte

The third narrative was one of defeat. The narrators were struggling with experiences or life circumstances that made it difficult for them to engage. They were defeated by the barriers that they faced and felt ostracised from participating in the scheme. There was a sense of failure. These were the participants for whom ERS in their current form do not work. Within 'the defeat'

three types of experience were identified. In the first, medical circumstances prevented attendance (Paul and Dan). As this was outside the scope of the scheme to influence, they are not discussed further. In the second, impaired social circumstances, lack of active peer role models and/or restrictive interpersonal relationships provided a challenging environment in which to become active (Jackie). In such circumstances it is unlikely that current ERS will work, as more intensive support may be required. In the third scenario members of staff from the scheme did not appear to have followed protocols or provided the support that was required. Due to severe back pain, this participant (Dorothy) may still not have completed the scheme but her experience could have been more positive if staff members had paid more attention. Lack of confidence appeared to be an important factor in both cases. Both narratives were steady in that neither achieved any increase in physical activity and there was no change in health status. Since the stories are very different, both narratives are presented.

6.4.6 Defeat narratives

Jackie was a 44 year old woman who was married with six children and several grandchildren. Being under 55 years old, referred because she was obese and having not enjoyed sport, she fitted the predicted profile of a dropout. Her husband Paul was 59 years old. Jackie and Paul were both referred to the scheme after attending one-to-one sessions with a dietician at a local hospital. It was unclear whether either of them had achieved any weight loss by attending these sessions. From the interviews conducted with both it was apparent that

they had very complex medical and social needs. Jackie was obese, diabetic and had suffered a heart attack. The couple had moved to the area 16 years previously but had not made many friends outside their family. Jackie appeared to struggle with relationships within her family and spoke about issues of social isolation during her first interview. She acted as a carer to her husband, who suffered from multiple health issues with very limited mobility. Initially she had agreed to be referred to the scheme so that she could accompany him. Jackie saw attendance at the scheme as a way to facilitate weight loss. She did not expect to pay to attend ERS as she was Paul's carer. She was surprised to find that if she wanted to participate in activities herself, she would have to pay.

Jackie did not attend any ERS sessions after attending her initial consultation. Paul was unable to participate due to his blood pressure being raised above scheme exclusion levels at his initial consultation. The interview for this study took place six months after Jackie's initial consultation. The scheme had kept in contact with the couple over the six-month period to monitor whether Paul's blood pressure had stabilised. Jackie had been given the option to attend by herself but had declined. The second interview was conducted with both Jackie and Paul present as she would only attend if accompanied. Paul was a dominant character and often interrupted what Jackie had to say. During the interview Jackie contradicted herself several times about whether she actually wanted to take part in the scheme and at one point said that Paul not being able to attend gave her an excuse not to go.

Despite having had a heart attack at a young age and being diabetic, Jackie did not think that declining health would affect her life expectancy. There was obvious conflict between the couple about this, with Jackie stating that she was only 44 and would live to be in her 60s or 70s so would definitely see her grandchildren as adults. Based on this, she did not feel that she needed to make any lifestyle changes as she was quite happy as she was. In contrast, Paul at 59 related how no man in his family had *'made it to 60'*.

Several times during the interview, Jackie expressed the opinion that if she had attended the scheme, she would have made friends and enjoyed herself. These opinions seemed to be at odds with any real intention to attend. The idea of being active and the potential benefits seemed appealing, but the motivation (or confidence) to act was lacking. Of all of the interviews conducted, Jackie's story was the least cohesive. Both Jackie and Paul were very positive about the way that staff from the scheme had kept in touch with them and seemed interested in encouraging them to attend, health permitting.

Excerpts from first interview:

'Skipping all I basically did is skipping. Poldies (hopscotch), I used to play that at school. Netball, I was in the netball team and then I got older and I didn't like it. I started becoming a mother. I've got different views from (Paul): if he was sitting here he would say 'yes she liked the sport' but I didn't like sport at all. I just liked my skipping and poldies and then the netball and that was me.

I want to try and lose weight because I find that my health is going downhill [...] I can't go out places when people go 'oh you're fat.' I mean I've got a wee bit wary of my weight. They keep calling me fat and it just gets on my nerves. But now I'm getting to the stage where I need to do something about it. [...] Just because I want to get down to a size 10. Just be a normal thin lady. [...] We've

been to the dietician to see about what we can eat; that's done. Now we're going to do the health thingy (ERS). [...] I never thought about losing weight. It was only when my grandchildren started coming on the scene that it bothered me. [...] Because my grandchildren says 'Granny lose some weight I want you to go swimming with me'. So I would like to take my grandchildren swimming. [...] I want to get right down so that when I do go out with my grandchildren I can go out without them worrying about having to look after me and things like that.

I want to get activities that me and him (Paul) can do together. [...] I don't know about him though, but I will be all right with it. He'll be alright, I'm there. That's all he needs. I just worry about him. I'm a worrier. Even when he goes out to the car; to the shop I worry. [...] The dietician said that because I am his carer I wouldn't have to pay. [...]

Swimming and other activities that I have never done before, something different. Something totally different that isn't going to hurt me. [...] I would be meeting new friends. I'd be talking to other people, enjoying myself talking to these other people, seeing what their lifestyles is rather than what just what I have to offer. [...] It will get me out of the house because I'm sick of sitting in the house 24 hours a day seven days a week. I walk up the stairs; back down the stairs; sit; go back in the kitchen; make me self a cup of coffee; come back; sit on the settee and watch telly all day. I go out once a week to bingo and that is it. [...] I would be meeting new friends... I'd be talking to other people enjoying myself [...]

Excerpts from second interview:

I thought that it was a great idea [...] because there would be things here that I could do that he [Paul] might not be able to do and we could work together on things. But the thought of coming here on me own, with nobody else; I'm not like him. I like staying in me comfort zone. I like me own friends and I didna think I could do it with other strangers. Every time I thought that I would get without him; well I didna go. So I thought well there's no point going on my own. [...] It's just that the referral was because I am his carer; there is a lot of things that I have to do with him, so I thought well I will give this a go; see what it is

like. But then when he wasna allowed to do it; that gave me an excuse for to get out of it. [...] If he had come in with me the first time I would have been okay [...] Once I get into the meeting new people I'd be alright; all he'd need to do is drop me off and then I would come. It was the fear of coming in meself.

I definitely want to come to the scheme but it is just doing it with somebody. I don't want to do it on my own. I would prefer if I had him, my daughters will say 'oh I can't be bothered with that the day'. Well they have been saying to me for weeks 'I'll go swimming with you mum' and every time they get me psyched up, they let me down at the end. They don't want to do things with mum because mums old. [...] Who wants to go swimming with her mother? [...] We already go to bingo on a Thursday together [...] With bingo I can just sit in a chair and do the numbers. When I am going swimming then people can see me body and I have got a problem.'

'No I didna [want to come] but now looking back at it I think maybe it is a good thing. Maybe it would give me that motivation that I would need to get out and about and not sit in the house for 24 hours every day, 7 days a week.

As an under 55 who was referred because she was obese and who did not enjoy physical activity as a child, Jackie would potentially be predicted to dropout based on the earlier findings of this thesis. What was important in this story, however, were the complex personal circumstances that contributed to non-engagement. Low self-esteem, a lack of perceived control in her personal life, and low confidence to take part in physical activity meant that there was little chance that Jackie would engage. In a study that included dropouts from ERS, Pentecost and Taket (2011) also reported that low self-image was linked to low confidence to exercise, which in turn was linked to general feelings of helplessness and a lack of control over health. These authors speculated that such referrals were less likely to engage with individuals or groups for support.

In Jackie's case this was combined with lacking a sense of immediacy that her health problems might affect her life expectancy.

Dorothy, in contrast, was a timid 69 year old woman with a history of back pain. She did not like PE and since leaving school had not done any exercise, with the exception of two previous referrals to the scheme. At the time of her first referral Dorothy completed the scheme but did not progress on to other activities as she did not have a friend to go with and did not consider herself to be a '*good mixer*'. Dorothy enjoyed her second referral more, as she made a friend who she played soft tennis with, but dropped out due to a foot injury. It was difficult to predict whether Dorothy would adhere to the scheme based on her profile. She was older and not overweight but had never liked physical activity.

During her first interview, Dorothy was clearly uncomfortable sitting down and described how back pain was having a very negative effect on her life. Dorothy was hoping that exercise would help to relieve her back pain. She was also looking forward to meeting people in a similar situation to herself and hoped that she would make friends. Although worried about how much she would be able to do due to her back problem, she felt confident that she would receive good guidance from the staff. Dorothy's initial consultation was at the beginning of the school summer holidays but she said that she would not be able to start attending until October as she would be looking after grandchildren and then going on holiday.

Dorothy attended her second interview 12 weeks after she started to attend the scheme, which was five months after her initial interview. She was very disappointed with her experience and had only attended four sessions. At her interview, she became very upset and twice started to cry as she related what had happened during her time on the scheme. In the two month period between attending her consultation and starting sessions, Dorothy had not had any contact with the scheme. At the beginning of her first session her back pain was severe and she did not feel that she would be able to cope with taking part in any activity. There was no registration at the beginning of the session but one of the other participants told her where to go. She was told by the staff member to just do what she could.

The session was a circuit class, which she found far too difficult and did not feel that she was given adequate help to allow her to adapt the session. The first three sessions that Dorothy attended were taken by three different members of staff. She felt that two of these were not interested, but that the other one was very helpful and caring. Her experience of this session was much more positive; she was helped to adapt the exercises and the instructor took the time to make sure she had cooled down properly before she left. Dorothy said that she would probably have continued to attend if this member of staff had been the one taking the sessions on a regular basis, despite her back problems.

After four sessions, Dorothy was in a lot of pain and decided that she did not want to attend until she had been given some injections in her back, which she hoped would give her some relief. She telephoned the scheme and left several

messages saying that she was unable to attend. She was not contacted by the scheme until she received a letter saying that she was due her 12-week consultation. At this point, she telephoned the scheme again to say that she was not due this appointment as she had delayed her start by two months. Dorothy explained her back pain situation to the staff member and asked if she could put her referral on hold until she had her injections. She was told that this was not possible and that she would just have to dropout and get re-referred when her back was better.

Even at the beginning of her second interview, Dorothy did not seem to have decided that she would dropout of the scheme. As she became upset while describing her experience, she made the decision that she did not want to continue even if she was able to. During the interview, Dorothy kept comparing her previous experiences on the scheme to what had happened this time. She spoke of friendly and caring staff that really got to know her and how she had enjoyed it. Despite her negative experience of this referral, she seemed to feel that to dropout would make her a failure and she did not want to disappoint her GP.

Excerpts from first interview:

I can remember at school I wasn't very good at PE. I never liked it very much, only did what I had to do. I learned to swim really late, probably when I was about 15. [...] I've been to be the scheme twice before; other than that I don't think I really did any exercise. [...] I did come to the walking group when we first moved here. Basically someone introduced to it saying it was a way of making friends. But it wasn't for me.

It was soon after we moved here because I have angina and a bit of blood pressure, and the doctor thought it would be good because I didn't do any exercise anyway. I liked it because I palled up with a lady to do the gym and the racquet sports and I used to like doing the soft ball with her and we sort of got quite friendly doing that then lost contact when it finished. [...] The second time that I came I had to stop because I had a foot injury. No I don't remember doing that [exit route] probably because I didn't have anybody to go with or I didn't sort of know anybody really. I'm not really a good mixer so I find it quite hard.

I've got a real problem with my back and it stops me from doing things. I can't stand for a long time so I'm sort of hoping that if I do exercise it will strengthen the muscles in my back and I will be able to do more things. [...] I go to church and I can't even stand up for long enough to sing one of the hymns because I get this really bad pain and I am fidgeting about all of time. It just hurts me to do everything; ironing, even standing cooking. I'm really fidgety and I can't really concentrate on it'

If I lost a bit of weight that would make things easier and better as well; so that would be good. And it would be a sort of routine again too I suppose; giving you a purpose to each day. [...] Probably people in the same situation as me that don't do lots of exercise I suppose. Whatever you do they're not going to laugh at you if you can't do it and things like that. I suppose it is being with like-minded people who are in the same situation. [...] I suppose that you probably will pal up with somebody. That's what happened before so as long as they kept coming it would be all right.'

Excerpts from second interview:

I was really disappointed because I was in such a lot of pain with my back cos I'm waiting to get injections in it again. I thought I'd actually start the scheme after the injections but it didn't work out like that. I was quite disappointed because I couldn't do much of what they was asking us to do and I probably went to 3 sessions, maybe 4 and then I couldn't go any more. I tried to phone in, I phoned in several times to explain. I left messages but nobody got back to me. I did think about maybe coming in and speaking to someone but I didn't feel like it.

I did tell her that I'd got a back problem during that [pre-scheme] assessment and I was waiting for these injections. But she said 'well start'. [...] I know I started a long time after that because I think it was holiday time. [...] I don't think I got a telephone call. I had written it in my diary so I knew that I had got to come then.

(The first session) there was 3 or 4 other people waiting outside and one of them was talking to me. She said stay with me; and so I stayed with her and just did what I could. It was a class and it was where you do sort of aerobics first and then go to all these sort of stations. I couldn't do that very well. I found it really hard. She (staff) just said do what you can do and if you can't do whatever it is, just keep your feet moving.

(Another day) There was a lady (staff) [...] and she was really nice. She came to me and she could see when I was struggling and she came to me each time on those stations [...] and she showed you before you started what you needed to do. She knew when you couldn't do it and she would give you an alternative [...] so she was really good but she was only there once.

I was due to go Thursday and I didn't; and I think I phoned the following week and left a message. Got the answer phone and I left a message for somebody to ring me back and I didn't get a call back. [...] I mean I think if maybe someone had phoned me back and said well come in and you can do the things a different way it might have sort encouraged me to go back in again but I just couldn't face it. [...]

After Christmas I phoned up again and said that I hadn't been coming for a while because I had a problem with my back and that I really needed to speak to someone about it because I wanted to see if I could put it on hold and come back when my back was done. [...] She said did I want to dropout and I said no, I didn't want to dropout because I really wanted to carry on with it, but found it difficult then. And I asked her again if I could stop and come back when, because I had got my date then for when I was having my injections. And she said no you will have to dropout and go back to your GP and get referred again. Well I said I didn't really want to do that because I didn't really want to seem like a failure really, and go back. And she just said dropout then'

Dorothy's story raised some potential process issues within the scheme and highlighted the need for a better understanding of how well staff followed protocols. Where published studies have commented on process evaluation, they have assessed the implementation of behaviour change techniques (Moore, Moore & Murphy, 2011b; Duda *et al.*, 2014). Both of these studies reported poor fidelity to such techniques. It is not known whether this extends to other aspects of scheme process. It is possible, therefore, that ERS may benefit from the development of a validated way of testing how closely defined scheme protocols are referred to. It may be that the Northumberland ERS works for more people if planned protocols are followed.

6.4.7 Mind the gap: expectation versus reality

As previously discussed pre-scheme expectations of changes in health were often high and multifaceted. The stories illustrate the often complex life stories of participants and identify issues such as low self-esteem, fear of change, body image disorders; impaired social circumstances ranging from a lack of active peer role models to co-dependent or restrictive interpersonal relationships; and chronic negative experiences of exercise often commencing in childhood.

ERS is essentially a relatively 'light touch' physical activity intervention.

Members of staff have undergone fitness industry vocational training that tends to be physiologically orientated; for example how to exercise a client with a cardiac condition within safe and effective heart rate zones so that further symptoms are avoided and fitness levels are improved (Bohin *et al.*, 2014).

Such training is not sufficient to prepare staff to deal with the complex

psychological barriers that have been identified. Although this could potentially be partially addressed by the further development of behaviour change elements within national occupational standards for promoting physical activity (Skills Active, no date), it is unrealistic to expect that referral to ERS will result in sustained change of habitual behaviours for individuals who are affected by severe or multiple barriers. The success of ERS has been measured in part by what percentage referrals engage both in the first instance and over a period of time (Dugdill, Graham & McNair, 2005; Gidlow *et al.*, 2007; Sowden *et al.*, 2008). There is a need to better understand how appropriate referrals are and explore whether different or more intensive approaches are required for those with complex needs before change at the individual level can occur; for example cognitive behavioural therapy (Beck, 1976), support from multiple agencies (Sugai *et al.*, 2000), or broader system change (Michie, van Stralen & West, 2011). It is possible that patients are being referred from primary care because ERS is the only easily available option that health professionals can offer patients who are asking for help.

6.4.8 Weight expectations versus wellbeing rewards

It was apparent from most pre-scheme interviews that becoming more physically active was perceived as a mechanism for weight loss. Even those who were referred for conditions other than overweight/obesity often saw weight loss as an important participation goal. Not only that, but expectations of weight loss tended to be high, with the most common amount of weight that participants hoped to lose over the 24-week period being two stones (12.7 kg).

This was regardless of initial body weight. When asked to express why this was felt to be a realistic amount most said that they had read or heard that 'one to two pounds a week' was an achievable amount for sustainable weight loss. During second interviews none of the participants reported that they had lost the amount of weight that they would have hoped based on pre-scheme expectations.

Some reflection is necessary about what type of behaviour change would be required to achieve such weight loss. Swift *et al.* (2014) reviewed the role of physical activity programmes in weight loss. Clinically significant weight loss was reported to be unlikely using pedometer step goals, and possible but unlikely with both aerobic endurance training, or aerobic and resistance training combined unless very high volumes were achieved. As a result it was suggested that health professionals (and in this case also fitness professionals) should educate participants about reasonable expectations of weight loss based on physical activity programmes and emphasise the numerous health benefits in the absence of weight loss.

Furthermore, Foster *et al.* (1997) discussed the concept of 'reasonable' weight loss in a study of obese women, which reported a dramatic disparity between participant expectations and professional recommendations, and weight loss achieved. These authors highlighted the need to help obese people accept more modest weight loss outcomes. If the Northumberland ERS in its' current form is to continue to accept referrals for overweight/obesity, then adherence for this group might be increased if realistic weight loss as a result of participation

was to be discussed by both referring health professionals and during the initial consultation. An emphasis should be placed on the benefits of physical activity regardless of weight change.

The Northumberland ERS process did not include a dietary behaviour change element other than general advice on healthy eating such as eating less fat and eating five portions of fruit and vegetables a day. Guidance from NICE recommends that programmes are provided for overweight and obese individuals that allow for gradual changes to dietary and physical activity habits in order to achieve sustained weight loss (National Institute for Health and Care Excellence, 2014b). Since it has been proven that combined physical activity and diet programmes are more effective in achieving longer-term weight loss (Johns *et al.*, 2014), the Northumberland ERS should consider how such a combined focus might be achieved if weight loss is a programme aim in addition to increased physical activity.

Lifestyle choices of referrals prior to starting the scheme should also be considered. The level of change required for some participants to adopt behaviours widely accepted as healthy lifestyle choices such as taking part in 150 minutes of moderate physical activity per week (Department of Health, 2011) or eating a healthy diet might be unrealistically high. For example, a couple who participated in this study had just completed eight weeks of one-to-one sessions with a dietician prior to referral to ERS that did not elicit weight loss. If such specialist help failed to change behaviour sufficiently for them to lose weight, it is not realistic that it will be achieved by participation in ERS. That

is not to say that the ERS will not be of value for the reasons stated in the previous paragraphs; but since the referral for this couple was by the dietician then some preparation around realistic expectations would have been beneficial.

While expected weight loss was not necessarily achieved, most of the participants were philosophical about this. For some there was a recognition that they would need to make dietary changes as well as being more active. All were somewhat disappointed but did not see it as a reason to stop attending. Instead they tended to describe success in terms of improvements in wellbeing. In particular they described: just 'feeling better'; a steady improvement in mental health, increases in self-esteem; perceptions about ability to be active; and the social benefits of participation. This is similar to the findings reported by Pentecost and Taket (2011) that the social and psychological benefits of attending were more meaningful than measurable health benefits. In the present study wellbeing gains were described as more immediate, with participants describing how they felt better for doing something.

Important factors that participants reported contributing to success were peer support, staff knowledge and support, achievable activities, and enjoyment. These were largely reflected in the recent systematic review of barriers and facilitators to ERS (Morgan *et al.*, 2016). What Morgan and colleagues did not attempt to do was to consider the influence of pre-scheme expectations in facilitating adherence. Jones *et al.* (2005) reported that those with more realistic pre-scheme expectations were more likely to adhere to ERS, which reflects

behaviour change theory and implies that ensuring participants have realistic expectations is potentially a key facilitator to adherence. This study however, suggests a more complex picture where adherence can be achieved, regardless as to whether some pre-scheme expectations are met, if there are sufficient wellbeing gains. This is an area that requires further study as there has been little attempt to qualify improvements in wellbeing as result of participation in ERS and this may be an important but little examined effect.

6.4.9 *These things take time; addressing the performance gap*

Participants in study two reported that they did not necessarily expect to see short-term changes but study one reported that most dropout occurs early in the scheme. Those who dropped out in the first 12 weeks in study one attended a median (IQR) of only 2.0 (0.0-5.0) sessions in total. Poor attendance has been suggested to be a contributing factor to a lack of effect in ERS (Pavey *et al.*, 2012). There have been no studies identified that have considered actual scheme attendance combined with qualitative investigation in an attempt to better understand when and why poor attendance occurs. Findings from the present thesis indicate that if participants do not have a positive experience within the first few weeks they will not continue to engage. Benefits such as physiological changes in health are unlikely in such a short period of time, however, and participants must be prepared for this.

