

## PROTOCOL

### Developing an activity pacing framework for the management of chronic pain/fatigue. Stage III: Feasibility and acceptability studies

Version 2.1, 27.04.2018

---

**Funder:** Health Education England/National Institute for Health Research (HEE/NIHR)  
Ref: ICA-CL-2015-01-019

**Sponsor:** The Pennine Acute Hospitals NHS Trust

**Higher Educational Institute:** School of Healthcare, University of Leeds

**Chief Investigator:** **Dr Deborah Antcliff**  
The Pennine Acute Hospitals NHS Trust/  
School of Healthcare, University of Leeds

**Co-investigators:**

**Professor Linda McGowan**  
School of Healthcare, University of Leeds

**Professor Philip Keeley**  
Department of Health Sciences, University of Huddersfield

**Professor Anne-Maree Keenan**  
NIHR Leeds Biomedical Research Centre (LBRC)  
School of Healthcare, University of Leeds

**Dr Malcolm Campbell**  
Division of Nursing, Midwifery and Social Work, School of Health Sciences, University of Manchester

**Professor Steve Woby**  
Research and Development Department, The Pennine Acute Hospitals NHS Trust and Salford Royal NHS Foundation Trust

## Contents

	<b>Page</b>
<b>Abstract</b>	4
<b>1.0 INTRODUCTION</b>	6
1.1 Background to the study	6
1.2 Our previous work	7
1.3 Conceptual framework	9
1.4 Purpose of the research	9
1.4.1 Aim	9
1.4.2 Objectives	10
1.4.3 Potential future benefits	10
1.5 Research question	10
<b>2.0 METHODS</b>	11
2.1 Study design	11
2.2 Stage III: Feasibility study	14
2.2.1 Sampling principles and procedures	14
2.2.1.1 Participants	14
2.2.1.2 Sample size	15
2.2.1.3 Recruitment	15
2.2.2 Rehabilitation programmes	17
2.2.3 Data collection methods	19
2.2.3.1 Outcome evaluation	19
2.2.3.2 Process evaluation	24
2.2.4 Data analysis	24
2.3 Stage III: Acceptability qualitative study	25
2.3.1 Sampling principles and procedures	25
2.3.1.1 Participants	25
2.3.1.2 Sample size	25
2.3.1.3 Recruitment	26
2.3.2 Data collection methods	27
2.3.2.1 Outcome evaluation	27
2.3.2.2 Process evaluation	28
2.3.3 Data analysis	28
2.4 Refining the activity pacing framework	28
<b>3.0 ETHICAL AND REGULATORY CONSIDERATIONS</b>	31
3.1 Assessment and management of risk	31
3.2 Benefits	32
3.3 Research Ethics Committee and other regulatory review and reports	32
3.4 Patient and public involvement	32
3.5 Data protection and patient confidentiality	33
3.6 Dropouts/Withdrawals	34
3.7 Indemnity	34
3.8 Costs/resources	34
3.9 Conflict of interest	35
<b>4.0 WHAT HAPPENS AT THE END OF THE STUDY?</b>	36
4.1 Dissemination/Publication	36
4.2 Future study	36
<b>5.0 CONTACTS FOR QUERIES</b>	37
<b>6.0 TIMETABLE</b>	38
<b>References</b>	40

	<b>Page</b>
<b>FIGURES</b>	
Figure 1. Three-stage study to develop the activity pacing framework	13
Figure 2. Timetable of research activities	39
<b>APPENDICES</b>	
Appendix 1. Stage III: Feasibility study. Invitation letter for patients	
Appendix 2. Stage III: Feasibility study. Participant information sheet	
Appendix 3. Stage III: Feasibility study. Patient consent form	
Appendix 4. Activity Pacing Framework 'Theory and Overview'	
Appendix 5. Activity Pacing Framework 'Appendices and Teaching Guide'	
Appendix 6. Stage III: Feasibility study. Questionnaire booklet (T1_Post)	
Appendix 7. Stage III: Feasibility study. Questionnaire booklet (T1_Dept)	
Appendix 8. Stage III: Feasibility study. Questionnaire booklet (T2)	
Appendix 9. Stage III: Feasibility study. Questionnaire booklet (T3)	
Appendix 10. Stage III: Feasibility study. Covering letter for T3	
Appendix 11. Stage III: Feasibility study. Chief Investigator's checklist	
Appendix 12. Stage III: Acceptability study. Invitation letter for patients	
Appendix 13. Stage III: Acceptability study. Participant information sheet for patients	
Appendix 14. Stage III: Acceptability study. Consent form for patients	
Appendix 15. Stage III: Acceptability study. Invitation letter/email for healthcare professionals	
Appendix 16. Stage III: Acceptability study. Participant information sheet for healthcare professionals	
Appendix 17. Stage III: Acceptability study. Consent form for healthcare professionals	
Appendix 18. Stage III: Acceptability study. Demographic questions for healthcare professionals	
Appendix 19. Stage III: Acceptability study. Outline for interviews. Patient version	
Appendix 20. Stage III: Acceptability study. Outline for interviews. Healthcare professional version	