In the present study those who dropped out reported negative experiences of participation, or outside factors, rather than lack of goal achievement as reasons for ceasing to attend. Although outside factors may be difficult to

overcome, schemes should attempt to address shortcomings in participant experience. Other studies have reported issues such as inconvenient operating hours, intimidating exercise environment, insufficient staffing, and narrow range of activities available as barriers to attendance (Wormald & Ingle, 2004; Dugdill, Graham & McNair, 2005). The Northumberland ERS offered both daytime and evening opportunities for participation, a range of activities, and had staffing available for all supervised sessions, however, addressing most of these issues. Instead the present study reported some dissatisfaction with staff approach such as not giving sufficient guidance, not encouraging inclusivity, or not encouraging preferred choice of activity. Individual experiences were notably different however, as staff support was also seen as an important facilitator of attendance. For example, Dorothy reported that different members of staff created very different experiences and stated that she would have been happy to continue to attend if a cover instructor had been the usual group instructor. Consistency of delivery is an area that is worthy of further investigation, as discussed in section 6.4.4.

As discussed in the previous section, a focus on making new participants feel welcome, allowing them to take part in appropriate achievable activities and importantly inclusion in social aspects may address many of the issues reported in the present study. These findings reflect SDT-based (Deci & Ryan, 1985; 2000) recommendations of seeking to maximise social interaction, skills development, and enjoyment, while providing sufficient structure and promoting competence. These recommendations aim to encourage active exploration of

reasons to be physically active beyond the motives such as improved body shape.

Expectations related to physical health improvements should not be ignored, however, as participants described many gains over the period of engagement. Strategies such as goal setting, planning, self-monitoring, and reward provision should be integrated into the scheme process in order to achieve these. Such strategies are suggested within established behaviour change theories (Bandura, 1977; Prochaska & DiClemente, 1983; Deci & Ryan, 1985).

6.4.10 Age concerns

The findings of study one indicated that those who were under 55 years were more likely to dropout and it was hoped that by including a wide age range in studies two and three it might be possible to better understand why this was the case. Participants who were aged 50 years and above reflected on the need to invest in healthier behaviours in order to maintain good health in later years. It is a possible that ERS, which is essentially an intervention to prevent ill-health, is more successful for older participants because of the perceived immediacy of health decline. Those who are older and/or less healthy may make a cost-benefit analysis about taking part that is different from younger and healthy people as discussed by Melenhorst (2002). Although ERS studies are in agreement that being older is a predictor of adherence (Pavey *et al.*, 2012), there has been little investigation of the reasons for this. Pentecost and Taket (2011) suggested that since participants are predominantly older, younger people feel isolated and do not 'fit in'. The initial study in this thesis reported that

approximately half of referrals were younger than 55 years old however; meaning that if ERS was appealing and/or accessible to younger people they would be proportionately represented in sessions. It is possible that younger people may perceive that they have many more years of good health and do not need to take the precaution of being more active yet. For example, when Jackie was talking about wanting to see her grandchildren grow up, she said that she was only 44 so she would definitely have time to see them as at least teenagers. This was in response to a comment from her husband, aged 59 years, who was worried that he would not live to see his grandchildren grow up.

Understanding why younger people were more likely to dropout proved to be a challenge with this group of participants. Jackie (44) did not start, Dan (50) dropped out after being diagnosed with cancer, and Julie (51), Peter (52) and Amy (23) adhered. The other three under 55s from study two did not take part in the third study. Two of these spoke briefly on the phone and said that they had dropped out because they had other priorities and did not have time to attend. There is therefore a need for future studies that examine this further

Amy, the only adherer under 50 years old, offered some insight into why her circumstances may have differed from those of other young people. Prior to starting she had been into the leisure centre and had watched some of the sessions so she was prepared that she would be attending with mainly older people. Her very low self-esteem meant that she did not want to mix with her own age group, but felt that those who were older were far less judgemental. Amy commented that while the group made an effort to include any new

younger people, they did not come back again despite seeming to enjoy themselves. This adds weight to the suggestion of Pentecost and Taket (2011) that the social make-up ERS is not conducive to engaging younger participants.

When asked what she thought might encourage more younger people to attend, Amy's suggestions included making sure they were thoroughly prepared for what to expect when they came to their first session by discussing the age of others in the groups during the initial consultation. Social Cognitive Theory (Bandura, 1977) suggests that seeing behaviour performed by relatable peers increases self-efficacy, an important element in changing behaviour. Lack of peer role models may be a contributory factor in decisions about whether to attend and preparing younger people that most participants will be older might help to mitigate this. Alternatively, it could be argued that due to a lack of immediacy of health concerns, ERS in its current form is not suitable for those who are younger. There is therefore a need to investigate alternatives for those who are under 55 years old.

6.5 Strengths and limitations of this study

This study has used narratives to give a richer understanding of the Northumberland ERS, reflecting the use of this methodology in the social study of health (Moffat & Johnson, 2001; Carless & Sparkes, 2008). The application of sociological methods in order to investigate participant influences and experiences has allowed for a novel approach in the study of ERS. It has been suggested that narrative preserves individuality and distinctiveness in a context that complements, rather than competes, with quantitative findings (Roberts,

2000). In a programme of evaluation research that has combined both quantitative and qualitative approaches in an attempt to explore what works to change physical activity behaviour in ERS, the use of narrative recognises the importance of the social context. A chronological aspect was introduced by combining responses from interviews conducted prior to engagement with those conducted after participation, giving perspectives from experiences of referrals. It has helped to better understand the changes in perceptions that occur over the period of participation and allowed the voice of both participants and an 'insider' researcher to be heard. Although the use of narrative is widely found in the study of social sciences, there is no published ERS literature that has been identified that uses this form. The study demonstrates that it is an appropriate methodology to increase understanding of such schemes.

The study failed to engage with some of those who dropped out of the scheme or did not start in the first place. These tended to be the younger participants from study two. Study one identified that those who were under 55 years were less likely to engage in the first instance and more likely to dropout when they did. The lack of willingness to take part in a second interview for this subgroup means that the study failed to fully identify reasons why the scheme may be less successful for those who are younger.

6.6 Conclusions and recommendations for future research

The identification of three typologies for participant experience, 'the quest', the struggle' and 'the defeat' provides a novel perspective of what participants in ERS deem to constitute success, sometimes in contrast to their pre-scheme

expectations. Roberts (2000), suggested that the acquisition of memorable, evocative tales can make a significant contribution to developing a mature understanding of experiences. These stories can be used to raise awareness of the different experiences of ERS. They could be used by both commissioners and providers to encourage reflection on current practice. 'The quest' could be used to re-inforce good practice, while highlighting potential improvements. 'The struggle' could be used to initiate conversations about those for whom ERS may not result in long-term physical activity and what could be done differently. Finally 'the defeat' could be used to initiate conversations about who should be referred to ERS and what improvements could be made to provision.

To date ERS has been judged mainly in terms of attendance, adherence to scheme consultations and self-reported physical activity behaviour change. This study highlighted factors that contribute to whether participants choose to engage and the challenges of creating behaviour change. In doing this it has begun to add the 'how and why' to the 'what' works in ERS. Issues identified related to realistic expectations, particularly around weight loss, the importance of wellbeing and social engagement, the enormity of change facing some referrals, and the effect of individual staff on the quality of ERS delivery. The study has identified elements of behaviour change theories that could be used to potentially improve delivery. Findings have resulted in several recommendations for future practice and research.

Recommendations for future practice:

- Schemes should consider including dietary advice as part of their process if they have a large number of referrals who have weight loss as a goal. They should also educate participants about the health benefits of physical activity regardless of weight loss.
- Schemes should ensure that during the initial consultation participants set realistic goals, discuss self-monitoring, and understanding that results will not be seen after attendance at only a few sessions.
- Schemes should consider how best to make the first few weeks as enjoyable as possible, while maximising opportunities for social interaction. Particular attention should be paid to social interaction for younger participants, who may find being expected to exercise with mainly older participants off putting.
- Staff should be trained in behaviour change techniques, which should be integrated into scheme process.
- Evaluation of schemes should include measurement of changes in wellbeing.

Recommendations for future research are:

- There is a need to investigate whether dietary intervention can be successfully integrated in existing schemes or whether there is a need for separate interventions to address weight loss.
- There is a need investigate whether behaviour change theory is being implemented into scheme processes, and if so how well.

- The actions of individual staff appeared to be very influential in influencing adherence. A better understanding is required of how well scheme processes are followed and how staff influence adherence.
- A better understanding is required about the suitability of ERS as an intervention for those with multiple complex barriers to participation in physical activity. Other support mechanisms should be piloted where ERS is not found to be suitable.

7 Conclusions and recommendations for future research

7.1 Introduction

This PhD was undertaken in order to create evidence about what works, for whom and in what circumstances in the Northumberland ERS. The impetus for evaluation came from the providers of the service, who were being challenged to provide an evidence base for a well-established physical activity intervention. This challenge was a result of the publication of NICE guidelines (National Institute for Health and Clinical Excellence, 2006) about ERS. The growing demands on public health resources in Northumberland meant that commissioners wanted to ensure that there was an increasing culture of accountability, with greater emphasis being placed on generating knowledge that could have a practical impact on delivery of the intervention. The PhD has been undertaken in a culture of collaboration and trust that has spanned three Directors of Public Health. Results have been positively received by both commissioners and providers, even when they have identified weaknesses in performance and/or delivery.

This programme of evaluation research was not undertaken specifically under the auspice of knowledge translation, which is defined as:

'a dynamic and iterative process that includes the synthesis, dissemination, exchange and ethically sound application of knowledge to improve the health of populations, provide more effective health services and products and strengthen the health care system' (Canadian Institute for Health Research, 2012, pp 1)

Despite this the planning process included many aspects that have been identified as facilitators in the translation of knowledge into policy/practice (Mitton *et al.*, 2007). These include: the involvement of decision makers in intervention/research planning and design; collaborators who had the authority to implement changes; interpersonal contact between researchers and decision makers; sufficient time to make decisions; the inclusion of short-term objectives; and the research being timely in that both commissioners and providers were open to changing practice (Mitton *et al.*, 2007).

In the case of this programme of evaluation research the status of the researcher as a manager within the provider organisation allowed for a dynamic and iterative process of data collation, analysis, and feedback and discussion with a range of stakeholders. Importantly, members of staff responsible for delivery were able to take part in feedback workshops and were given the opportunity to comment on findings. They were able to contribute to discussions about what to do differently to try and improve the intervention. The suggested changes were then discussed with commissioners and implemented if considered appropriate. Commissioners were also able to discuss findings and suggest changes themselves. Ongoing collection of quantitative data will allow for the assessment of changes in outcomes that may result from differences in delivery.

Findings have also been disseminated more widely via articles in peer reviewed journals (Hanson *et al.*, 2013; Oliver *et al.*, 2016) (Appendix 10); presentations

at academic and professional conferences (Appendix 11); and inclusion in several industry-related policy documents (Public Health England, 2014c; Sporta, 2014; UKActive, 2014) (Appendix 12). The results of study one were presented at the opening press conference of the 2013 British Science Festival and received national and international press coverage (Appendix 11). Quotes from participant narratives have also been used by Public Health in Northumberland to showcase their approach to wellbeing, for example in the Director of Public Health Annual Report 2015 (Northumberland County Council, 2015b). This chapter details: the main findings; theoretical and methodological advancements of the thesis; applied advances that have been made as a result of findings; overall strengths and limitations of the programme of evaluation research; recommendations for future research; and brief overall conclusions.

7.2 Overview of the thesis

This thesis has examined what elements of exercise behaviour change provision within ERS work, for whom, and in what circumstances in order to gain a better understanding of what and how factors influence effectiveness. It has done this by exploring what influences referral to, engagement with, and adherence to the Northumberland ERS.

An initial large-scale quantitative study of routinely collected data examined the association of demographics and other factors such as reason for referral with four stages of the Northumberland ERS pathway; initial referral, uptake, adherence at 12 weeks, and completion of the scheme at 24 weeks. The study allowed for an assessment of the extent to which demographic and referral

factors could be used to predict uptake and continued engagement. It also examined what difference completion made to self-reported physical activity levels and physiological indicators of health (blood pressure, resting heart rate, BMI, and waist circumference).

A second, qualitative study explored pre-scheme perceptions and experiences of referral for 15 potential participants of the Northumberland ERS. An approach following the principles of Grounded Theory (Glaser & Strauss, 1967) was used in the analyses of semi-structured interviews undertaken prior to engagement. This allowed for the development of a conceptual framework explaining perceived influences on referral - lifestyle, route to referral, motivators, perceived facilitators and barriers. The final study explored the experiences of engagement, or non-engagement, for 11 of the 15 participants in study two through semi-structured interviews in order to better understand associated mechanisms. Results were presented as a series of three narratives typologies, providing rich data about differing experiences and challenges faced. These were used to highlight the complexity of both process and personal influences on participation and the importance of individual context.

Finally the thesis details the theoretical, methodological and applied advances that have been made as a result of this programme of evaluation research. Recommendations are made for the direction of future research in this area.

7.3 Main findings and theoretical advancements of the thesis

Findings from the initial study of this thesis indicated that a six-month ERS is adequate to lead physical activity behaviour change that has some benefit to health in the longer-term (defined as one year) for those who complete. This reflects the six months to establish a habit that is suggested within the stages of change construct of the TTM (Prochaska & DiClemente, 1983; Prochaska & Marcus, 1994). A major criticism of ERS has been a lack of effectiveness in creating long-term physical activity behaviour change (Pavey *et al.*, 2011; Campbell *et al.*, 2015). Since the majority of ERS are 10-16 weeks in duration, this finding is potentially of major theoretical importance.

Analyses from the two qualitative studies resulted in the development of a conceptual framework related to the process/personal contexts of referral and the identification of three narrative typologies for those who were referred. Both studies highlighted the highly complex and multifaceted nature of the intervention and the referrals themselves. They identified some weaknesses in both the scheme process and its implementation. Key concepts from within established behaviour change theories such as seeking to maximise social interaction, skills development, and enjoyment (Deci & Ryan, 1985; 2000), and providing sufficient structure, relatable peers, and setting realistic goals in order to promote confidence (Bandura, 1977; Bandura, 1986) are recommended as appropriate behaviour change techniques within ERS. In addition, it should be recognised that behaviour change theory is not the answer to all the problems associated with ERS. More attention needs to be paid to process evaluation

and physical activity interventions in general would benefit from the development of a validated way of testing fidelity (how well what is planned is delivered).

Finally, the thesis has highlighted a lack of targeted referral that creates a challenging delivery environment where such schemes are potentially being 'set up to fail'. The concept of immediacy of health decline influencing appropriateness of referral should be given consideration when planning interventions that are based on a health message.

7.4 Methodological advancements made by the thesis

Prior to this programme of evaluation research, qualitative studies of ERS tended to be superficial in nature and mainly encompassed the views of those who adhered. Such criticisms were evident in systematic reviews by Williams *et al.* (2007) and more recently by Morgan *et al.* (2016), who also considered studies from unpublished doctoral theses. Interviewing referrals at the beginning of the ERS allowed for a new perspective in the study of this type of complex community intervention. The methodology gave an insight into influences on the decision to be referred and how the process of referral affected perceptions of what would be involved in participation. In doing this the study was able to identify the complexity of individual referrals and a need to improve the referral process.

A further methodological advancement in the field of ERS-based research was the use of narrative to give a rich understanding of experience of such

schemes. This reflects the use of narratives in the broader social study of health (Moffat & Johnson, 2001; Tutenges & Rod, 2009; Buman, Daphna & Giacobbi, 2010), and those suffering from chronic disease (Elliot, 2005). Although the use of narrative is widely found in the study of social sciences, to date there is no published narrative-based ERS literature that has been identified. In this thesis it has been demonstrated that the use of narrative within the context of ERS can provide a powerful way to highlight participant experiences. It has allowed for a better understanding of the ERS process and changes in perceptions that occur over the period of participation. In this specific case it allowed the voices of both participants and an 'insider' researcher to be heard, which is also unique in published ERS literature. During the thesis journey, there has been a 'crossing' of research disciplines in an attempt to answer the most pertinent questions that have arisen as the research has progressed. The resultant shift in methodology within the thesis has ultimately advanced the field of knowledge.

7.5 Applied advancements made by this thesis

The results of this thesis have led to refinement of the extant programme. Changes included improved provision of information for referrals from both the health professional and at the point of first contact by the provider; reducing the cost for those identified as being in receipt of benefits; and piloting a different option for those who are referred due to being overweight / obese. In addition, the highlighting of differences in performance between venues increased provider recognition of the role of structural and organisational factors in scheme effectiveness leading to structural staffing changes in delivery.

The existing scheme was based on the TTM (Prochaska & DiClemente, 1983; Prochaska & Marcus, 1994) but changes were not based on a particular behaviour change theory. Although some of the changes can be related to behaviour change techniques, they were pragmatic solutions co-produced by providers and commissioners in response to findings. These are discussed in more detail in this section and have been related to behaviour change techniques identified from the Behaviour Change Technique Taxonomy (V1) (Michie, Atkins & West, 2014) where appropriate.

The finding from chapter four that site performance varied was used by provider organisations as a basis for a review of ERS delivery. Investigation of internal factors at the most successful site highlighted consistency of staff contact, limited numbers in sessions, the highest quality data collection of all sites and clear delegation of responsibilities between administration and delivery staff. In the poorest performing site, providers discovered a lack of cohesive delivery, poor data recording, limited number of sessions and a lack of ownership. Resultant changes included allocation of single members of staff to specific groups (with the aim of providing more consistent support for participants), lower maximum group numbers, clearer delegation of responsibilities, the creation of league tables for staff to compare their performance with others (social comparison) and extended training (instruction of how to perform work behaviours) in poorer performing sites. These refinements were aimed at changing the behaviour of members of staff rather than participants.

In addition the findings from chapter five regarding lack of information given by referrers led to discussions with surgery staff. These established that information leaflets were not given out due to paperless consulting rooms in some cases and pictures within the leaflets being considered to be inappropriate for younger people in others. Providers designed an electronic one page printable leaflet to give to referrals where paperless consulting took place and the information leaflets were redesigned to have more inclusive pictures (social comparison). Also as a result of the chapter five finding regarding poor information sharing by the scheme itself, members of staff were instructed to provide more details to potential participants during initial telephone conversations, in particular about times of sessions, types of activity and cost (information about social and environment consequences, credible source, verbal persuasion). Finally providers used the results of chapters four, five, and six to justify a countywide ERS concessionary rate of £2.00 per session for those in receipt of certain benefits (financial incentive). This was introduced in June 2015.

The effect of changes can be assessed systematically in the future due to continued use of the database created for the initial evaluation. Following a data download in February 2016, a dataset totalling over 12,600 referrals was made available for future analysis. The comprehensive nature of these data, which includes a 12-month follow-up, will allow for more in-depth exploration of whether there are differences between subgroups in engagement, adherence, self-reported physical activity and physiological changes resulting from

participation in the scheme. Consistency of data collection has been identified as a shortcoming of current ERS practice nationally (National Institute for Health and Care Excellence, 2014a) and this ongoing dataset presents an excellent opportunity to increase understanding of what works and for whom.

The benefits of using a bespoke database to collate scheme information have been clearly recognised by both commissioners and providers. Work has now commenced to integrate the existing database within a portal developed for all Northumberland Public Health commissioned services. This will have additional benefits; primary care professionals will be able to make online referrals and have online access to patient progress and there will be automatic data downloads, reducing the administration burden associated with evaluation.

There is an aspiration to integrate the new database with the leisure centre front desk system, which records attendances via swipe cards, to allow for longer-term analysis of whether participants continue attending leisure centre-based activities after completing the scheme.

The relatively small median BMI reduction identified in chapter four raised commissioner concerns about the appropriateness of the ERS for weight loss. National guidance (National Institute for Health and Care Excellence, 2014b) identified the need for tier two weight management services via lifestyle interventions. Despite tackling levels of obesity through diet and exercise being a priority of the Northumberland Joint Strategic Needs Assessment (Northumberland County Council, 2012) and the Northumberland Health and Wellbeing board (Northumberland Health and Wellbeing Board, 2014) there

was no commissioned tier two service in Northumberland. The high levels of referrals for overweight/obesity to the ERS suggested that this was considered to be a suitable, or possibly the only, option for tier two weight management. Public Health commissioners therefore identified a need to provide a different tier two weight management service from the Northumberland ERS.

It was agreed to pilot the Momenta adult weight management programme, designed by Paul Chadwick who also designed the successful MEND children's weight management programme (Sacher *et al.*, 2010). Momenta is an evidence-based, outcome-driven behavioural intervention designed to be delivered by fitness professionals in a leisure environment as a tier two service. Behaviour change techniques included in Momenta include goal setting and problem solving. The pilot aimed to recruit 180 participants who were randomly allocated into one of three groups for a 12-week intervention: the Momenta programme, regular gym membership, and the Momenta programme with regular gym membership. Results were collated by members of staff at Active Northumberland and provided to Durham University researchers for external analysis during 2016.

Further refinements could be considered by Active Northumberland based on the findings from this programme of study. For example, the inclusion of SCT-based (Bandura, 1977; 1986) physical activity education sessions similar to those in cardiac rehabilitation could be piloted in order to further educate participants about the benefits of being active. Such sessions could employ behaviour change techniques such as decisional balance, goal setting, problem

solving, and further encourage peer support. An additional change that could be piloted is the pairing of new participants with relatable others who have been attending for a period of time.

During 2014, PHE applied rigorous quantitative Nesta standards to physical activity interventions in England after inviting providers to submit evidence of effect. Of the 952 programmes that submitted evidence, only 34 were sufficiently rigorous to be classified according to Nesta standards of evidence. No ERS interventions met standards for proven or promising practice, but the Northumberland ERS was one of only six of the 28 programmes classed as emerging practice that were ERS-based and one of nine identified as having the potential to move to promising practice. As a result the Northumberland ERS was included in the PHE England document '*Identifying what works for local physical inactivity interventions*' (Public Health England, 2014c) (Appendix 12). In tailored feedback about the submission the scheme was praised for its robust embedded approach to monitoring and evaluation, but criticised for a lack of randomisation, leading to a failure to establish causality (Public Health England, 2014b) (Appendix 12).