## **Developing an activity pacing framework for the management of chronic pain/fatigue.**

### **Stage III: Feasibility and acceptability studies**

#### **Abstract**

Activity pacing is frequently advised in the management of chronic pain/fatigue, including chronic low back pain, chronic widespread pain/fibromyalgia and chronic fatigue syndrome/myalgic encephalomyelitis (CFS/ME). While chronic pain/fatigue is a common and debilitating problem, there is no agreed definition of 'activity pacing', the instructions of pacing vary across different healthcare services/professionals and there is no framework to ensure that the instructions of pacing are evidence-based. For some, pacing is interpreted as involving adapting/limiting activities (for example, breaking down tasks/using rest breaks); while for others, pacing involves having consistent activity levels/gradually increasing activities. Furthermore, previous research has found pacing to be associated with both improved symptoms (decreased fatigue, anxiety and depression) and worsened symptoms (increased pain and disability).

Due to the frequent referral of patients with chronic pain/fatigue (20% of those frequently attending healthcare appointments/investigations), together with the cost of chronic pain/fatigue on patients' quality of life and financial burden on the NHS/society (>£12,000 million per year for back pain alone), it is imperative that coping strategies such as pacing are clearly defined and based on evidence.

This study involves the third stage of the development of an activity pacing framework to standardise how pacing is instructed by healthcare professionals. The first draft of the activity pacing framework was developed based on existing research, together with the findings from Stage I: Healthcare professionals' survey. The activity pacing framework was further developed through undertaking a consensus meeting in Stage II: Nominal group technique, involving an expert panel of four patients and six healthcare professionals. Stage III: Feasibility and acceptability studies will test the activity pacing framework in the clinical setting. The framework will be used to

underpin five/six-week's rehabilitation programmes for chronic pain/fatigue. The outcomes of the programme will be assessed using patient reported outcome measures of symptoms, self-efficacy and pacing; measured pre-treatment, on the last week of the programme and at 3-months follow-up. The acceptability of the framework will be explored using semi-structured interviews with a purposive sample of the healthcare professionals and patients. It is envisaged that Stage III: Feasibility and acceptability studies will last 22 months.

The pacing framework has the potential to improve treatments by providing guidance on the specific pacing components found to have benefits for patients and by standardising treatments that are based on a comprehensive and evidence-based framework. This study is funded by a Health Education England/National Institute for Health Research Integrated Clinical Academic (HEE/NIHR ICA) Clinical Lectureship (ICA-CL-2015-01-019).

## **1.0 INTRODUCTION**

### **1.1 Background to the study**

Patients with chronic pain/fatigue, including chronic low back pain, chronic widespread pain/fibromyalgia and chronic fatigue syndrome/myalgic encephalomyelitis (CFS/ME) are often referred to the healthcare services. These conditions contribute towards the 20% of patients who frequently attend secondary care (Reid et al., 2002). Chronic pain is estimated to affect approximately 28 million adults in the UK (Fayaz et al., 2016).

The negative impact of chronic pain/fatigue can include disability, anxiety, depression and reduced quality of life (Clauw and Crofford, 2003; NICE, 2007). These conditions place a heavy financial burden on healthcare services due to repeat referrals/investigations/treatments (Burton et al., 2012; Konnopka et al., 2013). In the UK, low back pain costs healthcare services over £1600 million, with indirect costs of over £10500 million (Maniadakis and Gray, 2000). Furthermore, there are indirect costs on the economy due to reduced employment/productivity; and loss of income and consequential emotional affects for the individual. A European survey across 243 respondents with chronic pain in the UK found that 25% had lost their job due to pain, whilst a further 16% had changed their job responsibilities and 18% had changed their job completely. Furthermore, 24% had been diagnosed with depression as a consequence of their pain (Breivik et al., 2006).

Healthcare professionals frequently advise patients with chronic pain/fatigue to implement activity pacing; considered a key facet of cognitive behavioural therapy and graded exercise therapy (Wallman et al., 2004; Beissner et al., 2009). Despite anecdotal support and frequent recommendations of activity pacing, there is a paucity of empirical evidence (Andrews et al., 2012). Of the existing findings, pacing is associated with better symptoms, including: increased pain control, and decreased physical impairment, fatigue, anxiety and depression (Nielson et al., 2001; Murphy et al., 2010; Cane et al., 2013). However, pacing has also been associated with worsened symptoms: increased pain, avoidance and disability (McCracken and Samuel, 2007; Andrews et al., 2012). The mixed findings may be partly due to the absence of

pacing guidelines. For some, pacing involves reducing activities, for example, through slowing down, breaking down tasks and using rest breaks (White et al., 2007; Cane et al., 2013). Such facets of pacing may align with adaptive pacing therapy/energy conservation (White et al., 2007). For others, pacing involves planning, setting goals and gradually increasing activities (Sharpe, 2002; Birkholtz et al., 2004; Nielson et al., 2013). Such strategies may align with the operant approach to pacing (Nielson et al., 2013). Therefore, different types of pacing are currently in existence, and it is stated in the NICE Clinical Guideline 53 (NICE, 2007) that activity pacing is advised with caution due to the current confusion regarding its effects. Due to the absence of a comprehensive, evidence-based pacing framework to standardise how it is instructed, patients, healthcare professionals and researchers may interpret/implement pacing differently.