Responding to these criticisms is a challenge to Active Northumberland given the pragmatic nature of the scheme and service expectations of referrers. The positivistic stance of the feedback failed to recognise that for physical activity-based interventions sensitive to complex individual behavioural and social influences, this approach may limit broader understanding of what works, for whom, and in what circumstances (Pawson *et al.*, 2005), a recurring theme

throughout this thesis. Randomisation may allow for an assessment against a control but tests rather than helps to improve an existing intervention. This programme of evaluation research was undertaken from a pragmatic stance with the aim of improving the scheme rather than testing against a control. It has been recognised that routinely collected data can help inform programme delivery, leading to more effective, efficient and equitable services (Hales *et al.*, 2016). In this case such an approach has resulted in different, more informed delivery. Over time the impact of this can be examined. Disappointingly the innovative qualitative work undertaken in this thesis would not have been considered in the PHE report (Public Health England, 2014c) as this type of research is not recognised within Nesta standards. It can be argued that there is a need to widen the type of evidence considered in such reviews a concept that was very recently explored in a publication by Oliver *et al.* (2016), which I co-authored (Appendix 10).

Since ERS are generally tailored to the requirements of the community in which they are based, it is perhaps understandable that policy makers have been unable to provide a single 'gold standard' in terms of programme structure. This thesis has contributed to a better understanding of the complex socio-demographic, environmental, economic, and cultural barriers that may inhibit physical activity behaviour change in the context of ERS. In recognising that such schemes may be most successful at engaging with discrete sub-populations, such as those aged over 55 years (chapter four, section 4.3.1), it demonstrates that there is a need to consider implementation of other more

targeted or different interventions for those who have multiple barriers to participation in physical activity. Overall it is possible that a 'one-size fits all' model will not be achievable, limiting the potential for the identification, communication, and scaling up of best practice models for ERS as desired by PHE (Public Health England, 2014c).

The Northumberland ERS has been used as a case study in the Sporta Purple document '*Sporta's offer for public health*' (Sporta, 2014) (Appendix 12) and the UKActive report '*Steps to solving inactivity*' (UKActive, 2014) (Appendix 12). Resultant recommendations of the latter industry report included that local authorities should prioritise and resource physical inactivity programmes to the same level as other top tier public health risks and deliver physical inactivity strategies independently of obesity and weight management. The report also recommended that the activity sector should focus on engaging and supporting inactive people by delivering tailored evidence-based programmes. In addition it identified the need to better record, analyse and evaluate data about users of leisure facilities and effectiveness of their programmes to improve the evidence base. Relationships that have been formed, or strengthened, as a result of this PhD have contributed to the development of these national recommendations and the implementation of them at county level.

7.6 Strengths of the thesis

A major strength of this programme of evaluation research was that it was practice based. It provided a pragmatic approach (Dewey, 1928) to the evaluation of an established, complex, community-based physical activity

intervention. It was an attempt to evaluate the Northumberland ERS based on the then current best practice recommendations (British Heart Foundation National Centre for Physical Activity and Health, 2010). The lack of RCT evidence about what works meant that there was not the opportunity to test delivery against a known standardised effective model in way that would help address the gap between evidence and community-based practice, as has been suggested is required in the case of falls prevention exercise programmes (Li *et al.*, 2016). The commitment by both commissioners and providers of the intervention to the planning and implementation of robust evaluation methodology ultimately led to creation of a large standardised quantitative dataset. The demographic and referral characteristic data collected enabled comparisons to be made with other published data (Dugdill, Graham & McNair, 2005; Gidlow *et al.*, 2007; Sowden *et al.*, 2008). Some studies (James *et al.*, 2008; Tobi *et al.*, 2012) have used an unclearly defined level of attendance as proxy measure for adherence and have failed to measure physical activity. Study one of this thesis, in comparison, has combined actual attendance data with the use of the GLTEQ (Godin & Shepard, 1985), a validated self-report questionnaire (Jacobs *et al.*, 1993; Miller, Freedson & Kline, 1994), to give a better understanding of physical activity behaviour change.

In an attempt to reduce participation bias this programme of evaluation research conducted interviews with potential participants after they had been referred to the scheme, but importantly, before they attended the initial consultation. To my knowledge no other similar work has been undertaken and so this exploration of

referrals' views is unique to the field of study. The second study of this thesis therefore presented a previously unexamined perspective of ERS. Additionally the narrative approach taken in the final study examined the experiences of the participants in a way that is novel in the current ERS research-base.

Furthermore, since not all interviewees subsequently engaged with the scheme other than the pre-scheme consultation, a different perspective emerged as to the reasons for engagement/non-engagement, and circumstances surrounding these, compared to other studies.

The 'insider' status of the researcher provided several benefits. First it meant that there was an ability to influence the creation of a bespoke database for data collation and ensure that the data collection process was robustly implemented. Second, as strategic manager of the ERS studied, I was able to engage with wider stakeholders such as referring GP surgeries and commissioners to share findings. Finally, the dual role as both manager and researcher meant that changes in delivery could be implemented according to study findings. Data collection is now an integral part of delivery for the Northumberland ERS meaning that the size of the dataset is increasing and currently stands at over 12,600 referrals. Ongoing downloads mean that the effect of changes made to the scheme process can be assessed in future evaluation work.

7.7 Limitations of the thesis

Despite the complex nature of health interventions (Craig *et al.*, 2008) and the limitations of RCTs in understanding the wider aspects of such interventions

(Pawson *et al.*, 2005), PHE have criticised the evaluation of the Northumberland ERS for lacking a control group and randomisation (Public Health England, 2014b). Although it can be argued that such an approach is not transferable to practice or indeed viable given the established nature of such schemes (Sowden & Raine, 2008), the application of strict Nesta standards to the assessment of effect by PHE means that based on this, the Northumberland ERS does not meet the criteria for Nesta level three evidence of promising practice.

While there has been a concerted effort to collect data in a standardised and robust manner, analysis revealed some inconsistencies in data collection and reporting at the poorer performing leisure sites. The provider was made aware of these issues however, and on further investigation they appeared to be indicative of other process failures in these sites.

The members of ERS staff responsible for taking physiological measurements were given internal training to ensure standardisation and accuracy so far as was feasible; however, in terms of academic rigour those undertaking the measurements were not International Society for the Advancement of Kinanthropometry trained and inter-/intra-tester error was not ascertained. Part-way through this PhD, I undertook the above training and as a result staff received further internal training to improve measurements for the future.

Qualitative studies were limited in that they only included participants from two of the nine leisure centres where the Northumberland ERS was provided. This

was due to logistical and political limitations, but it would have been beneficial to include a site where retention was particularly poor.

7.8 Reflection on my PhD journey

The concept of reflexivity is used to emphasise the importance of self-awareness, political and cultural consciousness, and ownership of perspective within qualitative research (Patton, 2002). It allows for a consideration of how the researcher and the research process have shaped the data, and how prior assumptions and experience might have influenced inquiry (Mays & Pope, 2000) This section therefore reflects on how my personal experience, biases, and closeness to the scheme being evaluated may have influenced both process and results.

The research in this PhD thesis was firmly grounded in the evaluation of practice. It began after a discussion between commissioners and providers about the need to better understand the effect of the Northumberland ERS. Studies were naturalistic in approach, although changes were made to delivery as a result of findings. On a personal level the six-year long process of completing a part-time PhD has been a life-changing experience. Previous work experience meant that I started with a definite preference for a positivistic approach to evaluating effectiveness of the ERS studied. This appeared to fit well with my knowledge of guidance developed for ERS (Department of Health, 2001; National Institute for Health and Clinical Excellence, 2006) and my liking for organisation, facts and figures.

When designing the quantitative evaluation I was very fortunate to be able to work with Sarah Sowden, who happened to be undertaking a six-month placement as part of her public health registrar training in Northumberland having recently completed her PhD evaluating equity of access to ERS in London (Sowden *et al.*, 2008). The pooling of academic, public health, and industry knowledge was very stimulating and resulted in the enthusiastic development of a comprehensive programme of monitoring and evaluation. Over the six years I have reflected on whether Sarah's knowledge was the catalyst for commissioners turning their attention to the effectiveness of the Northumberland ERS, rather than the 2006 NICE guidance. I have also wondered whether had she not been met with my enthusiasm, and a willingness by the chief executive of BVAL to indulge this, attempts to understand the scheme would have faltered from the start. During initial discussions I did not intend to undertake a PhD, merely to set up robust evaluation of the scheme. The PhD was the result of a chance discussion between me and Linda Allin (who became one of my supervisors) at the Tynedale Sports Awards, where both of our sons had been nominated for awards. In conversation I explained to Linda what was happening in my work life and she said 'you should write that up as a PhD'. When I replied something along the lines of 'hmm, that's a good idea', I think I was probably being polite. This PhD was definitely the combination of circumstance and timing. Certainly other commissioned services in Northumberland were not asked to provide the same comprehensive level of data. This was clearly demonstrated when we were planning the weight management pilot and wanted to understand existing provision in order to avoid

duplication. Was it the right thing to do? Absolutely. Is scheme delivery better informed? Has it strengthened the reputation of the scheme and improved stakeholder relationships? Definitely.

In my role as manager of the ERS for both providers my enthusiasm for evaluation was infectious, or possibly the staff were just long suffering and knew that getting 'on board' was the easiest option. The short-term nature of the funding cycle in public health meant that staff understood that every three years there was a possibility that funding might be withdrawn, resulting in them losing their jobs. This was a key driver in them understanding the need to demonstrate whether the scheme worked. I integrated quarterly reporting mechanisms into the database that allowed them to see graphs of performance and compare leisure sites, which were met with enthusiasm and not a little competitiveness. These were sent to referring surgeries and commissioners, helping to raise awareness of the scheme. The benefit of easy to understand, regular information distributed to stakeholders seemed to be beneficial for engagement with all parties. Referral numbers improved with timely information to surgeries, members of staff were motivated by objective measures of how they were doing, and commissioners were satisfied that referral quotas were being reached and performance was satisfactory. This promoted further conversations and increased credibility for the intervention.

The fact the scheme was able to provide 'raw data' to commissioners at regular intervals gave them assurances of authenticity in results. I am not aware that they have ever used this to undertake any analysis, preferring to rely on the

results of the academic evaluation. In this respect it is difficult to separate what was done in a work capacity and what was done as a result of undertaking a PhD. The evaluation was not presented to members of staff as a piece of academic work but as a way to help them do their job better and a necessity for continued funding. In retrospect I think that this represented a balanced approach and highlights the benefits of engaging with managers of interventions in the co-production of evaluation research programmes.

Having completed the initial study and established long-term routine data collection, there were still many unanswered questions. At this point I had to step outside my comfort zone and enter the world of qualitative research. I was faced with several problems. The first was that I did not know what the best approach was; the second was that I did not have any experience as a qualitative investigator; and the third was that I was unsure how my pre-existing knowledge and perspective would influence how I conducted the research.

There seemed to be a myriad of methods available to choose from and I did not know where to start. Unlike with statistical analysis, there did not seem to be a 'correct' method. As my organised world of objectivity and figures disappeared into the background, I had to make a choice about what was the most appropriate way to gain the most relevant knowledge. A slightly panicked period of reading followed before I decided to take an approach using the principles of Grounded Theory (Glaser & Strauss, 1967). I was dismayed to hear other students say that this was really complicated and difficult. Never mind, I thought, it's really just making it up as I go along ... Armed with Corbin and

Strauss (2008) and supervisory feedback, the learning curve was steep. Did I really understand Grounded Theory before I started to do my fieldwork? No, I do not think that this would have been possible. I needed to follow the process and develop understanding as I carried out the research. For example, my understanding of theoretical sampling, and the practical limitations of doing this, developed as I analysed each interview and decided what type of referral I wanted to interview next. Limitations due to time, location and recruitment strategies meant that a pragmatic approach was required. Although I did not achieve 'the ideal' in terms of theoretical sampling, I began to understand that if I analysed data by comparing incidents and events on the basis of concepts rather than in a descriptive sense I was still able to uncover process and variation, along with density. While I certainly would not claim to be an expert in Grounded Theory, my understanding of it has grown exponentially through the research process.

I also needed to develop my practical skills as a qualitative researcher. Before I began the fieldwork for my second study I felt that I had a good understanding of the relevant questions to ask. These were based on results from study one and extensive reading, combined with my working knowledge of ERS. During my working career I had completed several training courses in motivational interviewing (Miller, 2002) and thought that I had reasonable skills in asking open questions and allowing people to speak. I completed a two-day qualitative interviewing course at Oxford University and felt prepared. When I listened to my first interview recording I was shocked at how often I had interrupted or did

not allow enough time for someone to reply. I noticed a few occasions where I thought I had waited long enough to get a reply but as I started to prompt I could hear the intake of breath as the participant had been about to speak. This improved with practice. I also had a tendency to allow participants to drift off the point; in fact in several interviews I seemed to actively encourage this by asking further questions about things that were completely 'off course'.

When asked by one of my supervisors why I was doing this, I replied 'because it was interesting'. To which she replied 'but is it relevant?' This was a fair point that I tried to remember as I yet again allowed an interviewee to wander. As the interviews progressed I became better at staying 'on course', but still allowed participants to develop their own narrative perhaps more than I intended. On reflection this had both strengths and weaknesses. Sometimes it encouraged people to feel comfortable talking to me, which then allowed them to speak about what I wanted to ask about. Among this were sometimes 'pearls' of detail. Conversely it increased the effort required for transcription without always adding anything relevant. There were occasions where the interviewee seemed to take control of the dialogue and it was difficult to direct them to relevant discussion. These are skills that I will no doubt develop further in the future.

Perhaps the issue that has caused the greatest amount of reflection during my PhD journey has been how my pre-existing knowledge and perspective influenced how I conducted the qualitative research and how I interpreted results. I perceived that there were two issues. The first was how to avoid the potential for bias as a result of having a vested interest as manager of the ERS

being studied. How did I ensure that what I found was really not influenced by a desire to prove that it worked in order to protect the staff and service? How did I convince others that I had both a credible research strategy and results in light of this? Was I a critical collaborator or an independent investigator?

The second was whether my considerable experience as a deliverer of ERS meant that I had pre-conceptions of what I would find. Did this mean that I would ask questions that would encourage the answers that I expected to find; or did it mean that I was looking for themes within the data that I expected to exist? Patton (2002) discusses the idea of 'empathic neutrality', suggesting a middle ground between being too involved, which can cloud judgement, and being too distant, which can reduce understanding. I gave a lot of thought to this. How could I ensure that my findings were both credible and trustworthy?

Trying to answer these questions has been a challenge. I found the 'vested interest issue' the easiest to deal with and felt confident in justifying my approach to others. From a provision of service perspective, I had always believed that if something did not work then we should not be doing it. Or more accurately we should be doing something differently. As discussed on several occasions during this thesis, the evidence for the health benefits of being physically active is very strong, while the evidence about how to get the population more active is weak. Doing nothing is not an option. I was confident that this view was shared by public health colleagues and the qualitative element of this research was about trying to create understanding about why

the scheme worked for some and not for others. This work was important in a far wider context than just the Northumberland ERS.

From the start I knew that the Northumberland ERS was not a 'magic bullet'. The ERS sessions at Active Northumberland leisure sites were busy, referral numbers remained consistently high; it was popular. The participants were smiling and seemed to be having fun. I regularly saw people in the centres who had taken part in ERS ten years previously who were still attending. Clearly something was working. If it was not working well enough to be considered effective then this did not mean that it was not valuable. Understanding what elements were the 'active ingredients' of success could potentially improve performance, or failing that if a decision was made to cut funding, could influence future delivery of something else. If at the end of the research project funding for the scheme was cut; well such is life in the public sector. This was the reality of my work as a manager delivering local authority services.

Thoughts about potential bias due to my work experience have been a constant companion in my journey. I have tried to be reflexive in assessing what I know, how I know it, and what has shaped my perspective. I do not believe that anyone can come into any research situation with a truly value-free perspective and I do not think that my perspective is less valid than anyone else's as long as I am aware of how it has been shaped. Overall I felt that my knowledge added more to the interview and interpretation of data than it detracted. I made a decision not to inform participants of my role as the manager of the ERS. I did this in the hope that they would not feel constrained in what they said when

talking about their experience. At the end of each interview I kept a reflective diary in part of which I attempted to identify how much my own experience of the scheme was influencing my opinions and in particular whether I felt frustrated if a participant said something that reflected poorly on the scheme. The following excerpts illustrate my thoughts. Sometimes my knowledge was helpful in encouraging more in-depth discussion, as in the case of participant two:

'Given some of his answers, I told him a lot more about the scheme than I intended to – this was to try and explore his reactions, particularly over cost and the idea of being in a group. I was only able to do this because I know a lot about the scheme and this did really affect the balance in what was said (if I was an impartial researcher I am guessing that he would have just told me that the scheme was free and then it would have been left at that)'

By participant five it was evident that I was giving a considerable amount of thought to how much I was influencing participants by imparting knowledge. I was also finding a blurring of lines between researcher and scheme provider in terms of ordering my own thoughts. Rereading this now, I can sense my frustration that participants were arriving at the scheme lacking in information.

This was not something that I expected to find.

'Still struggling with how much input to give in relation to my knowledge of the scheme; I am worried that by telling the participants about what should happen, I will influence the outcome of their journey. This needs to be weighed up with the fact that I am probably influencing it anyway and the fact that they should be told all of the things I am discussing in their first assessment. Actually they should already have been given most of the information.'

I am finding it very difficult not to be thinking about how things could change to improve the scheme as I am talking to people, and need to recognise that this

is a different aspect of my job to the research part of it; however, the idea is that the research that I am doing will have an impact, so splitting the two is a lot more difficult than I thought it would be.'

There were other times where it is clear that my perspective was influenced by previous experience as with participant nine, although the prediction turned out to be correct:

'If I was making a prediction about whether this person will come, based on my past experience working on the scheme, I would say, not a chance.'

And that both my experience and nature influenced my discussion with participant eleven:

'She is absolutely terrified about coming to the scheme but seemed prepared to do it, even if she really didn't enjoy it, which she certainly wasn't expecting to. At some points I found I was reassuring her that she would be fine and telling her that she would not be out of place. As a researcher I probably shouldn't do this, so I guess I am still struggling to remove myself from the scheme and also from the people that I am dealing with. I am not sure about how much of a problem this is. I keep thinking about whether I would take a very different approach if I didn't know about the scheme in so much depth, or whether I am just the sort of person who naturally tries to reassure anyone who is uncomfortable.'

There was only one occasion where I felt very strongly that I wanted to take action after interviewing a participant about their experience of the ERS.

'I felt myself getting really annoyed with the staff concerned during this interview, especially when she started to cry when she was telling me what a terrible experience she had had. I found myself saying that I was sorry that she had to go through this experience but without telling her that I had anything to do with the scheme. I did ask her after the interview whether she would like me to raise this with anyone, but she said that she didn't.'

What to do led to some soul searching and discussion with my supervisors. I did not speak to the two members of staff concerned but resolved to raise some of the issues around client care at future training sessions. This allowed for discussion in a general context and did not have the effect that addressing the issues head-on would have had. This was the only point in which I felt compromised in my work as a result of the research.

Overall I feel like my interpretation of qualitative results has been as balanced as I could make them. I have presented these results to a range of audiences and they been positively received. I have always made it clear that my perspective was that of both practitioner and researcher. Usually people have wanted to know more, or what I thought should come next in terms of research in this area. I wanted to create space for participant voices to be heard, to gain a better understanding of why ERS works for some and not for others, and to contribute something new to the knowledge base. I also wanted to promote discussion about improving practice. I feel like my research has achieved all of these things and as such has been of value.

I feel very privileged to have been given the opportunity to undertake a work-based PhD. My increase in knowledge has been exponential and it has been a truly life-enriching experience. It was a first for the organisation that I worked for, and given the austerity measures imposed on the public sector this is unlikely to be repeated in the near future. There has never been enough time as I tried to juggle the demands of a full-time job with a PhD. Has it made a difference to the way in which the organisation works? Absolutely, the value

gained in learning, credibility with health partners and in continued funding has far outweighed the relatively small investment in paying for a part-time PhD. Just before completing this thesis I left my job. Whether there is a continued focus on evaluation and learning on the part of Active Northumberland without my drive and enthusiasm remains to be seen.

7.9 Future directions

This thesis has contributed to an increase in understanding of the important elements that might influence successful engagement with, and adherence to, ERS. As a result of findings, there are several recommendations for future direction:

The large quantitative data set provided by the Northumberland ERS has much potential for future exploration. To date, overall effect in terms of change to physical activity behaviour and physiological health indicators has been assessed for a subset of these data. It would be beneficial to better understand the effect for sub-groups of the referral population. For example there is a need to better understand the effects of the scheme for those who are living in the areas of greatest deprivation. There is also a requirement to understand whether the scheme is effective in self-reported changing physical activity levels sufficiently to benefit health for sub-groups of the referral population, such as those referred for CVD. Given that changes to scheme processes have been initiated as a result of this work, there is a need to understand whether these have resulted in any changes in uptake, adherence, completion or physical activity behaviour.

Given the findings about low levels of BMI reduction and high weight loss expectations, there is a need to better understand how ERS can contribute to effective weight management programmes. The weight management pilot that has already been undertaken as a result of this thesis is an example of how interpretation of results can be used to influence the testing of a different intervention. The smaller numbers involved in the pilot have allowed for a randomised study with comparison arms. This model has the benefit of satisfying the strict Nesta criteria applied by to assessment of effectiveness of community physical activity interventions (Public Health England, 2014c). Future studies could extend this pilot if results are promising or test different models of delivery if they are not.