## **1.2 Our previous work**

This study builds on the research team's previous work which developed an activity pacing questionnaire (APQ-26) (Antcliff et al., 2013; Antcliff et al., 2015; Antcliff et al., 2016). Following factor analysis of the APQ-26, five themes of pacing emerged: activity adjustment (for example, breaking down tasks, using rest breaks and alternating activities), activity consistency (undertaking similar amounts of activity each day, including on 'good' and 'bad' days), activity progression (gradually increasing activities), activity planning (assessing activity levels, setting time limits to avoid 'overdoing' activities and setting meaningful goals) and activity acceptance (adapting activity targets and being able to say 'no' to some activities). The APQ-26 study found pacing to be a multidimensional strategy, in contrast to earlier research that found pacing to be a unidimensional concept (Kindermans et al., 2011).

Our previous work found that the different themes of pacing contained within the APQ-26 were associated with both better and worse symptoms among patients with chronic pain/fatigue (Antcliff et al., 2017). Specifically, among a sample of 257 patients with chronic pain/fatigue, regression analyses found that activity adjustment was significantly associated with worse symptoms:

increased physical fatigue (measured using the Chalder Fatigue Questionnaire), depression (measured using the Hospital Anxiety and Depression Scale) and avoidance (measured using the Pain Anxiety Symptoms Scale); and decreased physical function (measured using the Short Form-12) (all  $p \leq 0.03$ ). Conversely, activity consistency was significantly associated with improved symptoms: decreased pain (measured using a Numerical Rating Scale), physical fatigue, depression and avoidance; and increased physical function (all  $p \leq 0.003$ ). Activity planning was significantly associated with reduced physical fatigue ( $p=0.025$ ) and activity acceptance was significantly associated with increased avoidance ( $p=0.036$ ) (Antcliff et al., 2017).

Since the above findings were cross-sectional and not causative, it is unknown whether the themes of pacing lead to the improved/worsened symptoms or whether the themes of pacing are implemented as a consequence to improved/worsened symptoms. In order to fully investigate the effects of pacing, a standardised pacing treatment is required. Currently, there is no comprehensive guide for healthcare professionals on how to instruct activity pacing in the clinical setting.

We have developed an activity pacing framework for chronic pain/fatigue in Stages I and II of the present study. Stage I: Healthcare professionals' survey, involved an online survey to explore opinions on activity pacing. Ninety-two healthcare professionals from across England were included in the data analysis, including physiotherapists ( $n=45$ ), occupational therapists ( $n=30$ ), clinical psychologists ( $n=7$ ), nurses ( $n=4$ ), doctors ( $n=4$ ) and a cognitive behavioural therapist. The data from the survey, together with existing research evidence were used to develop the first draft of the activity pacing framework.

The pacing framework was further developed in Stage II: Nominal group technique. This involved a consensus meeting to discuss the activity pacing framework across an expert panel of four patients with chronic pain/fatigue and six healthcare professionals (two physiotherapists, two occupational

therapists and two psychological wellbeing practitioners all based in the North West of England). The nominal group technique involved rounds of generating ideas and ranking the top 10 priorities of what needed to be included in the activity pacing framework and the corresponding appendices. For the framework, the priorities included a clear definition of pacing, the aims of pacing and providing the background to pacing behaviours. For the appendices, the priorities included explaining the stages of pacing, and describing other activity behaviours such as avoidance and boom-bust (overactivity-underactivity). Following the completion of Stages I and II, the current study involves Stage III to test the feasibility and acceptability of the framework.

### **1.3 Conceptual framework**

The conceptual framework that underpins the current study will explore pacing as both a coping strategy (Nijs et al., 2008; Cane et al., 2013) and a behaviour (Kindermans et al., 2011; Nielson et al., 2013). As a coping strategy, pacing receives varying descriptions (as stated above). As a behaviour, the implementation of pacing may be determined by numerous factors. Factors that may lower rehabilitative health behaviours include increased symptoms such as pain, anxiety and depression (Schwarzer et al., 2011) and lower self-efficacy (Jack et al., 2010). The implementation of pacing may align with conceptual models such as the Health Action Process Approach (HAPA) which conceptualises the uptake of health behaviours and behavioural change (Ogden, 2007; Schwarzer et al., 2008; Schwarzer et al., 2011).

### **1.4 Purpose of the research**

#### **1.4.1 Aim**

Despite the frequent use of activity pacing among patients with chronic pain/fatigue, pacing is instructed in varying ways and there are mixed findings regarding the associations between pacing and better/worse symptoms. We have developed a comprehensive activity pacing framework to standardise how pacing is instructed.

The aims of this study are:

1.) Explore the feasibility of the newly developed activity pacing framework and facilitate the powering for a future pacing trial. In this study, 'feasibility' refers to testing whether the pacing framework can be used to underpin rehabilitation programmes in the clinical setting. We are additionally assessing recruitment, attrition, the protocol, and whether the outcome measures that have been selected are appropriate to implement to assess the outcomes of pacing in a future trial.

2.) Explore the acceptability of the newly developed activity pacing framework and compliance with the framework by healthcare professionals and patients. In this study, 'acceptability' refers to patients' and healthcare professionals' opinions on the rehabilitation programme underpinned by the framework.

#### **1.4.2 Objectives**

The secondary objectives of this study are:

1.) Explore the associations between changes in pacing and changes in symptoms of chronic pain/fatigue, self-efficacy and quality of life.

2.) Develop a comprehensive operational definition of pacing; and a conceptual model of pacing, both as a coping strategy and a behaviour.

3.) Explore how pacing aligns with the Health Action Process Approach (HAPA) health behaviour model.

#### **1.4.3 Potential future benefits**

The development of a standardised activity pacing framework has the potential to clarify the instruction of the different facets of pacing and to enable future controlled clinical trials of pacing to add evidence regarding the effects of pacing on patients' symptoms.

#### **1.5 Research questions**

1.) Is the newly developed activity pacing framework feasible and acceptable for clinical practice?

2.) Is pacing associated with better or worse symptoms of chronic pain/fatigue?

## **2.0 METHODS**

### **2.1 Study design**

The Medical Research Council (MRC) describe complex interventions as interventions comprising of several interacting components (Craig et al., 2008). Activity pacing is considered to be a complex intervention, involving different facets of pacing, which interact with factors including symptoms and behaviours. Complex interventions involve stages of development, feasibility/piloting, evaluating, reporting and implementing (Craig et al., 2008). Stage III of this study involves the feasibility/piloting stage the MRC complex intervention process. (See Figure 1: Three-stage study to develop the activity pacing framework.)<sup>1</sup> The MRC advise a process evaluation of complex interventions to explore the fidelity and contextual factors that may influence the outcomes of the intervention (Moore et al., 2015). Stage III involves process evaluation in both the feasibility and acceptability studies.

Stage III will have a mixed methods design: feasibility study with a repeated measures design (quantitative), and acceptability study (qualitative). The feasibility study will collect self-report questionnaire data pre-treatment, on the last week of a 5/6-week's rehabilitation programme for chronic pain/fatigue and at 3-months follow-up. The activity pacing framework will be used to structure and standardise the instructions of pacing throughout the rehabilitation programme. Healthcare professionals (physiotherapists and psychological wellbeing practitioners) who deliver the programme will receive training in using the framework. The feasibility study will be used to assess patients' changes in activity pacing, self-reported symptoms, self-efficacy and quality of life from those who consent.

Since this study aims to test the feasibility of using the pacing framework and not compare between those attending the programme and those receiving a different intervention, there will be no control group. All patients will attend the same programme, including those who consent to the study and those who do

---

<sup>1</sup>This protocol refers only to Stage III: Feasibility and Acceptability studies

not. The pacing framework will be used to modify and standardise the pacing element of the rehabilitation programmes that usually run in the hospitals. Pacing is currently instructed as part of the programme, but at present, this is not standardised or based on evidence. The use of the framework is considered to be a service development to standardise the instructions of pacing and to ensure that the instructions are evidence-based. Therefore, all patients will receive the modified programme. However, those patients who do not consent to the study will not be asked to complete the study specific, repeated questionnaires.

The acceptability study will explore opinions on the activity pacing framework using semi-structured interviews with the healthcare professionals delivering the rehabilitation programme and patients attending the programme. The acceptability study will also discuss how burdensome patients found the completion of the questionnaire booklets.