Given the identification of complex barriers to participation in ERS for some referrals, there is a need to investigate what approaches may be more effective in changing physical activity behaviour. Qualitative work to understand what those living in deprived areas and/or with multiple barriers to participation feel would help to encourage behaviour change would be beneficial. Small pilots investigating new interventions based on these findings could test effect before scaling up of any successful models. These may be a different and innovative approach to traditional ERS.

More attention needs to be paid to the mechanisms that affect initial referral. Studies are required that investigate what influences the decision to be referred and the effect of information given to potential participants at the point of referral. These may be to investigate the effects of specific marketing

campaigns, for example, social media narratives about success; or may be more general, for example, the effect on information given by the referrer at point of first contact.

This thesis has recommended the application of elements of psychological behaviour change models in ERS. The effect of these is another future area for potential future study. There have been very few studies that have examined how constructs from such theories affect the success of ERS (Markland & Tobin, 2010; Duda *et al.*, 2014; Littlecott *et al.*, 2014) and only two identified studies that have assessed fidelity of implementation (Moore *et al.*, 2013; Beck *et al.*, 2016). There is a need for studies that clearly map what elements of behaviour change theory are being used within a scheme, measure change in core constructs such as self-efficacy if appropriate, measure fidelity of implementation and also any resultant change in physical activity behaviour.

Finally given the limitations of self-report questionnaires, future research using devices such as accelerometers is required to objectively measure physical activity change for ERS participants.

7.10 Implications for future research in Northumberland

Given the progress made in evaluation of the Northumberland ERS as a result of this PhD, it would be beneficial for commissioners and providers to consider the development of a feasibility study to explore whether it would be possible to carry out an RCT in the future. The use of a realist framework, such as that proposed by Pawson *et al.* (2005) to conduct a process evaluation, could allow

for an assessment of whether stakeholders recognise the need for higher quality evaluation and support the development of an RCT. This could include discussions with strategic implementers, referring health professionals, delivery staff and participants. It could also include an assessment of process fidelity in order to identify leisure sites with the best practice so that any RCT would only be implemented where it would test what is planned is being implemented. If positively received, such a feasibility study could be used to apply for external research funding for a future RCT.

7.11 Conclusion

In conclusion, this thesis represents six years of applied evaluation research in the field of ERS. It has been undertaken in a period of unprecedented austerity in the public sector, particularly in local government. Increasing financial pressures have resulted in a greater requirement for accountability in the provision of services. In light of the weak evidence base for ERS, there was an urgent need to better understand what elements of the Northumberland ERS worked, for whom, and in what circumstances. This thesis has been the result of a strong partnership between Northumberland Public Health team and Active Northumberland, the provider of the intervention investigated. The evaluation research was undertaken on the understanding that at least in the initial stages it would be used to inform delivery rather than decommission the service. The 'insider' status of the researcher was used to good effect to implement evaluation processes, to disseminate knowledge to stakeholders, and to implement change as a result of findings.

In particular the thesis has examined the influence of demographics and other factors such as reason for referral on initial referral, uptake, 12-week adherence and, 24-week completion of the scheme. For those who completed it has also examined the change in self-reported physical activity at 24 and 52 weeks after starting the Northumberland ERS, and 24-week change in physiological health indicators (blood pressure, BMI and waist circumference). It has explored how and why participants came to be referred to the Northumberland ERS, as well as pre-scheme perceptions after referral but prior to starting the scheme. Finally, it followed a group of participants through their referral journey in an attempt to understand what elements of the scheme were most likely to lead to successful engagement.

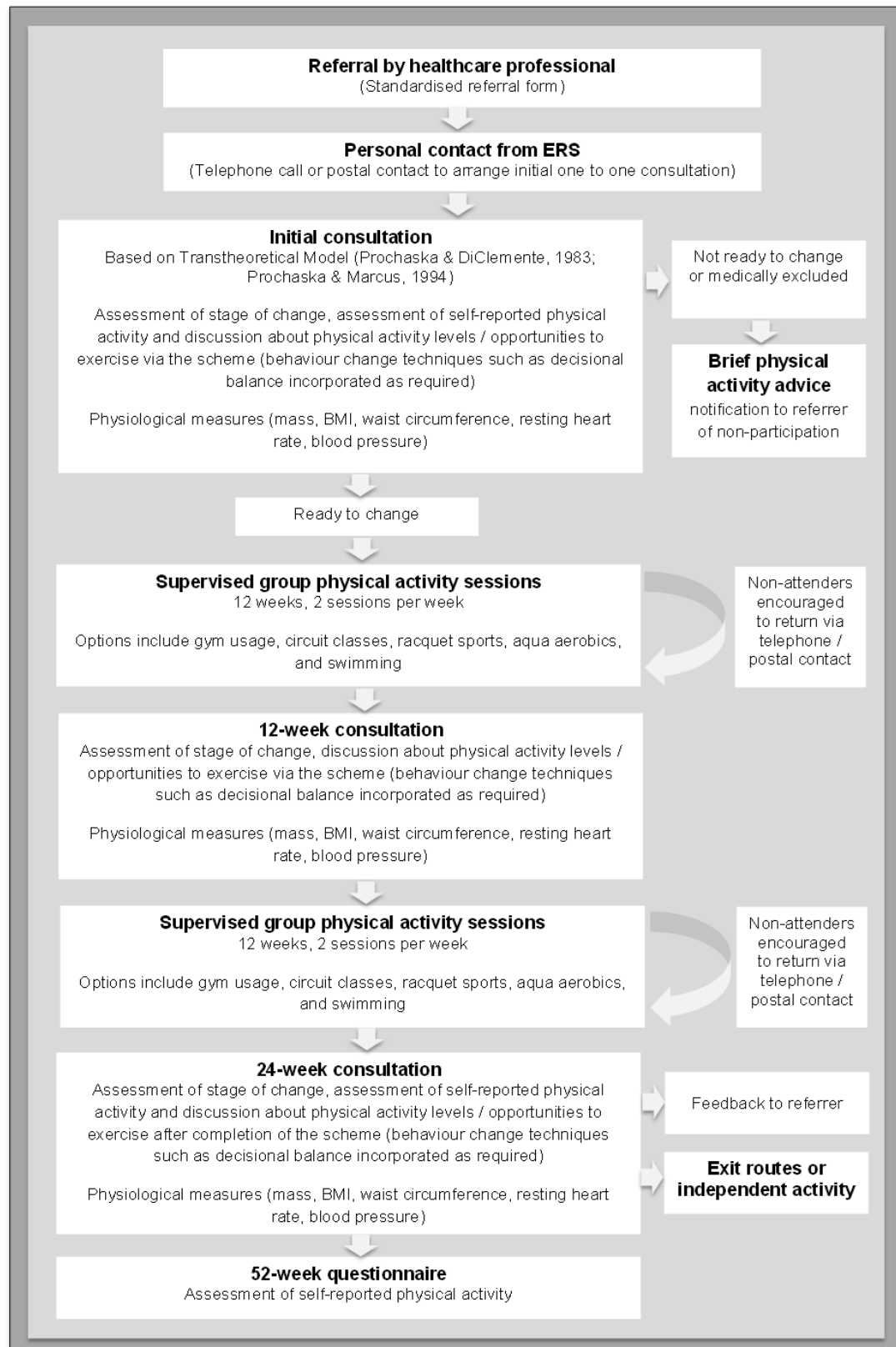
The receptiveness of staff members within Active Northumberland to ensure that robust evaluation became integral to the Northumberland ERS operation has meant the production of a large and comprehensive dataset. Process and personal factors that influenced referral were used to create a conceptual framework and experiences of referrals were shared in a series of narratives. The complexity of referrals and the potential limitations of ERS have been highlighted. The need to investigate other support mechanisms/different interventions for those who most require help, when ERS fails to engage, has been identified.

The combined knowledge gained through the three studies has been used to make changes to the scheme process. These have included changes to staffing structure, additional training, changes in the way that information is shared with

referrals at the point of first contact by the scheme and the piloting of a tier two weight management scheme. Findings have contributed to the policy debate about 'what works for physical inactivity interventions' and has been used as a case study of good practice within industry policy documents.

Overall the thesis has contributed to the knowledge base by providing new information about the effect of ERS on physical activity behaviour and physiological health outcome change. Importantly, it has provided an increased understanding of factors affecting the referral process and participant experience. The narrative typologies suggest a new way of identifying who is most likely to engage in ERS. Findings have been used at both a local and national level to influence the future delivery of ERS.

Appendix 1 Flow diagram of components of the Northumberland ERS



Appendix 2 NRES ethics guidance for study one

From: NRES Queries Line queries@nres.npsa.nhs.uk
Sent: 10 December 2010 17:17

NRES reply to enquiry 10.12.10

Thank you for your enquiry.

Your query was reviewed by our Queries Line Advisers.

Our leaflet "Defining Research", which explains how we differentiate research from other activities, is published at:

<http://www.nres.npsa.nhs.uk/rec-community/guidance/#researchoraudit>

Based on the information you provided, our advice is that the project is not considered to be research according to this guidance. Therefore it does not require ethical review by a NHS Research Ethics Committee.

Would this be classed as a service evaluation or audit?

I would deem this service evaluation.

Would it be appropriate to use this data analysis as part of a PhD study, which explores whether the GP exercise on referral scheme in Northumberland is effective in increasing physical activity levels for those who are referred: what works within the scheme, who does it work for and does it have any effect on physical activity levels in the medium-term (1 year after referral)?

I am not aware of any reason why it should not be.

Can this anonymised data be published in an academic journal or presented at an academic conference?

That is a decision for the conference organisers or editors but I cannot see any grounds for objection.

The results of the initial analysis will inform future evaluation / audit questions. Would separate ethics clearance be required for this, or would the initial ethics clearance be sufficient?

Service evaluation does not require NHS REC review.

If you are undertaking the project within the NHS, you should check with the relevant NHS care organisation(s) what other review arrangements or sources of advice apply to projects of this type. Guidance may be available from the clinical governance office.

Although ethical review by a NHS REC is not necessary in this case, all types of study involving human participants should be conducted in accordance with basic ethical principles such as informed consent and respect for the confidentiality of participants. When processing identifiable data there are also legal requirements under the Data Protection Act 2000. When undertaking an audit or service/therapy evaluation, the investigator and his/her team are responsible for considering the ethics of their project with advice from within their organisation. University projects may require approval by the university ethics committee.

This response should not be interpreted as giving a form of ethical approval or any endorsement of the project, but it may be provided to a journal or other body as evidence that ethical approval is not required under NHS research governance arrangements.

However, if you, your sponsor/funder or any NHS organisation feel that the project should be managed as research and/or that ethical review by a NHS REC is essential, please write setting out your reasons and we will be pleased to consider further.

Where NHS organisations have clarified that a project is not to be managed as research, the Research Governance Framework states that it should not be presented as research within the NHS.

If you have received advice on the same or a similar matter from a different source (for example directly from a Research Ethics Committee (REC) or from an NHS R&D department), it would be helpful if you could share the initial query and response received if then seeking additional advice through the NRES Queries service.

However, if you have been asked to follow a particular course of action by a REC as part of a provisional or conditional opinion, then the REC requirements are mandatory to the opinion, unless specifically revised by that REC. Should you wish to query the REC requirements, this should either be through contacting the REC direct or, alternatively, the relevant local operational manager.

Regards

Queries Line
National Research Ethics Service
National Patient Safety Agency
4-8 Maple Street
London
W1T 5HD

The NRES Queries Line is an email based service that provides advice from NRES senior management including operations managers based in our regional offices throughout England. Providing your query in an email helps us to quickly direct your enquiry to the most appropriate member of our team who can provide you with accurate written response. It also enables us to monitor the quality and timeliness of the advice given by NRES to ensure we can give you the best service possible, as well as use queries to continue to improve and to develop our processes.

Website: www.nres.npsa.nhs.uk
Email: queries@nres.npsa.nhs.uk

Ref: 04/31

Appendix 3 Northumberland ERS Referral Form

| | |
|--|---|
| Referral No: <input style="width: 100px;" type="text"/> | |
| <h1>Health Start Referral Form</h1> | |
| <p>Patient: (Mr/Mrs/Ms)</p> <p>Name</p> <p>Address:</p> <p>Postcode: DOB:</p> <p>NHS No:</p> <p>Tel No:</p> <p>Mobile:</p> <p>Email:</p> | <p>GP Practice:</p> <p>GP practice code:</p> <p>Patients GP:</p> <p>Practice Name:</p> <p>Practice Address:</p> <p>Postcode:</p> <p>Tel No:</p> <p>Fax No:</p> <p>Email address:</p> |
| <p>Physiological Measurements:</p> <p><input type="text"/> Resting Heart Rate Date.....</p> <p><input type="text"/> BMI Date.....</p> <p><input type="text"/> Blood Pressure Date.....</p> <p><input type="text"/> Cholesterol Date.....</p> <p><input type="text"/> Waist Circumference Date.....</p> | <p>Referrer Details:</p> <p>Name of Referrer:</p> <p>Job Title of Referrer:</p> <p>(Please complete only if non practice based referrer):</p> <p>Referrer's Address:</p> <p>Postcode:</p> <p>Tel No:</p> <p>Fax No:</p> <p>Email address:</p> |
| <p>Medical Information:</p> <p><input type="checkbox"/> CVD Primary / Secondary Prevention <input type="checkbox"/> Overweight / Obesity <input type="checkbox"/> Mental Health Problems</p> <p><input type="checkbox"/> Metabolic / Endocrine (e.g. diabetes) <input type="checkbox"/> Respiratory Conditions <input type="checkbox"/> Neurological conditions (e.g. Parkinson's)</p> <p><input type="checkbox"/> Musculoskeletal Conditions</p> <p>Other Relevant Medical Information</p> | |
| <p>Employment Status:</p> <p><input type="checkbox"/> Retired <input type="checkbox"/> Claiming incapacity benefit</p> <p><input type="checkbox"/> Employed <input type="checkbox"/> Claiming job seekers allowance</p> <p><input type="checkbox"/> Other <input type="checkbox"/> Full time education</p> | <p>Ethnicity:</p> <p><input type="checkbox"/> White <input type="checkbox"/> Black/Black British</p> <p><input type="checkbox"/> Mixed <input type="checkbox"/> Chinese / Other Ethnicity</p> <p><input type="checkbox"/> Not Stated <input type="checkbox"/> Asian/Asian British</p> |
| <p>Authorisation and Consent:</p> <p>I deem this patient safe to undertake the exercise referral programme and the patient does not meet any of the exclusion criteria for the scheme</p> <p>Referrer's Signature..... Date</p> <p>Referrer's Name (please print)</p> <p>The exercise referral scheme has been fully explained to me. I am prepared to participate and I give permission for this information to be passed to staff involved in the physical activity referral scheme.</p> <p>Patient's Signature..... Date.....</p> <p>Patient's Name (please print)</p> <p>I give permission for my clinical record to be interrogated at 12 and 24 months for the sole purpose of monitoring outcomes from the exercise on referral scheme (please tick box to give permission) <input type="checkbox"/></p> | |

Inclusion Criteria

CVD Primary Prevention

- Any risk factors that will be positively affected by increasing physical activity levels e.g. hypertension

CVD Secondary Prevention

- On completion of Phase III Cardiac Rehabilitation
- Those who are more than 6 months post event and have been recently assessed as being clinically stable.

Overweight / Obesity

- BMI 25+

Mental Health Problems

- Mild to moderate anxiety and depression where referrers feel that group based exercise would be beneficial to a patients mental well being

Metabolic / Endocrine Disease

- Predominantly type 2 diabetes and impaired glucose tolerance where increased physical activity is known to improve glucose control.

Musculoskeletal Problems

- Conditions such as osteoarthritis where referrers feel that exercise will have a beneficial effect

Respiratory Conditions

- Mild to moderate asthma and COPD

Neurological Conditions

- E.g. mild Parkinson's disease. Please note that there is a falls prevention pathway for those who require predominantly balance exercises.

Exclusion Criteria

The following conditions are unsuitable for referral:

- Resting systolic blood pressure of >180mmHg or diastolic blood pressure of >100mmHg
- Unstable Angina
- Uncontrolled Tachycardia
- Uncontrolled Arrhythmia
- Significant drop in blood pressure during exercise
- Severe anxiety and depression
- Severe neuromuscular disorders
- Unstable or acute heart failure
- Uncontrolled diabetes
- New or worsening breathlessness, palpitations, dizziness or lethargy

Please return completed referral forms to:

Nicole Rowley
Concordia Leisure Centre
Forum Way
Cramlington
NE23 6YB

If you would like further advice about suitability of referral please contact Nicole Rowley,
Exercise on Referral Co-ordinator: 07703540192 email: nicole.rowley@northumberland.gov.uk

Appendix 4 Physical Activity Stages of Change Questionnaire

RM 1–FM: Physical Activity Stages of Change—Questionnaire*

For each of the following questions, please circle Yes or No. Be sure to follow the instructions carefully.

Physical activity or exercise includes activities such as walking briskly, jogging, bicycling, swimming, or any other activity in which the exertion is at least as intense as these activities.

| | No | Yes |
|--|----|-----|
| 1. I am currently physically active. | 0 | 1 |
| 2. I intend to become more physically active in the next six months. | 0 | 1 |

For activity to be *regular*, it must add up to a *total* of 30 minutes or more per day and be done at least five days per week. For example, you could take one 30-minute walk or take three 10-minute walks for a total of 30 minutes.

| | No | Yes |
|--|----|-----|
| 3. I currently engage in <i>regular</i> physical activity. | 0 | 1 |
| 4. I have been <i>regularly</i> physically active for the past six months. | 0 | 1 |

SCORING

If question 1 = 0 and question 2 = 0, then you are at stage 1 (*Pre-contemplation*).

If question 1 = 0 and question 2 = 1, then you are at stage 2 (*Contemplation*).

If question 1 = 1 and question 3 = 0, then you are at stage 3 (*Preparation*).

If question 1 = 1, question 3 = 1, and question 4 = 0, then you are at stage 4 (*Decision/action*).

If question 1 = 1, question 3 = 1, and question 4 = 1, then you are at stage 5 (*Maintenance*).

Appendix 5 Godin Leisure Time Exercise Questionnaire

CALCULATIONS

For the first question, weekly frequencies of strenuous, moderate, and light activities are multiplied by nine, five, and three, respectively. Total weekly leisure activity is calculated in arbitrary units by summing the products of the separate components, as shown in the following formula:

Weekly leisure activity score = (9 × Strenuous) + (5 × Moderate) + (3 × Light)
 The second question is used to calculate the frequency of weekly leisure-time activities pursued “long enough to work up a sweat” (see questionnaire).

EXAMPLE: Strenuous = 3 times/wk + Moderate = 6 times/wk + Light = 14 times/wk

Total leisure activity score = (9 × 3) + (5 × 6) + (3 × 14) = 27 + 30 + 42 = 99

1. During a typical 7-Day period (a week), how many times on the average do you do the following kinds of exercise for more than 15 minutes during your free time (write on each line the appropriate number).

Times per Week

a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY) _____

(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

b) MODERATE EXERCISE (NOT EXHAUSTING) _____

(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

c) MILD EXERCISE (MINIMAL EFFORT) _____

(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-moiling, easy walking)

2. During a typical 7-Day period (a week), in your leisure time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

OFTEN

SOMETIMES

NEVER/RARELY

1

2

3

Appendix 6 Consultation recording sheet

HEALTH START CLIENT RECORDING FORM

| | | | |
|-----------------------|--|--------------------|--|
| CLIENT: | | SURGERY: | |
| DATE OF BIRTH: | | ATTENDANCE: | |
| DATE STARTED: | | REF NO: | |

| | | | |
|-----------------------------|-------------------|----------------|----------------|
| Dates: | | | |
| Instructor: | | | |
| | ASSESSMENT | Week 12 | Week 24 |
| Smoker | Yes No | Yes No | Yes No |
| Alcohol units per wk | | | |
| Blood pressure | | | |
| Resting Heart rate | | | |
| Weight | | | |
| Stature | | | |
| BMI | | | |
| Measurements; | | | |
| Waist | | | |
| Hip | | | |
| Waist to Hip Ratio | | | |
| Chester Step Test | | | |
| Stature | | | |
| Minutes | | | |
| Reason not done | | | |

DO YOU INTEND TO GO TO HEALTH QUEST? YES NO

CLIENT GOALS AND COMMENTS

Appendix 7: Study two interview schedule

INITIAL SEMI STRUCTURED INTERVIEW QUESTIONS

Expectations of participants in the Northumberland exercise on referral scheme.

Preface: Set the interviewee at rest; explain the purpose of the interview (to understand their expectations of the exercise on referral scheme) explain that the expected outcomes (that the study will give a better understanding of why the scheme works for some people, but not others); rules of confidentiality etc.