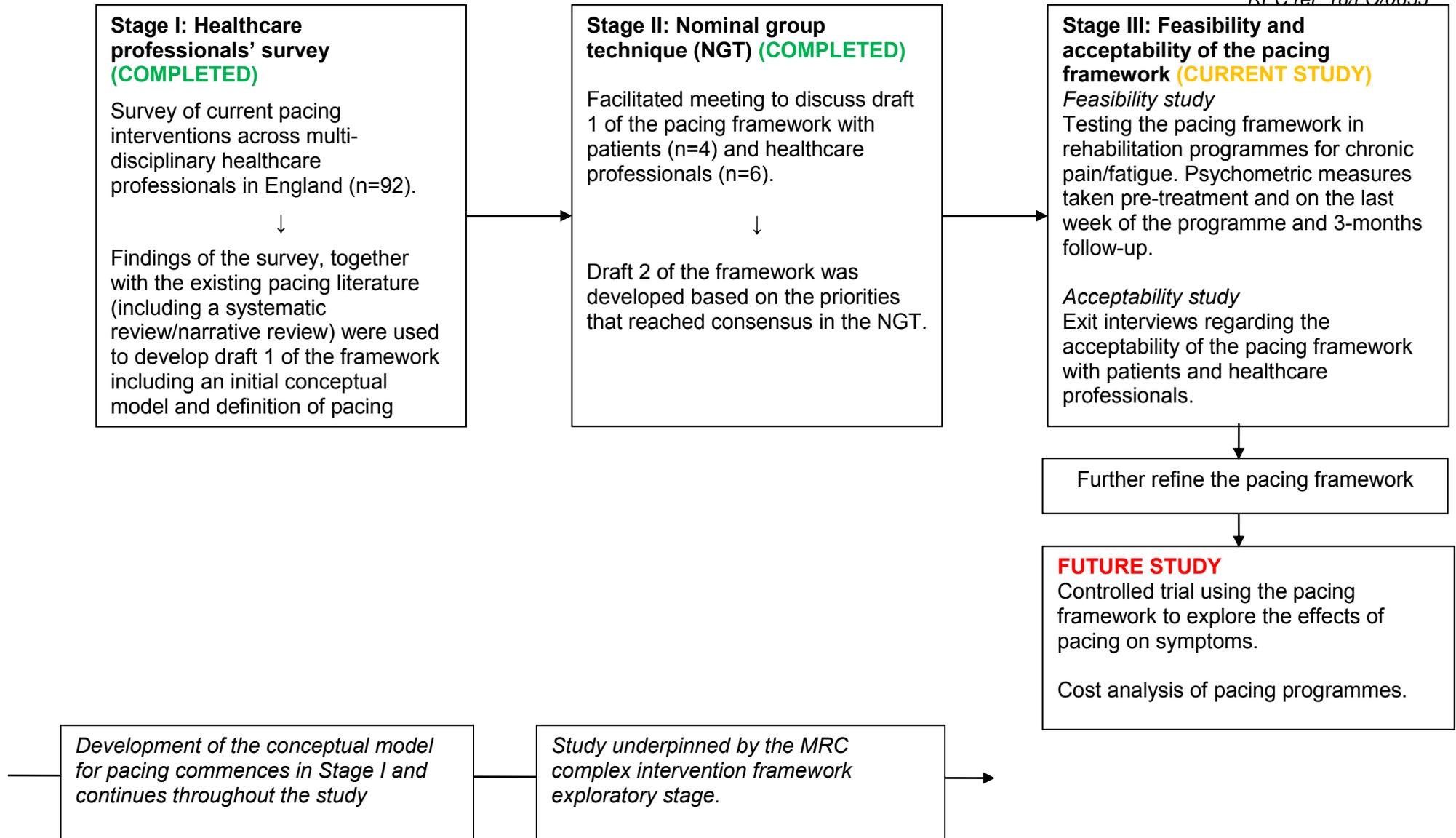


Figure 1. Three-stage study to develop the activity pacing framework

## **2.2 Stage III: Feasibility study**

### **2.2.1 Sampling principles and procedures**

#### **2.2.1.1 Participants**

Participants will include patients with conditions of chronic pain/fatigue attending rehabilitation programmes in physiotherapy departments of Fairfield General Hospital and North Manchester General Hospital (The Pennine Acute Hospitals NHS Trust). Five/six-week rehabilitation programmes currently run as part of usual treatment pathways for chronic pain/fatigue in these departments. Patients are currently referred to the physiotherapy departments with diagnoses of chronic pain/fatigue by a hospital consultant or a GP, and they are screened by physiotherapists ahead of referral into the rehabilitation programmes to ensure their main condition is that of chronic pain/fatigue (for example, chronic low back pain, chronic widespread pain, fibromyalgia and CFS/ME) and that they are appropriate for a group environment.

Most patients who are referred to the rehabilitation programmes will be eligible to participate in the study due to the similar criteria for attending the programme. Patients' eligibility to participate in the study can be further checked by the Chief Investigator using patients' demographic data available in their physiotherapy notes, and by checking patients' demographic answers in the study questionnaire booklet. The Chief Investigator is a physiotherapist based in The Pennine Acute Hospitals NHS Trust and is experienced in maintaining confidentiality of patients' data when accessing patients' medical notes. The inclusion and exclusion criteria for the study are as follows:

#### *Inclusion criteria:*

- Patients with an initial GP/hospital consultant referral to The Pennine Acute Hospitals NHS Trust with diagnoses of chronic low back pain, chronic widespread pain, fibromyalgia or CFS/ME, with a minimum symptom duration of 3 months.
- Patients referred to a rehabilitation programme for chronic pain/fatigue
- Patients aged  $\geq 18$  years
- Patients able to read/write in English

*Exclusion criteria:*

- Patients with evidence of a serious underlying pathology, such as a current diagnosis of cancer
- Patients with severe mental health/cognitive functioning issues

### **2.2.1.2 Sample size**

A sample size of 50 patients has been recommended for feasibility studies to enable estimates of attrition, compliance rates, means, standard deviations and differences between means with a suitable level of precision to facilitate future clinical trials (Sim and Lewis, 2012).

### **2.2.1.3 Recruitment**

Participants will be recruited via consecutive sampling from those patients who are referred to the rehabilitation programmes in the physiotherapy departments. Patients' eligibility to attend the rehabilitation programme will be screened by physiotherapists in the department to include patients with chronic pain/fatigue, and exclude those without the ability to read/write in English or those unsuitable for group rehabilitation (for example, those with agoraphobia). From the referral list into the rehabilitation programmes, the Chief Investigator can further check patients' eligibility to participate in the study by checking patients' physiotherapy notes against the inclusion/exclusion criteria.