Record demographic / personal info to start:

- Gender
- Age

1. Tell me a bit about what sort of physical activity you have taken part in in the past.

- *What were your experiences of sport /physical activity at school / as a child*
- *What influence have others had on the type of physical activity you have taken part in?*
- *Do you have any particular likes / dislikes of sport / physical activity*
- *Tell me about any times in past where there has been a big change in your physical activity patterns*
- *Has there been anything else that has influenced your participation in physical activity?*

2. How do you feel about taking part in physical activity now?

- *What type of physical activity (if any) do they take part in at the moment?*
- *What type of physical activity would they like to take part in?*
- *What do they think the important reasons for taking part in physical activity are?*
- *Is there anything that particularly worries them about taking part in physical activity?*

3. So thinking about the exercise on referral scheme that you have been referred to, how did you find out about it?

- *Who/ what has motivated you to attend?*
- *What made you decide that this is the right time to take part in the scheme?*

4. Why were you referred to the scheme?

- *Do they feel that you know why they are being referred?*
- *What did the referrer explain to you about the scheme?*
- *What do you expect (if anything) when you start attending the scheme?*
- *What type of health professional referred you?*

5. What do you hope to achieve by taking part in the scheme?

- *What are the changes to your health that you expect will happen as a result of participation?*
- *How quickly do you expect to see these changes?*
- *How have you decided that these changes are realistic?*

6. How do you feel about being referred?

- *How confident do you feel about taking part in the scheme?*
- *Is there anything that you are particularly looking forward to?*
- *Is there anything that you are worried about?*

7. What happened after you were referred?

- *How long after referral did it take to be contacted by the scheme?*
- *What information has been given to you prior to the initial consultation?*
- *How comfortable do you feel coming to first consultation?*

8. What are the things do you think will most influence you to attend sessions?

- *How important do you think attendance in a group will be?*
- *What do they expect from the staff on the scheme?*
- *How important are changes in health?*
- *Why were the influences raised important?*

9. What things do you think are most likely to prevent you from attending sessions?

- *Tell me about any worries you might have about health issues*
- *Tell me about any other things such as other commitments that might stop you from attending*
- *Have you thought about any ways that you might overcome these issues if they arise?*

10. Is there anything else that you would like to tell me about your expectations for participation in the scheme?

Appendix 8: Invitation letter, participant information sheet, consent form, and participant debrief sheet for study two and three

Coral Hanson
Faculty of Health and Life Sciences
Northumbria University
Room 431 Northumberland Building
Newcastle upon Tyne
NE1 8ST
UK



Tel: 01670 622188

E-mail: coral.hanson@northumbria.ac.uk

Dear

Thank you for agreeing to consider participating in the research study 'Expectations, barriers and facilitators for participants in the Northumberland Exercise on Referral Scheme'. As Health and Fitness Manager at Blyth Valley Arts and Leisure (BVAL), I am responsible for the overall delivery of the scheme across the county and am currently undertaking a PhD evaluating how well the scheme works. I hope that this study will help me to understand the scheme better from a participant's point of view. You are being asked to take part in this study because you have recently been referred to the Health Start Scheme at your local leisure centre.

I have enclosed an information sheet for you to read. If you would like to take part in the study, please complete the consent form and return it in the envelope provided. I will then contact you to arrange for a one to one interview to talk about your expectations of the scheme. You will be contacted again 12 weeks after you start (or when you stop attending if it is before this) and will be asked to attend a further one to one appointment to discuss your experiences. As far as possible, I will try to arrange this when you will be attending a session at the leisure centre.

If you have any questions, please do not hesitate to contact me (or speak to a member of the Health Start staff). If you decide that you do not want to take part in this study, this will not affect your participation in the Health Start Scheme.

Yours sincerely,

A handwritten signature in black ink, appearing to read "C. Hanson".

Coral Hanson
Health and Fitness Manager bval
PhD Student Northumbria University



Information sheet

PROJECT TITLE: Expectations, barriers and facilitators for participants in the Northumberland Exercise on Referral Scheme (Health Start); a qualitative study.

PRINCIPAL INVESTIGATOR: Coral Hanson

The purpose of this information sheet is to provide you with sufficient information so that you can then give your informed consent. It is thus very important that you read this document carefully, and raise any issues that you do not understand with the investigator.

1. What is the purpose of the project?

Health Start is a scheme at your local leisure centre, where your GP surgery is able to refer you to take part in an exercise programme. The purpose of this project is to gain an understanding of participants' expectations and feelings about taking part in the Health Start Scheme; factors that encourage participation and what discourages attendance.

2. Why have I been selected to take part?

You have been selected to take part in this study because you have recently been referred to the Health Start Exercise Scheme at Blyth Sports Centre or Concordia Leisure Centre.

3. What will I have to do?

You will need to attend two interviews (one before you start participating in the scheme and one 12 weeks after you start attending or when you stop attending if this is earlier) with the researcher to talk about your expectations and also your experiences of the Health Start Scheme. You will be asked questions about your past experiences of physical activity; why you have been referred to the scheme; and what things have helped or hindered you from attending the scheme and becoming more physically active.

4. What is the exclusion criteria (i.e. are there any reasons why I should not take part)?

If you have been referred to the scheme, there are no reasons why you should not take part unless your blood pressure or resting heart rate are above the scheme inclusion criteria during your initial consultation.

5. Will my participation involve any physical discomfort?

No, participation in the research study will involve two interviews lasting approximately 45 minutes at the leisure facility where you attend the scheme. These interviews will be recorded and transcribed for analysis purposes at a later date. All transcriptions will be anonymised. You will be seated in a comfortable environment.

| |
|--|
| <p>6. Will my participation involve any psychological discomfort or embarrassment?</p> <p>It is not expected that your participation will involve any psychological discomfort or embarrassment and you will not be expected to discuss anything that will make you feel uncomfortable. You can choose not to answer any questions asked by the researcher for any reason.</p> |
| <p>7. Will I have to provide any bodily samples (i.e. blood, saliva)?</p> <p>No, you will not have to provide any bodily samples.</p> |
| <p>8. How will confidentiality be assured?</p> <p>All personal information will be anonymised and your name will be replaced with an identification pseudonym. Your participant consent form will be stored securely and separately from the record of your interview.</p> |
| <p>9. Who will have access to the information that I provide?</p> <p>Only the principal researcher will have access to your personal information. The records of your interview will be anonymised and be available to the rest of the research team for analysis.</p> |
| <p>10. How will my information be stored / used in the future?</p> <p>Consent forms with participant names will be stored securely and separately from all other the collection documents. All study documents will be stored in locked filing cabinets to be accessed only by the principal researcher (Coral Hanson) and used for the sole purpose of the study. All electronic data will be stored on password-protected computers. Your information will be stored securely at Northumbria University for 5 years after the conclusion of the research, when it will be destroyed.</p> <p>The anonymised information collected for the study will be used as part of a PhD thesis and may also be used in a peer reviewed publication journal and/or presented at a conference.</p> |
| <p>11. Has this investigation received appropriate ethical clearance?</p> <p>Yes, the investigation has received ethical clearance from the Northumbria University Faculty of Health and Life Sciences Ethics Committee.</p> |
| <p>12. Will I receive any financial rewards / travel expenses for taking part?</p> <p>No.</p> |
| <p>13. How can I withdraw from the project?</p> <p>You can withdraw from the project at any time by informing the principal researcher (Coral Hanson) by telephoning her on 01670 622188 or emailing coral.hanson@northumbria.ac.uk. You do not need to give a reason and your participation in the Health Start Scheme will not be affected in anyway should you choose to withdraw from the study.</p> |
| <p>14. If I require further information who should I contact and how?</p> <p>If you require any further information about the project, please contact Coral Hanson (Tel: 01670 622188 or email coral.hanson@northumbria.ac.uk)</p> |



INFORMED CONSENT FORM

Project Title: Expectations, barriers and facilitators for participants in the Northumberland Exercise on Referral Scheme; a qualitative study.

Principal Investigator: Coral Hanson

Participant Number: _____

please tick where applicable

I have carefully read and understood the Participant Information Sheet.

I have had an opportunity to ask questions and discuss this study and I have received satisfactory answers.

I understand I am free to withdraw from the study at any time, without having to give a reason for withdrawing, and without prejudice.

I agree to take part in this study.

I would like to receive feedback on the overall results of the study at the email address given below.

Email address.....

| | |
|--|--|
| Signature of participant..... Date..... | |
| (NAME IN BLOCK LETTERS)..... | |
| Signature of Parent / Guardian in the case of a minor | |
| Signature of researcher..... Date..... | |
| (NAME IN BLOCK LETTERS)..... | |



Faculty of Health & Life Sciences

FOR USE WHEN TAPE RECORDINGS WILL BE TAKEN

Project title: Barriers and facilitators for participants in the Northumberland Exercise on Referral Scheme; a qualitative study.

Principal Investigator: Coral Hanson

Participant Number: _____

I hereby confirm that I give consent for the following recordings to be made:

| Recording | Purpose | Consent |
|------------------|---|---------|
| voice recordings | To provide a complete record of the interview. This will be transcribed to give a written record and used by researchers to look for themes in feelings about participating in the Health Start Scheme. | |

Clause A: I understand that the recording(s) may also be used for teaching/research purposes and may be presented to students/researchers in an educational/research context. My name or other personal information will never be associated with the recording(s).

Tick the box to indicate your consent to Clause A

Clause B: I understand that the recording(s) may be published in an appropriate journal/textbook or on an appropriate Northumbria University webpage. My name or other personal information will never be associated with the recording(s). I understand that I have the right to withdraw consent at any time prior to publication, but that once the recording(s) are in the public domain there may be no opportunity for the effective withdrawal of consent.

Tick the box to indicate your consent to Clause B

Signature of participant..... Date.....

Signature of researcher..... Date.....

PARTICIPANT DEBRIEF SHEET

PROJECT TITLE: Barriers and facilitators for participants in the Northumberland Exercise on Referral Scheme; a qualitative study.

PRINCIPAL INVESTIGATOR: Coral Hanson

| |
|---|
| <p>1. What was the purpose of the project? Health Start is a scheme at your local leisure centre, where your GP surgery is able to refer you to take part in an exercise programme. The purpose of this project was to gain an understanding of your expectations of the Health Start Scheme and how you felt about taking part in it; what things encouraged you to take part and / or what prevented you from attending. By understanding better what works and what does not work so well, it is hoped that the scheme will be able to offer a better experience for future participants.</p> |
| <p>2. What will happen to the information I have provided? The anonymised information collected for the study will be used as part of a PhD thesis and may also be used in a peer reviewed publication journal and/or presented at a conference.</p> |
| <p>3. Will I receive individual Feedback? You will not normally receive individual feedback.</p> |
| <p>4. How will I find out about the results? A summary of the results will be available from the principal researcher (Coral Hanson). You will be sent a copy of this summary via email if you have requested this.</p> |
| <p>5. Have I been deceived in any way during the project? No, you have not been deceived in any way during the project.</p> |
| <p>6. If I change my mind and wish to withdraw the information I have provided, how do I do this? If you change your mind and wish to withdraw the information you have provided, please contact the principal researcher (Coral Hanson) by telephone 01670 622188 or email coral.hanson@northumbria.ac.uk. The information that you provided up until this point will be destroyed. This decision will not affect your participation in the Health Start Scheme and you will not be treated any differently by staff if you choose to withdraw from the project.</p> |

If you have any concerns or worries concerning the way in which this research has been conducted, or if you have requested, but did not receive feedback from the researcher concerning the general outcomes of the study within a few months after the study has concluded, then please contact Les Ansley via email at les.ansley@northumbria.ac.uk

Appendix 9: Study three interview schedule

Semi Structured Interview Questions:

Welcome interviewee back; explain the purpose of the interview (to hear about their experiences of the exercise on referral scheme) explain that the expected outcomes (that the study will give a better understanding of why the scheme works for some people, but not others); rules of confidentiality, informed consent etc.

- 1. Tell me about your experience of the scheme**
- 2. How often have you attended?**
- 3. How have you found the sessions / assessments?**
- 4. Is the scheme what you expected it to be like? What was the first session like?**
- 5. What things have you most enjoyed?**
- 6. What things have encouraged you to keep attending?**
- 7. Is there anything that you found difficult or not enjoyed so much?**
- 8. Have you noticed any changes to your health and wellbeing and if so what?**
- 9. Have you changed your activity levels outside of the scheme?**
- 10. How confident do you feel that you will complete the whole 6 months of the scheme?**
- 11. What things do you think are most likely to keep you attending?**
- 12. What things do you think are most likely to prevent you from attending sessions?**
- 13. Would you suggest making any changes to the way that the scheme runs?**
- 14. What do you think about the time of sessions**
- 15. What do you think about the 6 month time period for the scheme?**
- 16. Is there anything else that you would like to tell me about your experience of participation in the scheme and your expectations for the rest of the scheme?**

Appendix 10 Articles in peer reviewed journals that are related to this thesis:

Hanson, C. L., Allin, L. J., Ellis, J. G. & Dodd-Reynolds, C. J. (2013) 'An evaluation of the efficacy of the exercise on referral scheme in Northumberland, UK: association with physical activity and predictors of engagement. A naturalistic observation study', *BMJ Open*, 3 (8).

Oliver, E. J., **Hanson, C. L.**, Lindsey, I. A. & Dodd-Reynolds, C. J. (2016) 'Exercise on referral: evidence and complexity at the nexus of public health and sport policy', *International Journal of Sport Policy and Politics*, pp. 1-6.



An evaluation of the efficacy of the exercise on referral scheme in Northumberland, UK: association with physical activity and predictors of engagement. A naturalistic observation study

Coral L Hanson,¹ Linda J Allin,¹ Jason G Ellis,² Caroline J Dodd-Reynolds¹

To cite: Hanson CL, Allin LJ, Ellis JG, et al. An evaluation of the efficacy of the exercise on referral scheme in Northumberland, UK: association with physical activity and predictors of engagement. A naturalistic observation study. *BMJ Open* 2013;3:e002849. doi:10.1136/bmjopen-2013-002849

► Prepublication history for this paper is available online. To view these files please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2013-002849>).

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Correspondence to
Coral L Hanson; coral.hanson@northumbria.ac.uk

ABSTRACT

Objectives: Exercise on referral schemes (ERS) are widely commissioned in the UK but there is little evidence of their association with physical activity levels. We sought to assess the Northumberland exercise on referral scheme in terms of increased levels of physical activity and identify predictors of engagement.

Design: A naturalistic observational study.

Setting: 9 local authority leisure sites in Northumberland.

Participants: 2233 patients referred from primary and secondary care between July 2009 and September 2010.

Intervention: A 24-week programme including motivational consultations and supervised exercise sessions for participants.

Outcome measures: Uptake, 12-week adherence, 24-week completion, changes in Godin Leisure-Time Exercise Questionnaire scores after 24-weeks and attendance levels at supervised exercise sessions during the scheme. Three binary logistic regressions were used to examine demographic and referral factors associated with initial uptake, 12-week adherence and 24-week completion.

Results: Uptake was 81% (n=1811), 12-week adherence was 53.5% (n=968) and 24-week completion was 42.9% (n=777). Participants who completed significantly increased their self-reported physical activity levels at 24-weeks t (638)=11.55, p<0.001. Completers attended a mean of 22.87 (12.47 SD) of a target 48 supervised sessions. Increasing age, being female and leisure site were associated with uptake, increasing age, Index of Multiple Deprivation and leisure site were associated with 12-week adherence and Body Mass Index and leisure site were associated with 24-week completion. Each regression significantly increased the prediction accuracy of stage of exit (non-starters vs starters 81.5%, dropouts before 12 weeks vs 12-week adherers 66.9%, and dropouts between 13 and 24 weeks 82.2%).

ARTICLE SUMMARY

Article focus

- Exercise on referral schemes are widespread in the UK and are a popular way of promoting physical activity in primary care.
- There is evidence for an association between exercise on referral and short-term increase in physical activity, but weaker evidence for longer term physical activity maintenance.

Key messages

- We found evidence of significant changes in self-reported physical activity over a 6-month period for those who completed the scheme, but levels achieved were well below the UK recommendations for 150 min of moderate activity per week.
- Increasing age was a significant predictor of uptake of and adherence to exercise on referral schemes; while a prescheme BMI of 30+ kg/m² was a significant negative predictor of completion.

Strengths and limitations of this study

- The use of routinely collected scheme data provides a viable way of evaluating an intervention type that is already widespread but lacks evidence about effectiveness.
- The use of a self-reported physical activity questionnaire may have led to inaccuracies in quantifying increases in levels of physical activity.
- Although the study identified which participants successfully engaged with the scheme, it has not attempted to identify the reasons for engagement or non-engagement.
- The factors analysed only minimally increased prediction accuracy levels. This would indicate that there are other factors that have not been considered in this study that are associated with how long participants engage with the scheme.

Conclusions: Completers of the Northumberland ERS increased physical activity at 24 weeks, although the levels achieved were below the current UK guidelines of 150 min of moderate exercise per week. Leisure site was associated with uptake, adherence and completion.

INTRODUCTION

Regular physical activity is known to have a beneficial effect on the risk of coronary heart disease (CHD), stroke, and mortality from all causes.^{1–3} However only 39% of men and 29% of women in England are sufficiently active to benefit their health.⁴ Intervention in primary care is seen as key to increasing physical activity in those at risk of developing long-term health conditions and exercise on referral schemes (ERS), established during the 1990s, are a popular method of promoting such activity.⁵ Schemes generally consist of a referral by a primary care health professional to a third party (usually a leisure facility), followed by a series of consultations with an exercise specialist, and a programme of supervised physical activity over a 10-week to 12-week period.⁶ There is uncertainty about the efficacy of ERS in promoting medium to long-term physical activity behaviour change due to the short duration of programmes.⁷ There has been one recent pragmatic randomised controlled trial (RCT) of ERS in Wales,⁸ which found increased physical activity for those with CHD only. That said, it has been argued that evaluation of ERS by RCTs is not realistic given the number of established schemes in the UK.⁹

Many existing UK schemes are commissioned by the National Health Service; however, lack of evidence about effectiveness in increasing physical activity levels means it is unclear whether they represent an efficient use of resources.¹⁰ A Health Technology Assessment in 2011¹¹ identified that for ERS cost per quality-adjusted life year could change markedly when scheme differences and cost inputs are taken into account, meaning that robust evidence on cost effectiveness could not be currently provided. To provide a clear assessment of value for money, there is a requirement for robust evaluations of existing programmes.

There have been a limited number of observational studies that have examined data from established schemes in England.^{12–19} These studies have examined how many of those who were referred initially participated in the scheme (uptake)^{12–14–16–19} and for how long individuals engaged with the scheme (adherence).^{12–14–15–17–18} Levels of uptake were reported to be between 58% and 79% and adherence, between 34% and 57%. Moreover, a recent systematic review²⁰ found a pooled adherence level of 49% across observational studies. In addition to analysing levels of uptake and adherence, studies^{12–14–17–19} have examined whether ERS is more successful for certain types of participants. There has been little consensus other than increasing age is a predictor of adherence.^{12–14–15}

Although the primary aim of ERS is to increase physical activity, few studies have robustly reported on changes in physical activity as a result of participation. Dugdill *et al*¹² reported significant increases in self-reported physical activity but other studies have used attendance at consultations as a proxy measure of attendance at sessions. Some studies^{17–21–22} have indicated participants achieved 80% of target attendance but did not define number of attendances required to achieve 'target attendance'. In a RCT of an ERS in Hailsham²³ completers on average attended 9 of 20 (45%) possible exercise sessions over a 10-week programme.

The present study was an evaluation of routinely collected data from an ERS in North East England (Northumberland), which had an intended primary outcome of increasing physical activity. This naturalistic observational study was designed to investigate whether engagement in scheme consultations (prescheme, after 12 weeks and postscheme after 24 weeks) (1) resulted in increased physical activity and (2) was predicted by factors relating to the referral.

METHOD

Anonymised data were extracted from a database compiled by scheme providers (provider 1 and 2) about referrals made between July 2009 and September 2010. Ethics approval was not sought; guidance from NHS National Research Ethics Service indicated that this was not required as the evaluation was considered to be a service audit of anonymised data.

Scheme structure

Referrals to the ERS could be made to nine local authority leisure sites in Northumberland by primary or secondary care professionals on a standardised form. The scheme was operated by provider 1 (sites B–F) and provider 2 (sites A and G–I). The scheme was newly established at site A, where it was implemented with shared learning from both providers. Scheme staff (employed by the leisure providers) held a minimum of a Register of Exercise Professionals (REPs) recognised level 3 exercise on referral qualification. Staff dealing with cardiac rehabilitation referrals held a REPs recognised level 4 cardiac rehabilitation qualification.

Demographic and other personal data (age, postcode, gender, employment status, primary and secondary reason for referral) were provided on the referral form. Where possible, information from missing data fields was requested by scheme staff at initial contact with referrals. All data were recorded in the scheme database. There were set inclusion criteria for referral (eg, primary/secondary CVD prevention, mild-to-moderate mental health issues) and exclusion criteria (eg, resting systolic blood pressure of ≥ 180 mm Hg or diastolic blood pressure of ≥ 100 mm Hg, severe anxiety or depression; see figure 1 for full details).

There was a standardised pathway for referrals (figure 2).

Figure 1 Scheme inclusion and exclusion criteria.

| |
|---|
| <p>Inclusion Criteria</p> <p>Cardiovascular disease (CVD) primary and secondary prevention (hypertension, hypercholesterolemia, post-cardiac event or procedure and having completed phase III cardiac rehabilitation, established CVD with a clinical assessment within previous 6 months)</p> <p>Overweight / obesity ($BMI \geq 25 \text{ kg/m}^2$)</p> <p>Mental health problems (mild to moderate anxiety and depression where the referring health professional considered that group exercise would be suitable and beneficial)</p> <p>Metabolic / endocrine disease (type 2 diabetes or impaired glucose tolerance)</p> <p>Musculoskeletal problems</p> <p>Respiratory conditions (mild to moderate asthma and chronic obstructive pulmonary disease)</p> <p>Neurological conditions (e.g. mild Parkinson's disease)</p> |
| <p>Exclusion Criteria</p> <p>Resting systolic blood pressure of $\geq 180 \text{ mmHg}$ or diastolic blood pressure of $\geq 100 \text{ mmHg}$</p> <p>Unstable angina (diagnosed within the previous month, following no established pattern, occurring at rest or with minimal exertion, not relieved by rest or oral medication taken at the onset of symptoms)</p> <p>Uncontrolled tachycardia (resting heart rate $\geq 100 \text{ bpm}$)</p> <p>Uncontrolled arrhythmias</p> <p>Significant drop ($\geq 15 \text{ mmHg}$) in blood pressure during exercise</p> <p>Severe anxiety and depression (no definition provided)</p> <p>Severe neuromuscular disorders (no definition provided)</p> <p>Unstable or acute heart failure (excessive breathlessness, unexplained weight gain of more than 2kg over a 5 day period, ankle oedema)</p> <p>Uncontrolled diabetes (poorly controlled blood sugar levels)</p> <p>New or worsening breathlessness, palpitations, dizziness or lethargy</p> <p>Aged under 16 years</p> |

The scheme was longer than many others previously studied, being 24 weeks in duration. Participants were asked to attend three consultations at the leisure site where they had chosen to take part (prescheme, after 12 weeks and postscheme after 24 weeks). Consultations, based around the Transtheoretical Model,²⁴ involved an assessment of stage of change and a discussion about reason for referral, activity preferences, current activity and potential barriers to increasing activity.

Participants accessing the scheme were encouraged to attend two supervised exercise sessions per week (maximum 48 sessions). Sessions were group based, with different activities available (gym, circuit classes, racquet sports and swimming). Although group based, activities were tailored to individuals. Cost for sessions ranged from £1.55 to £5.70. Participants were encouraged to undertake independent physical activity and given advice based on the (then current) 30 min, 5x per week, moderate activity message.²⁵

Dated attendances at sessions were recorded for each participant. Staff contacted participants who had not attended sessions for 1 week by telephone (maximum three calls) or by post. Participants who did not wish to return or did not respond within 1 month were recorded as dropouts. Twelve-week and 24-week consultations were offered to all participants not classed as dropouts, regardless of levels of attendance at sessions.

Measurements

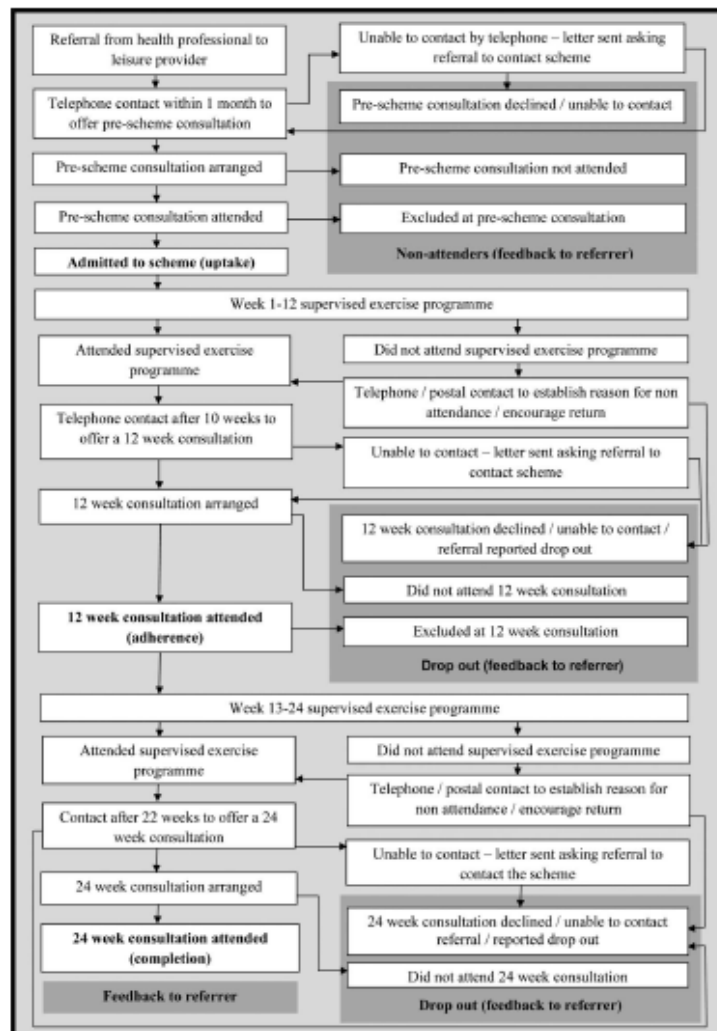
The Godin Leisure-Time Exercise Questionnaire (GLTEQ)²⁶ was used to assess self-reported physical

activity at prescheme and postscheme consultations. Participants were asked to report the number of times they participated in light, moderate and vigorous activity for at least 15 min over a typical 7-day period. The number of incidences of light activity were multiplied by three, moderate by five and vigorous by nine (multipliers related to metabolic equivalents (METs) for each activity intensity). These results were then added together to give the Godin weekly activity score. An equivalent weekly amount of moderate activity was calculated by dividing the weekly activity score by its metabolic equivalent for moderate activity (ie, 5 METs) and then multiplying by 15 min (the minimum amount of time for each bout of activity reported) to determine an overall typical weekly duration of moderate activity. A moderate benchmark was used in order to provide comparison with the current guidelines of 150 min of moderate activity per week.²⁷

- Referrals were initially classified as either
- ▶ Non-starter: did not attend prescheme consultation or excluded at prescheme consultation as not meeting referral criteria;
 - ▶ Starter: attended prescheme consultation and was admitted to the scheme.
- Length of engagement for starters was further classified by stage of exit
- ▶ Dropout (before 12 weeks): admitted, but dropped out before 12-week consultation;
 - ▶ Twelve-week adherer: attended 12-week consultation;
 - ▶ Dropout (12–24 weeks): attended 12-week consultation but dropped before 24-week consultation;
 - ▶ Completer: attended 24-week consultation.

Hanson CL, Allin LJ, Ellis JG, et al. *BMJ Open* 2013;3:e002849. doi:10.1136/bmjopen-2013-002849

Figure 2 Scheme process.



To make comparisons with previously published studies, uptake (defined as number of participants admitted to the scheme following the prescheme consultation) and adherence (defined as number of participants who attended the 12-week consultation) were calculated. As 12 weeks was the midpoint of the ERS studied, a measure of completion (defined as number of participants who attended the 24-week consultation) was added.

Statistical analysis

Analyses were performed using PSAW Statistics V20. Descriptive statistics of referrals relating to personal characteristics (gender, age, Index of Multiple Deprivation (IMD), employment status and initial BMI

and the referral process (profession of referrer, reason for referral, secondary reason for referral and leisure site) were examined in relation to non-starters compared to starters; then for starters in relation to stage of exit. Initial analysis (χ^2 and t tests) explored whether there were significant differences (<0.05 with 95% CI) in these characteristics between non-starters and starters.

Three binary logistic regressions were used to identify whether personal and referral characteristics were predictors of the three binary outcomes of starting the scheme after referral, 12-week adherence and 24-week completion (table 1).

Seven common independent variables were entered into each regression (age, gender, IMD, profession of referrer, reason for referral, secondary reason for

Table 1 Binary outcome variables for logistic regressions

| Logistic regression | Binary outcome 0 | | Binary outcome 1 |
|---------------------|-----------------------------------|----|--------------------------|
| 1 | Non-starter (n=422) | vs | Starter (n=1811) |
| 2 | Dropout (before 12 weeks) (n=843) | vs | 12-week adherers (n=968) |
| 3 | Dropout (12–24 weeks) (n=191) | vs | Completers (n=777) |

referral and leisure site). In addition, prescheme BMI was available for entry into regressions two and three. Goodness of fit tests (Cox & Snell, Nagelkerke and Hosmer & Lemeshow) were used to assess whether the regressions were good fits of the data.

A paired sample t test was used to examine whether there were significant differences in prescheme and 24-week self-reported levels of physical activity using the GLTEQ.²⁶

RESULTS

Participant flow

A total of 2233 referrals were made between July 2009 and October 2010. A total of 19% (n=422) referrals were non-starters. Of these, 409 did not attend a consultation and 13 were excluded after the prescheme consultation. Eighty-one per cent (n=1811) of referrals were admitted to the scheme after the initial assessment (uptake). Of these 46.5% (n=843) dropped out in the first 12 weeks, 53.5% (n=968) attended the 12-week consultation, 10.5% (n=191) dropped out between weeks 13 and 24 and 42.9% (n=777) attended the 24-week consultation.

Baseline data

Table 2 shows personal and referral characteristics of participants. Referrals were predominantly female (59%), with a mean age of 53 years (15.9 SD). The main referrers were general practitioners (58%, n=1278) and the most common reasons for referral were overweight/obesity (42%, n=913) and cardiovascular disease primary/secondary prevention (CVD) (30%, n=649).

Differences in personal and referral characteristics between non-starters and starters

Descriptive characteristics of referrals can be seen in table 2. There were significant differences in demographics (age t(2231) = -9.60, p<0.001; IMD t(2211) = -5.40, p<0.001; employment status $X^2=40.43$, p<0.001) and in referral characteristics (reason for referral $X^2=31.2$, p<0.001, secondary reason for referral $X^2=20.8$, p<0.001 and leisure site $X^2=38.0$, p<0.001) for starters compared to non-starters.

Characteristics associated with uptake, adherence and completion

A logistic regression analysis was conducted to predict uptake of the ERS using age, gender, IMD quintile, reason for referral, secondary reason for referral,

profession of referrer and leisure site as predictors. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between acceptors and decliners of the offer ($X^2(31) = 168.53$, p<0.001).

Nagelkerke's R^2 of 0.12 and Cox & Snell R^2 of 0.08 indicated an adequate relationship between prediction and grouping. Prediction success overall was 81.5% (99.5% for starters and 4.3% for non-starters). The Wald criterion demonstrated that age (35–44 years, B=0.705, SE=0.247, 45–54 years, B=0.657, SE=0.240, 55–64 years, B=1.113, SE=0.249, 65–74 years, B=1.429, SE=0.274, 75+ years, B=2.002, SE=0.421), gender (female B=0.341, SE=0.122), IMD quintile (61–80%, B=0.533, SE=0.215, 81–100% least deprived B=0.348, SE=0.204), secondary reason for referral (metabolic/endocrine B=1.104, SE=0.409) and leisure site (site F, B=0.855, SE=0.304, site H, B=0.925, SE=0.387, site I B=0.664, SE=0.315) made significant contributions to the model.

A second logistic regression analysis was conducted to predict 12-week adherence among starters using the same predictors as in regression one, but with the addition of prescheme BMI. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between dropouts and 12-week adherers ($X^2(34) = 261.82$, p<0.001).

Nagelkerke's R^2 of 0.19 and Cox & Snell R^2 of 0.14 indicated an adequate relationship between prediction and grouping. Prediction success overall was 66.9% (62.1% for dropouts and 70.8% for adherers). The Wald criterion demonstrated that age (55–64 years, B=1.382, SE=0.302, 65–74 years, B=1.734, SE=0.302, 75+ years, B=1.173, SE=0.354), IMD (61–80%, B=0.412, SE=0.195, 81–100% least deprived B=0.671, SE=0.199), profession of referrer (cardiac rehabilitation nurse, B=0.829, SE=0.254), BMI (35+ kg/m² B=-0.437, SE=0.218) and leisure site (site G, B=-1.393, SE=0.391, site H, B=-1.185, SE=0.341, site I, B=-0.961, SE=0.299) made significant contributions to the model.

The final logistic regression was conducted to predict 24-week completion among 12-week adherers using the same predictors as regression two. A test of the full model against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between those who dropped out between 12–24 weeks and completers ($X^2(34) = 159.16$, p<0.001).

Nagelkerke's R^2 of 0.25 and Cox & Snell R^2 of 0.19 indicated an adequate relationship between prediction and

Table 2 Descriptive characteristics of referrals

| | All referrals | | Non-starters | | Starters | | 12-Week adherers | | Completers | |
|---|--|----------|--------------|----------|----------|----------|------------------|----------|------------|----------|
| | n | Per cent | n | Per cent | n | Per cent | n | Per cent | n | Per cent |
| Age (n=2233) | | | | | | | | | | |
| 16–24 | 122 | 5.5 | 43 | 10.2 | 79 | 4.4 | 23 | 2.4 | 17 | 2.2 |
| 25–34 | 220 | 9.9 | 72 | 17.0 | 148 | 8.2 | 43 | 4.5 | 34 | 4.4 |
| 35–44 | 322 | 14.5 | 70 | 16.6 | 252 | 13.9 | 94 | 9.7 | 65 | 8.4 |
| 45–54 | 408 | 18.3 | 93 | 22.0 | 315 | 17.4 | 131 | 13.5 | 101 | 13.0 |
| 55–64 | 571 | 25.6 | 85 | 20.1 | 486 | 26.8 | 304 | 31.4 | 243 | 31.3 |
| 65–74 | 447 | 20.0 | 49 | 11.6 | 398 | 22.0 | 278 | 28.7 | 239 | 30.7 |
| 75+ | 143 | 6.2 | 10 | 2.5 | 133 | 7.3 | 95 | 9.8 | 78 | 10.0 |
| Gender (n=2233) | | | | | | | | | | |
| Female | 1327 | 59.4 | 238 | 56.4 | 1089 | 60.1 | 566 | 58.5 | 441 | 56.8 |
| Male | 906 | 40.6 | 184 | 43.6 | 722 | 39.9 | 402 | 41.5 | 336 | 43.2 |
| Index of multiple deprivation (n=2213) | | | | | | | | | | |
| 20% most deprived | 511 | 23.1 | 135 | 32.1 | 376 | 21.0 | 183 | 19.0 | 156 | 20.2 |
| 21–40% | 479 | 21.6 | 100 | 23.8 | 379 | 21.1 | 187 | 19.4 | 156 | 20.2 |
| 41–60% | 413 | 18.7 | 68 | 16.2 | 345 | 19.2 | 191 | 19.8 | 158 | 20.3 |
| 61–80% | 378 | 17.1 | 54 | 12.9 | 324 | 18.1 | 190 | 19.7 | 148 | 19.1 |
| 81–100% least deprived | 432 | 19.5 | 63 | 15.0 | 369 | 20.6 | 213 | 22.1 | 156 | 20.2 |
| Employment status (n=1447) | | | | | | | | | | |
| Retired | 525 | 36.3 | 58 | 22.0 | 467 | 39.4 | 351 | 52.3 | 320 | 55.1 |
| Incapacity benefit | 190 | 13.1 | 51 | 19.4 | 139 | 11.7 | 58 | 8.7 | 48 | 8.3 |
| Employed | 404 | 27.9 | 86 | 32.7 | 318 | 26.9 | 150 | 22.4 | 118 | 20.3 |
| Job seekers allowance | 93 | 6.4 | 27 | 10.3 | 66 | 5.6 | 23 | 3.4 | 19 | 3.2 |
| Full time education | 21 | 1.5 | 5 | 1.9 | 16 | 1.4 | 1 | 0.1 | 1 | 0.2 |
| Other | 214 | 14.8 | 36 | 13.7 | 178 | 15.0 | 88 | 13.1 | 75 | 12.9 |
| Profession of referrer (n=2190) | | | | | | | | | | |
| General practitioner | 1278 | 58.4 | 253 | 60.7 | 1025 | 57.8 | 508 | 53.4 | 407 | 53.2 |
| Practice nurse | 590 | 26.9 | 117 | 28.1 | 473 | 26.7 | 257 | 27.0 | 200 | 26.1 |
| Cardiac rehabilitation nurse | 185 | 8.4 | 21 | 5.0 | 164 | 9.2 | 130 | 13.7 | 117 | 15.3 |
| Other | 137 | 6.3 | 26 | 6.2 | 111 | 6.3 | 57 | 5.9 | 41 | 5.4 |
| Reason for referral (n=2161) | | | | | | | | | | |
| CVD | 649 | 30.0 | 96 | 23.6 | 553 | 31.6 | 365 | 38.8 | 308 | 40.8 |
| Overweight/obesity | 913 | 42.2 | 192 | 46.9 | 721 | 41.2 | 343 | 36.5 | 271 | 35.9 |
| Mental health | 297 | 13.8 | 79 | 19.4 | 218 | 12.4 | 95 | 10.1 | 72 | 9.5 |
| Metabolic/endocrine | 149 | 6.9 | 29 | 7.1 | 120 | 6.8 | 60 | 6.4 | 45 | 6.0 |
| Other | 153 | 7.1 | 14 | 3.0 | 139 | 8.0 | 77 | 8.2 | 58 | 7.8 |
| Secondary reason for referral (n=2233) | | | | | | | | | | |
| No secondary reason | 1649 | 73.8 | 324 | 76.8 | 1325 | 73.2 | 715 | 73.9 | 594 | 76.5 |
| CVD | 34 | 1.5 | 3 | 0.7 | 31 | 1.7 | 18 | 1.9 | 14 | 1.8 |
| Overweight/obesity | 222 | 9.9 | 41 | 9.7 | 181 | 10.0 | 94 | 9.7 | 67 | 8.6 |
| Mental health | 130 | 5.8 | 35 | 8.3 | 95 | 5.2 | 41 | 4.2 | 31 | 4.0 |
| Metabolic/endocrine | 105 | 4.7 | 7 | 1.7 | 98 | 5.4 | 53 | 5.5 | 39 | 5.0 |
| Other | 93 | 4.2 | 12 | 2.8 | 81 | 4.5 | 47 | 4.8 | 32 | 4.1 |
| Prescheme BMI (n=1776) | | | | | | | | | | |
| Normal weight (18.5–24.9 kg/m ²) | Not available for those who did not start the scheme | | | | 215 | 12.1 | 131 | 13.6 | 110 | 14.2 |
| Overweight (25–29.9 kg/m ²) | | | | | 459 | 25.8 | 273 | 28.3 | 228 | 29.5 |
| Obese (30–34.5 kg/m ²) | | | | | 499 | 28.1 | 272 | 28.2 | 210 | 27.2 |
| Morbidly obese (35+ kg/m ²) | | | | | 603 | 34.0 | 288 | 29.9 | 225 | 29.1 |
| Leisure site (n=2233) | | | | | | | | | | |
| A (Leisure provider 2) | 113 | 5.1 | 22 | 5.2 | 91 | 5.0 | 67 | 6.9 | 60 | 7.7 |
| B (Leisure provider 1) | 186 | 8.3 | 54 | 12.8 | 132 | 7.3 | 75 | 7.7 | 71 | 9.1 |
| C (Leisure provider 1) | 332 | 14.9 | 83 | 19.7 | 249 | 13.7 | 152 | 15.7 | 117 | 15.1 |
| D (Leisure provider 1) | 103 | 4.6 | 20 | 4.7 | 83 | 4.6 | 39 | 4.0 | 34 | 4.4 |
| E (Leisure provider 1) | 428 | 19.2 | 89 | 21.1 | 339 | 18.7 | 186 | 19.2 | 168 | 21.6 |
| F (Leisure provider 1) | 501 | 22.4 | 81 | 19.2 | 420 | 23.2 | 224 | 23.1 | 196 | 25.2 |
| G (Leisure provider 2) | 73 | 3.3 | 10 | 2.4 | 63 | 3.5 | 27 | 2.8 | 20 | 2.6 |
| H (Leisure provider 2) | 156 | 7.0 | 18 | 4.3 | 138 | 7.6 | 54 | 5.6 | 24 | 3.1 |
| I (Leisure provider 2) | 341 | 15.3 | 45 | 10.7 | 296 | 16.3 | 144 | 14.9 | 87 | 11.2 |

grouping. Prediction success overall was 82.2% (24.2% for dropouts and 96.5% for adherers). The Wald criterion demonstrated that BMI (30–34.9 kg/m² B=−1.164, SE=0.377, 35+ kg/m² B=−0.921, SE=0.395) and leisure site (site G, B=−1.336, SE=0.377, site H, B=−2.102, SE=0.533, site I, B=−1.709, SE=0.473) made significant contributions to the model (table 3).

Physical activity levels

Self-reported physical activity for those who completed the scheme was measured through the GLTEQ²⁶ prescheme and postscheme. Mean prescheme weekly activity scores were 17.43 units/week (15.82 SD) and postscheme scores were 27.11 units/week (20.46 SD). This equated to 52 min of moderate activity per week prescheme and 81 min postscheme, (a mean increase in moderate activity of 29 min/week). Participants who completed significantly increased their self-reported physical activity levels ($t(638) = -11.55, p < 0.001$).

Attendance at supervised ERS sessions

Mean attendance across sites for dropouts before 12 weeks was 4.28 sessions (5.68 SD), for 12-week adherers was 13.06 sessions (9.2 SD) and for completers was 22.87 sessions (12.47 SD). For completers, this equated to 47.7% of potential attendances (maximum 48), however, there were large variations between sites. Highest mean attendance for completers at a single site (A) was 31.18 (11.87 SD) sessions and the lowest (H) 15.37 (6.69 SD) sessions.

DISCUSSION

Main findings

The aim of the present study was to examine whether participation in the ERS resulted in increased physical activity and what factors were predictors of uptake and stage of exit from the scheme. For those who completed the Northumberland ERS, there was a significant increase in self-reported physical activity. Completers attended sessions on average once a week during the referral period. Participants were asked to complete the GLTEQ²⁶ prescheme and postscheme. Results showed a statistically significant mean increase in activity of 29 min per week, but the average 82 min achieved was still well below the current recommendation of 150 min/week.²⁷ The only other ERS study to have used this questionnaire¹² reported a mean increase of 27 min/week after 3 months and 21 min/week after a year. Although reported increases were comparable between studies, in both levels of activity achieved are below recommended levels.

Personal and referral characteristics were found to be significant predictors of both uptake and length of engagement with the ERS studied. Increasing age, being female and metabolic/endocrine condition as a secondary reason for referral were positive predictors of uptake; while greater deprivation was a negative

predictor. Increasing age and being referred by a cardiac rehabilitation nurse were positive predictors of 12-week adherence; while greater deprivation and a BMI of 35+ kg/m² were negative predictors. BMI of more than 30 kg/m² was a negative predictor of completion. Leisure site was a significant predictor of uptake, 12-week adherence, and 24-week completion.