Patients who are enrolled on the rehabilitation programmes will be invited to participate via a postal letter one week before commencing the programme. Patients will be sent the participant information sheet, a consent form and the pre-treatment questionnaire booklet. Patients who consent to the study will be asked to complete the questionnaire booklet and consent form and return these in a pre-paid addressed envelope. In order to allow patients the opportunity to ask questions about the study and to increase recruitment, patients will also be reminded about the study and invited to participate on the first week of the rehabilitation programme. Patients who have not yet completed the questionnaire booklet/consent form from the postal invitation will have the opportunity to do this during the break time of the first session of

the programme (see Appendices 1, 2 and 3 for the participant invitation letter, participant information sheet and consent forms respectively).

The application for ethical approval will include permission to gather basic demographic data (for example, age, gender, ethnicity, condition and duration of condition) from patients invited to participate but who do not consent to participating in the study to explore the representativeness of those recruited from those invited. (This information is also included in patients' individual physiotherapy notes as per usual practice.) This basic data will be kept anonymous using unique study codes and it will remain confidential. These data will be inputted into a statistical package for data analysis. However, they will not be linked to patients' identifiable information such as name, address, date of birth or NHS/department number.

A minimum recruitment rate of 50% is estimated since patients will be advised that their participation involves only the completion of a questionnaire booklet at the beginning and end of treatment and at 3-months follow-up after finishing the programme. It is current practice in the physiotherapy departments for patients to complete questionnaire booklets at the beginning and end of the rehabilitation programmes, and so participating in the study will be an extension of this usual practice. Patients will be advised that their personal data will remain strictly confidential and anonymised during data analysis and any publication of the results. However, patients will have the option of not consenting, leading to the conservative estimate of a 50% recruitment rate.

A completion rate of the rehabilitation programme of approximately 60% is expected based on current rates of the programmes running in the physiotherapy departments. The return rate of the 3-months follow-up questionnaire booklet is envisaged to be 50% based on recruitment rates into the previous APQ study (Antcliff et al., 2015). The estimated combined retention rate is 30%. Therefore, to achieve a sample size of approximately 50 participants at 3-months follow-up who have both completed their rehabilitation programme and returned their follow-up questionnaires, 340 patients will be invited to participate. This number is feasible based on the approximate 380

patients referred to the programmes each year. The criteria for patients to be referred to the rehabilitation programmes is similar to that of the inclusion criteria for the study, therefore, the majority of the 380 patients referred into the group will be eligible to participate in the study. If more than 50 participants respond to the 3-month's follow up questionnaire, these data will be included to maximise data analyses.

Recruitment will occur from physiotherapy departments at two locations in The Pennine Acute Hospitals NHS Trust. Fairfield General Hospital runs approximately fourteen 6-week's programmes each year with a maximum of 12 participants per group. Recruitment will launch at this site first and recruit over a 15 month period (18 groups with 12 patients: n=216 invited to participate). Following the study set-up at Fairfield General Hospital, recruitment is envisaged to occur over a 12 month period from approximately fourteen 5/6-week's rehabilitation programmes at North Manchester General Hospital with a maximum of 12 participants each group (14 groups with 12 patients: n=168 invited to participate). Recruitment will occur over a 15-month period and data collection will occur over 20 months to allow for the 3-month follow-up questionnaire to be administered following the completion of the 5/6-week's programmes. To increase the follow-up return rate at 3-months, pre-paid addressed envelopes will be provided and reminder phone calls will be made. (See *Figure 2. Timetable of the study*).

### **2.2.3 Rehabilitation programmes**

#### *Existing rehabilitation programmes*

Rehabilitation programmes currently run in two physiotherapy departments of The Pennine Acute Hospitals NHS Trust. These locations deliver similar programmes that consist of 3-3.5 hour sessions over 5/6 consecutive weeks. The programmes are delivered by healthcare professionals (physiotherapists and psychological wellbeing practitioners). The current programmes involve graded exercise, relaxation and discussion into coping strategies such as promoting healthy sleep behaviours, medication, balancing 'choice' and 'demand' activities and activity pacing. Pacing is currently instructed during one session of the programme and these instructions are not standardised by

any specific framework. Pacing is referred to informally throughout the duration of the programme, for example, to assist patients' approach to graded exercise.

#### *Activity pacing framework standardised programme*

The newly developed activity pacing framework will be used to structure and standardise the instructions of pacing across the 5/6-week's rehabilitation programmes. The pacing framework clarifies the conceptual model of pacing on which the instructions are based. This pacing framework is underpinned by the operant approach of pacing rather than adaptive pacing therapy/energy conservation. The framework details the aims of pacing, different facets of pacing and contains tools/exemplars for healthcare professionals to assist their instruction of pacing to patients (see Appendices 4 and 5 for the Activity Pacing Framework 'Theory and Overview' and 'Appendices and Teaching Guide' respectively). In comparison to the existing rehabilitation programmes, pacing will be instructed on one session and revisited the following week. During this 1-week period, patients will be asked to complete an activity diary in order to discuss their activity patterns the following week. Pacing will be referenced throughout the programme in relation to the other coping strategies, since pacing principles apply to the use of relaxation and healthy sleeping behaviours. This is also advised in the activity pacing framework/appendices. Pacing is rarely implemented in isolation and so it will be explored in the current study as part of a programme alongside other coping strategies. This approach is similar to other pacing studies (Nielson and Jensen, 2004; Cane et al., 2013).