Uptake for this ERS was 81%, which compared favourably with other evaluation studies of routinely collected data,^{12 14 15 19} but was lower than the 85% uptake reported by a recent UK RCT.⁸ The 53.3% adherence in this study was not dissimilar to results of a recent systematic review,²⁰ which found a pooled adherence level of 49% across observational studies. The measure of completion in this study indicated further attrition of 10.5% in weeks 13–24. Since the highest levels of dropout occurred in the first 3 months (46.5% of uptake), understanding barriers to, and facilitators of, attendance in the earlier stages of the scheme would make the most difference to improving sustained engagement. There has only been one qualitative study²⁸ considering participant perceptions of ERS, although several other studies^{29 30} have included qualitative elements. Future studies are required to explore these issues in depth.

No other observational studies have reported comprehensive attendance data. In this study the total number of attendances at sessions was reported for participants. Completers attended approximately once a week, rather than the proposed two times a week. However, this did vary between sites and the site with the highest attendance also had the highest adherence to 12-week and 24-week consultations; conversely the site with the lowest attendance also had the lowest adherence to consultations. These findings indicate that using attendance at consultations as a proxy measure for attendance in activity sessions is an appropriate index.

Compared to other studies^{17 21 22} that have indicated that participants achieved 80% of attendance, the present study found much lower levels of attendance (47.7%). However, previous studies have not tended to report data about actual levels of attendance per week. The present results are, however, similar to those reported in the RCT in Hailsham²⁵ where completers attended on average 45% of exercise sessions. If ERS only achieve average attendance rates of one session per week (potentially 60 min of moderate exercise), there is a need to investigate whether participants increase other activity in order to make an assessment of whether they achieve the 2011 UK government recommended 150 min of moderate exercise.²⁷

This study also analysed whether demographic/other factors relating to the referral were predictors of uptake and stage of exit from the scheme. As in previous studies^{12 14 15} increasing age was associated with uptake and adherence; however, in the present study almost half of the referrals (48%) were under 55 years. In the short term, retention to this ERS could be increased by focusing referrals on those over 55 years or specifically

Table 3 Binary logistic regression outcomes

| | Regression 1 OR (95% CI) | p Value | Regression 2 OR (95% CI) | p Value | Regression 3 OR (95% CI) | p Value |
|--------------------------------------|-----------------------------|---------|-----------------------------|---------|-----------------------------|---------|
| Age | | | | | | |
| 16–24 | 1.000 (ref) | <0.001 | 1.000 (ref) | <0.001 | 1.000 (ref) | 0.004 |
| 25–34 | 1.161 (0.711 to 1.896) | 0.551 | 1.049 (0.556 to 1.981) | 0.882 | 1.118 (0.279 to 4.475) | 0.875 |
| 35–44 | 2.023 (1.247 to 3.281) | 0.004 | 1.501 (0.838 to 2.688) | 0.172 | 0.558 (0.165 to 1.890) | 0.349 |
| 45–54 | 1.928 (1.204 to 3.088) | 0.006 | 1.697 (0.954 to 3.017) | 0.072 | 1.022 (0.301 to 3.467) | 0.972 |
| 55–64 | 3.042 (1.866 to 4.959) | <0.001 | 3.984 (2.254 to 7.045) | <0.001 | 1.601 (0.488 to 5.247) | 0.437 |
| 65–74 | 4.175 (2.442 to 7.137) | <0.001 | 5.665 (3.136 to 10.234) | <0.001 | 2.505 (0.740 to 8.484) | 0.140 |
| 75+ | 7.402 (3.244 to 16.890) | <0.001 | 5.544 (2.771 to 11.089) | <0.001 | 1.894 (0.500 to 7.168) | 0.347 |
| Gender | | | | | | |
| Male | 1.000 (ref) | | 1.000 (ref) | | 1.000 (ref) | |
| Female | 1.406 (1.106 to 1.787) | 0.005 | 1.189 (0.952 to 1.486) | 0.128 | 0.823 (0.554 to 1.221) | 0.333 |
| Index of multiple deprivation | | | | | | |
| 20% most deprived | 1.000 (ref) | 0.119 | 1.000 (ref) | 0.012 | 1.000 (ref) | 0.807 |
| 21–40% | 1.215 (0.869 to 1.699) | 0.254 | 1.191 (0.947 to 1.675) | 0.314 | 0.960 (0.501 to 1.842) | 0.903 |
| 41–60% | 1.416 (0.948 to 2.113) | 0.089 | 1.335 (0.913 to 1.951) | 0.136 | 1.281 (0.622 to 2.638) | 0.502 |
| 61–80% | 1.704 (1.118 to 2.599) | 0.013 | 1.510 (1.031 to 2.211) | 0.034 | 0.894 (0.445 to 1.795) | 0.753 |
| 81–100% Least deprived | 1.546 (1.019 to 2.347) | 0.041 | 1.956 (1.325 to 2.887) | 0.001 | 0.955 (0.481 to 1.898) | 0.896 |
| Profession of referrer | | 0.301 | | 0.012 | | 0.353 |
| General Practitioner | 1.000 (ref) | | 1.000 (ref) | | 1.000 (ref) | |
| Practice nurse | 0.802 (0.610 to 1.055) | 0.114 | 1.129 (0.878 to 1.451) | 0.346 | 1.006 (0.643 to 1.573) | 0.979 |
| Cardiac rehabilitation nurse | 1.243 (0.708 to 2.183) | 0.449 | 2.291 (1.392 to 3.769) | 0.001 | 2.045 (0.915 to 4.572) | 0.081 |
| Other | 0.999 (0.616 to 1.620) | 0.988 | 1.146 (0.738 to 1.779) | 0.544 | 0.924 (0.455 to 1.874) | 0.826 |
| Reason for referral | | 0.157 | | 0.751 | | 0.113 |
| CVD | 1.000 (ref) | | 1.000 (ref) | | 1.000 (ref) | |
| Overweight/obesity | 0.819 (0.560 to 1.199) | 0.304 | 0.937 (0.673 to 1.303) | 0.697 | 1.475 (0.832 to 2.616) | 0.183 |
| Mental health | 0.751 (0.484 to 1.163) | 0.199 | 0.823 (0.544 to 1.244) | 0.355 | 0.753 (0.360 to 1.572) | 0.449 |
| Metabolic/endocrine | 0.873 (0.521 to 1.462) | 0.605 | 0.806 (0.511 to 1.272) | 0.354 | 0.571 (0.261 to 1.247) | 0.160 |
| Other | 1.652 (0.866 to 3.153) | 0.128 | 0.789 (0.501 to 1.244) | 0.308 | 1.018 (0.467 to 2.218) | 0.965 |
| Secondary reason for referral | | 0.031 | | 0.667 | | 0.820 |
| No secondary reason | 1.000 (ref) | | 1.000 (ref) | | 1.000 (ref) | |
| CVD | 2.125 (0.618 to 7.304) | 0.231 | 1.001 (0.450 to 2.228) | 0.998 | 1.529 (0.392 to 5.961) | 0.541 |
| Overweight/obesity | 0.829 (0.526 to 1.305) | 0.418 | 0.869 (0.580 to 1.302) | 0.496 | 1.233 (0.633 to 2.405) | 0.538 |
| Mental health | 0.818 (0.522 to 1.284) | 0.383 | 0.898 (0.554 to 1.423) | 0.621 | 1.268 (0.531 to 3.028) | 0.594 |
| Metabolic/endocrine | 3.016 (1.354 to 6.719) | 0.007 | 0.894 (0.555 to 1.440) | 0.644 | 0.778 (0.368 to 1.644) | 0.511 |
| Other | 1.497 (0.779 to 2.877) | 0.226 | 1.445 (0.856 to 2.441) | 0.168 | 0.797 (0.367 to 1.730) | 0.566 |
| Prescheme BMI (kg/m ²) | | | | 0.214 | | 0.012 |
| Normal weight 18.5–24.9 | N/A | | 1.000 (ref) | | 1.000 (ref) | |
| Overweight 25–29.9 kg/m ² | | 0.151 | 0.749 (0.506 to 1.111) | 0.151 | 0.598 (0.298 to 1.197) | 0.147 |
| Obese 30–34.5 kg/m ² | | 0.230 | 0.775 (0.511 to 1.175) | 0.230 | 0.312 (0.149 to 0.654) | 0.002 |
| Morbidly obese 35+ kg/m ² | | 0.045 | 0.646 (0.421 to 0.990) | 0.045 | 0.398 (0.184 to 0.863) | 0.020 |

Continued

Table 3 Continued

| | Regression 1 OR (95% CI) | p Value | Regression 2 OR (95% CI) | p Value | Regression 3 OR (95% CI) | p Value |
|------------------------|-----------------------------|---------|-----------------------------|---------|-----------------------------|---------|
| Leisure site | | <0.001 | | <0.001 | | <0.001 |
| A (Leisure provider 2) | 1.000 (ref) | | 1.000 (ref) | | 1.000 (ref) | |
| B (Leisure provider 1) | 0.839 (0.440 to 1.601) | 0.595 | 0.625 (0.320 to 1.217) | 0.167 | 2.670 (0.705 to 10.117) | 0.148 |
| C (Leisure provider 1) | 1.253 (0.695 to 2.294) | 0.464 | 0.972 (0.528 to 1.788) | 0.927 | 0.532 (0.207 to 1.365) | 0.189 |
| D (Leisure provider 1) | 1.675 (0.781 to 3.589) | 0.185 | 0.518 (0.249 to 1.078) | 0.079 | 1.324 (0.347 to 5.052) | 0.681 |
| E (Leisure provider 1) | 1.667 (0.905 to 3.071) | 0.101 | 0.991 (0.535 to 1.835) | 0.978 | 2.362 (0.801 to 6.967) | 0.119 |
| F (Leisure provider 1) | 2.351 (1.296 to 4.263) | 0.005 | 0.875 (0.487 to 1.573) | 0.656 | 1.464 (0.552 to 3.883) | 0.443 |
| G (Leisure provider 2) | 1.690 (0.708 to 4.030) | 0.237 | 0.248 (0.115 to 0.534) | <0.001 | 0.263 (0.073 to 0.950) | 0.041 |
| H (Leisure provider 2) | 2.521 (1.181 to 5.381) | 0.017 | 0.306 (0.157 to 0.596) | 0.001 | 0.122 (0.043 to 0.347) | <0.001 |
| I (Leisure provider 2) | 1.943 (1.048 to 3.600) | 0.035 | 0.383 (0.213 to 0.688) | 0.001 | 0.181 (0.072 to 0.458) | <0.001 |

N/A indicates that data were not available. Employments status was not included in any final regression as it did not improve the fit.

tailoring ERS interventions for those under 55 years. Further qualitative studies that improve understanding about why ERS is not as successful for those who are younger could lead to the development of more appropriate interventions for those under 55 years.

Apart from increasing age being a predictor of uptake and adherence, there has been little consensus about how demographics are associated with uptake and adherence to ERS. This is due to the small number of studies that have examined the associations between referral demographics and engagement and a lack of standardisation of data collection between studies. In this study, increasing age, being female, IMD, secondary reason for referral and leisure site were found to be significant predictors of uptake, while increasing age, IMD, prescheme BMI and leisure site were found to be significant predictors of 12-week adherence. As 12 weeks was the mid-point of the scheme in this study (unlike most other studies), an additional element of 24-week completion was used; prescheme BMI and leisure site were found to be significant predictors for this.

Two previous studies^{12 14} found that men were more likely to adhere however, this study found that although being women was significantly associated with uptake, there was no statistical difference in stage of exit for gender for starters.

Only two other observational studies have examined whether deprivation is associated with likelihood to complete; as in this study, Sowden *et al*²⁵ found it was not a significant predictor of likelihood to complete, while Gidlow *et al*¹⁴ found those from deprived areas were less likely to start and adhere to ERS (as did this study). Additionally in this study leisure site was found to be a significant predictor of uptake, 12-week adherence and 24-week completion. It is possible that processes within individual sites are associated with success. Reasons for performance varying by site are likely to be complex. Differing provision of leisure services in Northumberland created challenges in providing a standardised scheme. The highest level of adherence was seen at the site where the scheme was most recently established, and prior learning had been shared between providers. The only other study¹² to compare performance between two sites found a 12% difference in adherence.

Reason for referral was not found to be a significant predictor of uptake or stage of exit for starters; however those referred by a cardiac rehabilitation nurse (CVD secondary prevention) were more likely to adhere at 12 weeks and those with a prescheme BMI of 30+ kg/m² were less likely to complete at 24 weeks. Other studies have found referral for CVD to be significant; Sowden *et al*²⁵ found that those referred for prevention of diabetes or cardiovascular disease were significantly more likely to complete than those referred for musculoskeletal/neurological, respiratory and mental health conditions; and Dugdill *et al*¹² found that those referred for a myocardial infarction were almost twice as likely to

adhere as those referred for a mental health condition. Additionally, James *et al*⁶ found that those referred for overweight/obesity musculoskeletal, and mental health issues were less likely to take up a referral than those with cardiovascular disease, but they did not find an association between reason for referral and completion for those who started. Given the identified rise in levels of obesity in the UK,⁴ the benefits of physical activity for those who are obese,³¹ and the high proportion of referrals made to this ERS who were obese (62% of recorded BMIs for starters were 30+ kg/m²); there is a need to understand why the current intervention is not as successful for this group and what approach might result in more sustained engagement.

Limitations

The factors analysed only minimally increased prediction accuracy. This would indicate that there are other factors that have not been considered in this study that are associated with how long participants engage with the scheme.

The use of a self-reported physical activity questionnaire might have led to inaccuracies in quantifying increases in levels of activity. The GLTEQ²⁶ is limited in that it asks how many times in a typical 7-day period activity was undertaken for 15 min or more. An hour-long activity session therefore receives the same rating as a 15 min exercise session, leading to a possible underestimation of activity levels achieved. While it might be unrealistic to expect an ERS provider to routinely collect data about physical activity levels other than by self-report questionnaire, small scale studies that objectively measure activity levels prescheme and postscheme (eg, via accelerometer) would give a more realistic assessment of any increase in activity levels while also accounting for levels of physical activity outside the programme.

Although the study identified which participants successfully engaged with the scheme, it has not attempted to identify the reasons for engagement or non-engagement. Here, an examination of the experiences, expectations, attitudes and beliefs about the scheme would be a most beneficial next step, ideally through a qualitative methodology.

Implications for practice and future research

There are several key recommendations resulting from this study.

- ▶ Studies are required that explore why ERS is successful for certain groups, while failing to sustain engagement with others. In particular there is a need to focus on why ERS is less successful for those who are younger and those who are obese.
- ▶ Adherence to and completion of ERS in its present form could be improved by focusing referrals on those aged over 55 years.
- ▶ In addition to encouraging participants to attend supervised sessions, there is a need for ERS to promote physical activity outside scheme sessions in

order for participants to achieve government physical activity recommendations.

- ▶ Further studies are required that more accurately determine changes in physical activity behaviour as a result of participation in ERS.

CONCLUSION

The Northumberland ERS was more successful for those aged over 55 years and less successful for those who were obese. Completers increased physical activity at 24 weeks. Leisure site attended was a significant predictor of uptake and length of engagement.

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Exercise on referral: evidence and complexity at the nexus of public health and sport policy

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ABSTRACT

Exercise on referral schemes (ERS) are recommended by the National Institute of Clinical Excellence for increasing physical activity in inactive patients with long-term health conditions. The current paper critiques a recent extension to ERS provision, specifically, schemes using sport as the primary delivery mechanism (sport-based ERS). We suggest attention should be given to how such schemes that operate across sport and public health sectors may have mismatched approaches to evidence and policy implementation.

Specifically, we highlight two current issues concerning ERS and consider the addition of sport-based schemes in respect to these. First, we argue that ERS-related public health policy and guidance is drawn from a limited evidence base, and is consequently vague. While this leads to opportunities for local innovation, the subsequent design, implementation and evaluation of ERS is diverse. ‘Scaling-up’ of effective interventions, desired by Public Health England, is therefore problematic, and likely to be further exacerbated by introducing sport-based ERS. Second, we contend that sport-based schemes are unlikely to overcome existing challenges concerning untargeted provision of ERS, and that funding would be better directed towards services for those who have complex barriers to successful engagement.

KEYWORDS

Exercise referral; physical activity; community based; healthcare; sport

Introduction: the emergence of sport-based ERS

Exercise on referral schemes (ERS) are one of the most widespread physical activity interventions in the United Kingdom, with a sustained rise in number initiated since the early 1990s (Pavey *et al.* 2011). Usually commissioned via public health, they involve referral of patients with long-term conditions from primary care to a third party (typically a leisure provider), where a programme is provided that aims to encourage participants to increase their physical activity levels. There is, however, a lack of clear evidence about ERS’ effectiveness in terms of changing physical activity behaviour and for whom different types of scheme are most effective (National Institute for Health and Care Excellence (NICE) 2014). Accordingly, NICE guidance (2014) proposes broad restrictions on ERS funding and use, recommending that referral is not appropriate where individuals are inactive or sedentary but are otherwise healthy. Furthermore, when schemes are commissioned, NICE recommends performance data be collected and made available to allow for assessment of effectiveness within population subgroups.

Despite the cautious approach recommended for public health commissioning of ERS, new schemes have recently been implemented with support from Sport England’s ‘Get Healthy, Get

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Active' fund (Sport England 2014). One development of particular note has been the commissioning of ERS that use sport (as opposed to traditional gym or class-based activities) as the primary delivery mechanism, here called sport-based ERS. Funding sport pathways within established public health provision is a clear attempt to enact the recommendations of Cavill, Richardson and Foster's (2012) review, funded by Sport England, for sport to be fully integrated in service offers for health.

Targeting public health objectives through sport is not novel in itself. From the 1960s, sport has repeatedly responded to political impetus to contribute to various social policy objectives (Houlihan and White 2002). Policy documents from the turn of the century through to the most recent government strategy for sport have repeatedly advocated and sought to evidence the health benefits of sport as a form of physical activity (e.g. DCMS /Strategy Unit 2002, Carter 2005, DCMS 2010, HM Government 2015). However, the extent to which the implementers of sport programmes are themselves deeply committed to, and capable of, delivering on health agendas has previously been questioned (Bloyce *et al.* 2008). Nevertheless, current policies for sport (HM Government 2015) and public health (Public Health England 2014a) are aligned in identifying a need for cross-sectoral approaches to address physical inactivity. 'Everybody Active Every Day' (Public Health England 2014a) acknowledges existing networks between stakeholders from sport, leisure, social care and health, for example, and highlights an opportunity for sport and fitness professionals to deliver targeted health-based programmes for those with complex health issues. Such policies provide a clear steer for Sport England's funding for new programmes using sport to improve health.

Given this increasingly prominent overlap and cowering, exploring the potential for complementarity or conflict between sport and public health policy is both pertinent and topical. Here, we focus on the emerging use of sport-based ERS to highlight some of the difficulties in seeking a greater role for sport within public health. We briefly summarise existing problems with ERS policy, in terms of interpretation, delivery and evaluation, and consider implications for both sport and public health policy makers. First, we discuss how problems in evaluating ERS' effectiveness have previously limited the scaling-up of good practice in order to inform policy, and argue this also applies to sport-based ERS. Second, we consider whether current policy is appropriate in advocating a relatively untargeted approach to the prescription of ERS, and whether sport-based ERS will serve those neglected by or unable to access current schemes. We conclude by suggesting that these concerns represent a significant challenge for any continuing impetus towards sport-based ERS.

The problematic relationship between ERS evidence and policy

Rigorous systematic reviews encompassing extensive literature are required to inform NICE guidelines, including those applicable to ERS. For physical activity-based interventions sensitive to complex individual behavioural and social influences, this approach may limit broader understanding of what works, for whom and in what circumstances (Pawson *et al.* 2005). This is further exacerbated as PHE's (2014b) application of rigorous quantitative Nesta standards has resulted in criticisms of the ERS evidence-base in terms of sparse use of randomised control trials (RCTs), failure to establish causality (e.g. PHE 2014c) and considerable variation in data collection, analysis and reporting quality between schemes. Responding to these criticisms is a challenge for those involved in the delivery of ERS given the pragmatic nature of the schemes and service expectations of referrers. Similar constraints commonly apply to community-based physical activity interventions more broadly, and indeed also to sport-based interventions. Although some reviews attempt to adopt a balanced and inclusive approach to interpreting the diverse evidence-base for sport-based interventions (e.g. Taylor *et al.* 2015), determining the effectiveness of sport-based ERS may be problematic when examples and expertise of methodologies, such as RCTs, prioritised by public health policy makers are found even more rarely within the sport sector (Cavill *et al.* 2012).

With trial-based evidence taken to be the gold standard, assessments have indicated that the evidence for public health-based physical activity schemes is weak. This is reflected in Public Health England (2014b) findings that from 952 programmes, only 34 were sufficiently rigorous to be classified according to Nesta standards of evidence. No ERS interventions met standards for 'proven practice', or 'promising practice'; only 6 of the 28 programmes classed as 'emerging practice' were ERS-based. Since ERS are generally tailored to the requirements of the community in which they are based, scalability is a problem (PHE 2014b).

Given this, it is perhaps unsurprising that national policy and best practice guidelines that attempt to draw from the evidence-base are somewhat vague; for example, NICE (2014) are unable to define discrete subpopulations for whom an ERS pathway may be more effective, nor provide a single 'gold standard' in terms of programme structure. Such ambiguous policy, or guidance that lacks specificity, enables a myriad of interpretations in practice (Matland 1995). In the case of ERS, we suggest that one consequence has been continued diversity in terms of scheme delivery and evaluation quality (PHE, 2014b). While this might well be construed as positive in terms of allowing for local innovations in service provision, perhaps including the development of sport-based ERS, it does little to resolve uncertainties concerning the relative effectiveness of schemes or their components. In turn, this has impeded progress in terms of identifying, communicating and achieving the desired scaling-up (Public Health England 2014b) of best practice models for ERS. Recognition that there is insufficient understanding as to how national policies may effectively contribute to improving sport participation (Nicholson *et al.* 2011) suggests that the addition of sport-based ERS will exacerbate rather than clarify these problems. As such, while there is strong political impetus for linking sport and ERS, diversifying ERS delivery in this way may raise additional problems when seeking to summarise the evidence.

Broad or narrow: should policy advocate the more targeted delivery of ERS?

At present, NICE (2014) offer only a broad recommendation for ERS' eligibility criteria, namely individuals who are inactive or sedentary and have existing medical conditions. This approach fails to acknowledge emerging evidence suggesting schemes may be more, or only, effective or engaging for particular groups. While this does not yet reach a consensus (Campbell *et al.* 2015), extending the range of evidence considered by public health reviews may offer guidance for more targeted policy. For example, some ERS have been identified as more successful at engaging older individuals (Isaacs *et al.* 2007, Hanson *et al.* 2013), those living in a less deprived area (Gidlow *et al.* 2007) or those referred from specific disease pathways (Dugdill *et al.* 2005; Sowden *et al.* 2008; Hanson *et al.* 2013). At the least, guidelines should encourage attention to subgroup effects in both evaluations and by evidence users.

Exploring *why* subgroups do not initially engage with, or continue to attend, ERS will have value for informing more effective practice as well as future policy through enhancing understanding of the complex sociodemographic, environmental, economic and cultural barriers that may inhibit behaviour change. For example, previous work has linked factors, such as age, employment status, family type, household income and habitual location to physical activity (e.g. Bergman *et al.* 2008; Pan *et al.* 2009, Borodulin *et al.* 2016). Mixed methods approaches can highlight not only groups who may be poorly served by interventions, but also provide detail on how these barriers and interventions are experienced from the perspective of the individual. For example, qualitative data (Hanson 2015) identifies serious psychological barriers (e.g. low self-esteem, fear of change and body image disorders), impaired social circumstances (ranging from a lack of active peer role models to codependent or restrictive interpersonal relationships) or chronic negative experiences of exercise, often commencing in childhood, as factors influencing participants' ERS experiences.

For individuals who are affected by severe or multiple barriers, we argue that it is unrealistic to expect ERS to result in sustained change of habitual behaviours. Such participants may require a different or more intensive approach before change at the individual level can occur (e.g.

therapeutic approaches, support from multiple agencies or broader system change). These arguments, focusing on how individuals can be empowered for change, have begun to inform community sport interventions (e.g. Mansfield *et al.* 2015); they are also clearly relevant to the delivery of ERS. Although considering scheme inclusion and exclusion criteria at the point of referral would enable more effective provision, targeted towards individuals likely to benefit, we must be mindful that this approach would require alternative intervention pathways for those unlikely to engage with and adhere to current ERS provision. Of key relevance here, we must ask whether sport-based ERS are likely to present an attractive alternative for those who do not currently engage with or benefit from schemes, and if not, whether they are really an appropriate way of extending ERS provision.

In this last regard, there has been long-standing recognition (e.g. Collins and Kay 2003) that identified groups who are more likely (e.g. older adults, women) or less likely to engage (e.g. individuals from deprived backgrounds) in ERS are all amongst those less likely to engage with sport. More recent data from Sport England's (n.d.) Active People Survey reinforce the continuation and currency of these trends. It can be argued that the former groups are unlikely to be further engaged by the option of sport-based ERS and there can be little expectation of success for the latter when significant, if somewhat inconsistent, policy impetus and sport-based interventions have previously failed to significantly increase participation amongst those living in deprivation (Bloyce and Smith 2009). Further, sport-based schemes that *have* shown greater promise in engaging individuals from deprived backgrounds have tended to be those that adopt locally driven, bottom-up approaches to implementation (e.g. Walpole and Collins 2010), a direct conflict with the centralised guidance-driven approach favoured in public health guidelines.

Conclusions

We have argued that (i) enhanced quality and consideration of a broader range of evidence concerning ERS' effectiveness is needed before we can establish how they can best be delivered and developed, and (ii) provision for those who are not able to benefit from existing schemes is necessary. On the one hand, the limitations of evidence on public health ERS and the associated ambiguity in policy could be viewed as an opening for adding sport-based ERS to the diversity of current practices. On the other hand, and moving beyond such policy opportunism, there are a number of reasons for concern as to the long-term appropriateness of promoting sport-based ERS as interventions at the nexus of sport and public health policy.

Critically, allocating funding to sport-based ERS is unlikely to address either of the problems identified in this paper. First, the type of evidence desired in the public health sector to scale up interventions is not and has not been widely collected for sport-based interventions. Perceived weaknesses in the evidence-base for ERS are likely to also apply to sport-based ERS trials, resulting in continued ambiguity in national policy guidance. Second, there is little to suggest that sport-based ERS would offer an alternative well-suited to engaging those underserved by current schemes.

More generally, the complexity of issues that can be identified at the nexus of sport and public health requires greater recognition and more nuanced approaches on behalf of policy makers. Some groups, which ERS do not currently engage (e.g. younger adults) *are* more likely to participate in sport (Sport England, n.d.), and offering sport-based ERS may have a role to play in attracting and retaining such individuals. Critically, however, we propose that the more pressing issue is to identify and develop schemes that will work for those who are most in need and least likely to benefit from traditional ERS, that is, those with poor health and complex barriers to engagement.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Appendix 11 Dissemination of thesis results

Publications in refereed journals

Oliver, E. J., **Hanson, C. L.**, Lindsay, I., Dodd-Reynolds, C. J. (2016) *Exercise on referral: Evidence and complexity at the nexus of public health and sport policy*. International Journal of Sport Policy and Politics (10.1080/19406940.2016.1182048) IF 1.366

Hanson, C.L., Ellis, J.G., Allin, L.J. & Dodd-Reynolds, C.J. (2013) *An evaluation of the efficacy of the exercise on referral scheme in Northumberland, UK: association with physical activity and predictors of engagement. A naturalistic observation study* BMJ Open 3(e002849) IF 2.562

Papers in preparation

Dodd-Reynolds, C.J., **Hanson, C.L.**, Bambra, C., & Kasim, A. (in prep.) *Impact of socioeconomic status on weight-loss efficacy for overweight and obese individuals referred to the Northumberland Exercise on Referral Scheme*. To be submitted to Journal of Public Health. IF 2.039

Hanson, C.L., Oliver, E.J., Allin, L.J., & Dodd-Reynolds, C.J. (in prep.) *More than (sample) size matters: co-production and impact in physical activity evaluation*. To be submitted to Journal of Public Health. IF 2.039

Invited talks and conference presentations

Hanson C. L., Allin, L., Oliver, E. J. & Dodd-Reynolds, C.J. (2016) *Mind the gap: challenges for ERS in meeting expectations, evidence informed future directions* Presented at The Physical Activity Special Interest Group of the Wolfson Research Institute for Health and Wellbeing Symposium, Durham

Hanson C. L., Allin, L., Oliver, E. J. & Dodd-Reynolds, C.J. (2016) *Evaluating the impact of evidence-based change within the Northumberland Exercise on Referral Scheme* Presented at the 3rd International Fuse Knowledge Exchange Seminar, Gateshead

Dodd-Reynolds, C.J. & **Hanson, C.L.** (2015) *Impact of socioeconomic status on weight-loss efficacy for individuals referred to the Northumberland Exercise on Referral Scheme* Presented at the 5th Fuse Physical Activity Workshop: Physical Activity and Weight Management, Durham

Hanson, C. L., Ellis, J., Allin, L., and Dodd-Reynolds, C.J. (2013) *Efficacy of the Northumberland Exercise on Referral Scheme* Presented at the opening press conference of the British Science Festival, Newcastle University, Newcastle upon Tyne

Hanson, C. L., Allin, L., Ellis, J., and Dodd-Reynolds, C.J. (2012) *An evaluation of the efficacy of the exercise on referral scheme in Northumberland, UK: impact on physical activity and predictors of engagement*. Presented at the Northern Symposium for Sports Medicine, St James Park, Newcastle upon Tyne

Conference posters

Dodd-Reynolds, C.J., **Hanson, C.L.**, Lake, A., & Oliver E.J. (2015) *Efficacy of "Momenta": a pilot adult weight management programme*. Presented at the 2015 Wolfson Research Institute for Health and Wellbeing Research Colloquium, Durham University, Stockton

Hanson, C. L., Allin, L., Ellis, J. and Dodd-Reynolds, C.J. (2012) *An evaluation of the Northumberland Exercise on Referral Scheme: Preliminary results on predicting drop-out for overweight and obese referrals*. Presented at the FUSE Quarterly Research Meeting/North East Obesity Forum, Durham University, Stockton

Press coverage from British Science Festival 2013

The Telegraph: Doctors should prescribe exercise to over 55s, researchers claim
<http://www.telegraph.co.uk/news/health/elder/10296453/Doctors-should-prescribe-exercise-to-over-55s-researchers-claim.html>

Huffington Post: Over-55s not active enough, should be prescribed exercise by doctors
http://www.huffingtonpost.co.uk/2013/09/10/older-adults-not-active-enough-prescribe-exercise_n_3898424.html

Medical News Today: Over 55s more likely to complete exercise on referral
<http://www.medicalnewstoday.com/articles/265854.php>

Leisure Management: Older patients more likely to take up exercise on referral, new study shows
<http://www.leisuremanagement.co.uk/detail1.cfm?pagetype=detail&subject=news&codeID=306825&site=LM&dom=N>

Mental Health Matters: Doctors should prescribe exercise to over 55s, researchers claim
<http://www.mentalhealthmatters.com/doctors-should-prescribe-exercise-to-over-55s-researchers-claim/>

Mature Times: Over 55s show more stamina in exercise scheme
<http://www.maturetimes.co.uk/health/health-news/7004-over-55s-show-more-stamina-in-exercise-scheme.html>

Australian Broadcasting Corporation: The Science Show Participation rates in exercise programs (broadcast Saturday 21 September 2013 at 12.46pm)

Appendix 12 Examples of how findings from PhD have been included in national policy and industry documents

Excerpt from ‘Identifying what works for local physical inactivity interventions’ (Public Health England, 2014)

NORTHUMBERLAND EXERCISE ON REFERRAL SCHEME

This is an exercise referral scheme that aims to support weight loss, social cohesion and increase physical activity levels of people who are inactive as well those who have certain medical conditions. The programme operates in Northumberland and receives ~2000 referrals per year with an 80% uptake on places. Based on analysis of those referred between October 2011 and March 2013, 12-week adherence was 57.6% and 24 week adherence was 46.5%.

Qualitative measurements

One-on-one interviews, questionnaires.

Quantitative measurements

Psychological outcomes, cardiorespiratory fitness, blood pressure, BMI, waist circumference, physical activity levels

Impact and evaluation

Internal evaluations reported significant positive changes in systolic and diastolic blood pressure, waist circumference and BML.

Independent evaluation carried out by the University of Northumbria; the study was published in BMJ Open in August 2013. Study design: a naturalistic observational study. Setting: nine local authority leisure sites in Northumberland. Participants: 2233 patients referred from primary and secondary care between July 2009 and September 2010. Intervention: a 24-week program including motivational consultations and supervised exercise sessions for participants. Results: uptake was 81% (n=1811), 12-week adherence was 53.5% (n=968) and 24-week completion was 42.9% (n=777). Participants who completed the intervention significantly increased their self-reported physical activity levels at 24-weeks t (638) = -11.55, p<0.001. Conclusion: completers of the Northumberland ERS increased physical activity at 24 weeks, although the levels achieved were below the current UK guidelines of 150 min of moderate exercise per week. Leisure site was associated with uptake, adherence and completion.

Scalability

There is a robust evaluation methodology being applied in Northumberland to the ERS which constitutes that the scheme is very clear in its processes and methodology making it suitable to be scaled up.

Future work

PhD research programme (ongoing): analysis of qualitative data such as satisfaction and wellbeing questionnaires following participants from referral through the scheme.

Pilot study: tier 2 weight management scheme, carried out by Active Northumberland and the public health team and evaluated by Durham University School of Applied Social Sciences. Research aims: to compare the Momenta weight management programme (see also standalone Momenta case study below) with a physical activity only option and a combined Momenta and physical activity option. Study design: randomised control trial. Sample: 180 participants, patients with a BMI of 25.0-29.9 kg/m², across two leisure sites. Method: once referred, participants will be randomly allocated into one of three groups: a) the Momenta adult weight management 12-week programme (n=60), b) regular gym membership for 12 weeks (n=60), c) the Momenta 12-week programme and regular gym membership for 12 weeks (n=60). Data: demographics (age, IMD, gender, ethnicity and employment status), physiological measures (BMI and waist circumference), self-reported physical activity pre and post programme and an objective measure of physical activity via the Fitlinx Pebble, attendance at Momenta sessions/leisure centre, diet. Follow up data will also be collected three months and nine months post programme.

Setting
Local authority leisure facility, community venue
Region
North East
Running length
6-8 years
Funding
Local authority
Participants/year
1000-5000

Activities
Walking, swimming, group activity classes, gym based sessions, motivational counselling, sports, fall prevention

Nesta level 2
• captures data that shows positive change (pre and post intervention comparisons)
• independent evaluation
• RCT trial to demonstrate causality not yet completed

Moving towards...

Nesta level 3
• control trial in place

Submission Feedback: Identifying 'what works' for local physical activity interventions



Submission Feedback

Identifying 'what works' for local physical activity interventions

Identifying 'what works' for local physical inactivity interventions Tailored feedback for Northumberland Exercise on Referral Scheme

Thank you for contributing to the 'Identifying 'what works' for local physical inactivity interventions' process. This document provides feedback and tailored advice from the Academic Classification Board for your submission.

Background

The All-Party Commission on Physical Activity suggested that "the UK lags behind other countries in evaluating the quality of physical activity interventions [therefore] we lack a coherent picture of what 'good' looks like". In response, Public Health England commissioned the National Centre for Sports & Exercise Medicine - Sheffield and ukactive Research Institute to undertake a process for 'Identifying 'what works' for local physical inactivity interventions'.

This was one of the largest surveys of physical activity programmes ever conducted in England, with the physical activity community responding in numbers with an unprecedented 952 programme submitted. An objective, academic approach was undertaken. The Nesta Standards of Evidence were used by an academic classification board to assess the level of evidence submitted (i.e. not specifically the efficacy of the programme).

Feedback from academic panel

The Northumberland Exercise on Referral Scheme submission was rated: "Emerging practice" (Nesta level 2)

The panel recognised the following strengths in your submission to achieve this rating:

You can describe what you do and why it matters, logically, coherently and convincingly: Northumberland Exercise on Referral Scheme provides individuals with certain medical conditions support to increase their activity levels, weight loss and social cohesion. Individuals are referred to the scheme by health professionals. You are able to articulate clear aims and objectives and provide a coherent rationale for the programme design.

You have captured data that shows a positive change: External evaluation has indicated a positive impact on healthy lifestyle behaviours. This formal evaluation used a comprehensive set of qualitative and quantitative measurements to quantify the impact of the programme. Results indicated participants who completed the scheme significantly ($p < 0.001$) increased their self-reported physical activity levels at 24-weeks. Additionally there were reductions in BMI and systolic blood pressure. This demonstration of positive impact meets the requirements for Level 2 of the Nesta Standards of Evidence.

Recommendations for increasing the quality of your evidence:

You can reach Nesta level 3 by considering the following practical guidance: To reach Level 3 of the Nesta Standards of Evidence you are required to demonstrate causality. Evidence can be generated using any robust methods using a control group (or another well justified method such as a competing intervention) that begin to isolate the impact of the service. In this way you can start to demonstrate that your intervention is causing the impact, by showing less impact amongst those who don't receive the service. The control group could be formed using a waiting list whereby data is collected from all participants before they enter the scheme (i.e. during a 12 week lead in period) that will act as a comparison for the participants actively receiving the intervention, or a competing intervention (i.e. individuals that receive additional counselling alongside the physical activities provided). Random selection of participants will strengthen the evidence at this level and sample sizes should be sufficiently large.

Excerpt from 'SPORTA Purple: SPORTA'S offer for public health'

SportaPurple

Members

Members

SportaPurple



BVAL (Blyth Valley Arts and Leisure) Exercise on Referral in Northumberland

The 2006 NICE guidance 'Four commonly used methods to increase physical activity' stated that exercise on referral should only be commissioned as part of a research study. Following this, NHS commissioners in Northumberland challenged providers to provide robust evaluation for exercise on referral. BVAL responded by sponsoring a member of staff to undertake a PhD at the University of Northumbria. This has led to a research publication in BMJ Open and a developing relationship between the trust and university in being able to provide robust evidence about leisure delivered health related programmes.

What does the exercise on referral scheme offer?

The scheme is a 24 week programme and includes three motivational consultations (pre-scheme, after 12 weeks and after 24 weeks). Participants are referred from primary and secondary care for a range of medical conditions including those with cardiovascular risk factors, established cardiovascular disease, diabetes, mental health issues and those who are overweight / obese. They are asked to attend the programme twice a week and can take part in a range of activities (gym, specialist fitness classes, racket sports and swimming).

What has the research looked at?

Routinely collected information from 2233 referrals made between July 2009 and September 2010. It analysed uptake, 12-week and 24-week adherence (measured by attendance at the three consultations), attendance at activity sessions and changes in self-reported physical activity. Demographic and other personal details were analysed to better understand who the scheme was most likely to be successful for.

What difference has it made?

The research has helped us to better understand who the scheme is most likely to be successful for. Northumberland GP Dr. David Shovlin said the findings should help reduce the waste that results from unused appointments and tailor schemes to give better results for patients:

"The research shows that people who complete the Exercise on Referral programme are more likely to engage in physical activity in the medium term. Additionally, getting a better understanding of which patients are more likely to drop out will make it possible to identify reasons for noncompletion and explore alternative ways of helping those individuals to increase their activity level."

The research has received considerable media coverage and has allowed us to have a constructive dialogue with health partners about delivery. We now have a developing relationship with a local university, which we hope will lead to future research studies and potentially unlock funding.

The full paper can be found here:
www.northumbria.ac.uk/content/3/8/e002849.full



Excerpt from 'UKActive: Steps to Solving Inactivity'



Nesta Level 2

Summary

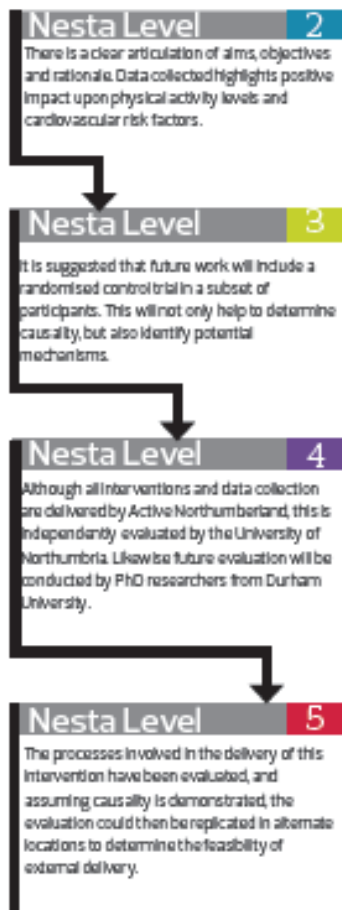
You can capture data that shows a positive change but you cannot confirm you caused this

Description

Level 2 is all about demonstrating positive impact. i.e. you are gathering data that shows some change amongst those receiving or using your intervention. At this point you are not required to compare this with a control group or any competing intervention. You will therefore have a clear idea of what you are doing, why and what effect it is having on the people taking part.

How to generate the evidence

You could consider such methods as pre and post data collection / survey evaluation or continual measurement. This could be as simple as taking some measures when somebody joins your programme, and repeating them at set intervals. Below is a case study of the Northumberland Exercise on Referral Scheme. This programme currently meets the criteria for Nesta level 2 standards of evidence. The boxes below detail how it meets these criteria and the steps that are being taken to move up the Nesta scale.



Northumberland Exercise on Referral Scheme

This is an exercise referral scheme which aims to support weight loss, social cohesion and increase physical activity levels of people who are inactive as well those who have certain medical conditions. The programme operates in Northumberland and receives ~2000 referrals per year with an 80% uptake on places.

Qualitative measurements

One-on-one interviews, questionnaires

Quantitative measurements

Psychological outcomes, cardiorespiratory fitness, blood pressure, BMI, waist circumference, physical activity levels

Impact

Internal evaluations reported significant positive changes in systolic and diastolic blood pressure, waist circumference and BMI.

Independent evaluation carried out by the University of Northumbria; the study was published in BMJ Open in August 2013. Study design: A naturalistic observational study. Setting: Nine local authority leisure sites in Northumberland. Participants: 2233 patients referred from primary and secondary care between July 2009. Results: Uptake was 81% (n=1811), 12-week adherence was 53.5% (n=968) and 24-week completion was 42.9% (n=777). Participants who completed the intervention significantly increased their self-reported physical activity levels at 24-weeks.

Conclusion: Completers of the Northumberland ERS increased physical activity at 24 weeks, although the levels achieved were below the current UK guidelines of 150 min of moderate exercise per week. Leisure site was associated with uptake, adherence and completion.

Future research

Tier 2 weight management scheme is being carried out by Active Northumberland and the public health team, and evaluated by Durham University School of Applied Social Sciences. Study design: Randomised control trial. Sample: 180 participants, patients with a BMI of 25.0–29.9 kg/m², across two leisure sites. Method: Once referred, participants will be randomly allocated into one of three groups: a) The Momenta adult weight management 12 week programme (n=60), b) Regular gym membership for 12 weeks (n=60), c) The Momenta 12 week programme + regular gym membership for 12 weeks (n=60).

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