The implementation of a standardised and evidence-based framework is considered to be a service development. The modifications will therefore be applied to all programmes across the different locations and all patients will attend the same programmes whether they choose to participate in the study or not. There is no harm envisaged through using the framework, rather, the framework aims to develop the current service by promoting more detailed and standardised information on activity pacing.

The healthcare professionals who usually deliver the programmes (n=8-10) will receive training on using the framework during a half-day session and they will also have regular contact with the Chief Investigator (face-to-face, or via the phone/email). Healthcare professionals will be advised that they can ask the Chief Investigator questions about the pacing framework at any time. The training will involve instructions on the different types of pacing and the model of pacing contained within the activity pacing framework. Healthcare professionals will be trained on the different facets of pacing and how these can be adapted and tailored to individuals according to their current activity behaviours and goals. The training will also involve practical issues around recruitment, administering consent forms/questionnaire booklets, and with regards to answering patients' questions regarding the research study.

No threats to patients' health are anticipated through their participation, since patients routinely attend rehabilitation programmes for chronic pain/fatigue within these physiotherapy departments. Pacing currently features in the rehabilitation programmes, however, it is not currently advised based on an evidence-based framework, nor is it standardised across the healthcare professionals delivering the programmes.

This study will not include a control group, since it aims to explore the feasibility of the protocol to assess the pacing framework in clinical settings, and not compare the effects of the programme against those not involved in a programme underpinned by the pacing framework. This is in keeping with the exploratory phase of the MRC framework for complex interventions.

## **2.2.3 Data collection methods**

### **2.2.3.1 Outcome evaluation**

Participants will be invited to sign the study consent form and complete the pre-treatment questionnaire booklet (T1). The T1 questionnaire booklet will be sent via the post one week before attending the programme (T1\_Post). Those patients who did not sign the consent form and complete the T1 questionnaire booklet at home will also have the opportunity to do that during the break-time on week 1 of the programme (T1\_Dept). Those patients not consenting to the

study will complete the usual department-required measures that are collected during Week 1 and 6 of the programme. The department-required measures are positioned at the front of the questionnaire booklet with a 'tear away' section for those questionnaires needed only for the research study.

Patients will be invited to complete the post-treatment questionnaire booklet (T2) during the break-time of the last week of the programme in the physiotherapy department. The 3-months follow-up questionnaire booklet (T3) will be administered via the post. If no response is made to the follow-up questionnaire within two weeks, patients may be called to clarify any questions they have regarding the study, and to clarify whether they wish to continue to participate in the study through returning the T3 booklet. Alternatively, patients may be invited to answer some questions from the questionnaire booklet over the telephone. If patients consent to this, the priority questionnaires from the booklet will be asked, for example, regarding pain, pacing and health status. Prior to full data collection, the questionnaires have been piloted on three individuals not involved in the study to check the suitability of the layout, and the time and burden of completion.

The T1 questionnaire booklet will contain demographic questions regarding age, gender, condition(s)/main condition, duration of condition, ethnicity, living situation (living alone/with others) and employment status; and the activity pacing questionnaire will be used as the measure of pacing. The questionnaire booklet will include validated measures of symptoms frequently reported by patients: pain, fatigue, anxiety and depression. The questionnaire will also assess self-efficacy as a driver for behavioural change, avoidance as a common behaviour presenting with this patient group, physical/mental function and health status. Many of the above constructs are important components of the HAPA behavioural model.

### *1. Activity Pacing Questionnaire-28*

The Activity Pacing Questionnaire-26 (APQ-26) has been initially validated among a sample of patients with chronic pain/fatigue. Factor analysis identified five themes of pacing contained within the APQ-26. These five

themes demonstrated satisfactory internal consistency (Cronbach's  $\alpha=0.72-0.92$ ; test-retest reliability intra-class correlation coefficient= $0.50-0.78$ ,  $p\leq 0.001$ ) and construct validity against validated psychometric measures (Antcliff et al., 2015).

The APQ-26 has been modified for the purpose of this study with the addition of two items to correspond to important aspects of pacing that emerged during Stages I and II of the study and also appear in the literature regarding pacing. These two items involve finding a baseline of activities and being flexible. The APQ-28 reflects the content of the activity pacing framework.

### *2.) 11-point numerical rating scale*

Two 11-point Numerical Rating Scales (NRS) will assess current pain and usual pain, where 0='no pain' and 10='worst possible pain' (Jensen et al., 1994). The 11-point NRS are frequently used and have been found to have ease of completion, responsiveness and sensitivity to change in symptoms (Ferreira-Valente et al., 2011).

### *3.) Patient Health Questionnaire*

The Patient Health Questionnaire (PHQ-9) contains nine items that screen for and measure the severity of depression in the clinical setting. Items are developed based on the Diagnostic and Statistical Manual of Mental Disorders 4<sup>th</sup> Edition (DSM-IV) (Kroenke et al., 2001). Each item is rated on a 4-point Likert scale (0-3) with a 2-week recall period. Scores of 1-4=no depression, 5-9=mild depression, 10-14=moderate depression and 15-19=severe depression (Kroenke et al., 2001). The PHQ-9 has demonstrated good internal consistency (Cronbach's  $\alpha=0.86-0.89$ ), test-retest reliability (0.84-0.95) and construct validity against other measures of depression (Smarr and Keefer, 2011; Kroenke et al., 2001; Cameron et al., 2008).

### *4.) Generalised Anxiety Disorder Assessment*

The Generalised Anxiety Disorder Assessment (GAD-7) contains seven items that screen for and measure the severity of anxiety in the clinical setting. The items are based on the Diagnostic and Statistical Manual of Mental Disorders

4<sup>th</sup> Edition (DSM-IV) (Spitzer et al., 2006). Items are rated on a 4-point Likert scale (0-3) over a 2-week recall period and cut-off scores of 5=mild anxiety, 10=moderate anxiety and 15=severe anxiety (Spitzer et al., 2006). The GAD-7 has demonstrated good reliability (Cronbach's alpha=0.89-0.92), test-retest reliability (Intraclass correlation=0.83) and construct validity against other measures of anxiety (Spitzer et al., 2006; Lowe et al., 2008).

#### *5.) Pain Self-Efficacy Questionnaire*

The Pain Self-Efficacy Questionnaire (PSEQ) contains 10 items that assess a persons' confidence in their ability to do things despite their pain. Each item is rated on a scale from 0-6 where 0=not at all confident and 6=completely confident. Cut-off scores of PSEQ $\geq$ 40 are considered high and PSEQ $\leq$ 16 are considered low (Nicholas, 2007). The PSEQ has been found to have high internal consistency (Cronbach's alpha=0.92), test-retest reliability (r=0.73, p<0.001) and construct validity against other measures of self-efficacy and other constructs (Nicholas, 2007; Miles et al., 2011).

#### *6.) Chalder Fatigue Questionnaire*

The Chalder Fatigue Questionnaire (CFQ) contains two subscales: physical fatigue (seven items) and mental fatigue (four items). All items are rated on 4-point Likert scale (0='better than usual', 3='much worse than usual') (Chalder et al., 1993). The scale has demonstrated good reliability and concurrent validity with regards to sensitivity and specificity (Chalder et al., 1993).

#### *7.) Pain Anxiety Symptoms Scale-short version*

The Pain Anxiety Symptoms Scale-short version (PASS-20) measures pain-related fear, anxiety and avoidance and it contains four subscales: cognitive anxiety, escape/avoidance, fearful thoughts and physiological anxiety (McCracken and Dhingra, 2002). Each subscale contains five items; and items are rated on a 6-point Likert scale (0='never' and 5='always'). The subscales of the PASS-20 have demonstrated good internal consistency and convergence validity with the PASS-40 (McCracken and Dhingra, 2002).

#### 8.) *12-Item Short-Form Health Survey*

The 12-Item Short-Form Health Survey (SF-12) is a generic health survey that assesses physical and mental function (Ware et al., 1996). The 12 items are scored out of 100, where higher scores indicate better function. The SF-12 correlates highly with the original 36-item survey and it has demonstrated test-retest stability (Ware et al., 1996; Jenkinson et al., 1997).

#### 9.) *EuroQol (EQ-5D-5L)*

The EuroQol (EQ-5D-5L) is a generic measure of health status that is widely used to assess both clinical and economic efficacy; and to compare health status across diseases (Brooks, 1996; Devlin and Brooks, 2017). The EQ-5D-5L measures health related quality of life via dimensions of mobility, self-care, usual activities, pain and anxiety/depression (Devlin and Brooks, 2017). The EQ-5D-5L was developed to reduce the possible ceiling effects of the EQ-5D-3L which contained only three levels of answers to each question (Devlin and Brooks, 2017).

The T2 and T3 booklets will contain the same questionnaires, except without the demographic questions. The T2 booklet will additionally contain two 11-point numerical rating scales (0-10) regarding satisfaction of the programme content and length. The T2 questionnaire booklet will also include a question inviting participants to indicate whether they would be interested in participating in the acceptability interviews (see Appendices 6, 7, 8 and 9 for the T1\_Post, T1\_Dept, T2 and T3 questionnaire booklets respectively; and Appendix 10 for the covering letter for T3).

Participants will be asked to complete a 1-week activity diary after activity pacing is introduced in the rehabilitation programme. The diaries will be used the following week to assess patients' patterns of behaviour, and to set goals towards pacing that are individualised. (See Appendix 5: Activity Pacing Framework 'Appendices and Teaching Guide' for the activity diaries.)

### **2.2.3.2 Process evaluation**

The Medical Research Council advise a process evaluation of complex interventions to explore the credibility of the findings and any confounding factors that may influence the outcomes (Moore et al., 2015). The process evaluation of the development of the activity pacing framework will include patients' completion of NRS rating scales of satisfaction of the rehabilitation programme, and general comments that are made in the questionnaire booklets. The satisfaction ratings will assist the selection of participants for the next stage of the study: the acceptability interviews, which will discuss the programme in more detail.

Healthcare professionals will be asked to complete a rehabilitation programme checklist to explore their compliance with the framework (see 'Appendices and Teaching Guide' Appendix 12 for the checklist). The Chief Investigator will meet healthcare professionals to ensure that there are no issues with delivering the activity pacing framework. Furthermore, the Chief Investigator will observe the rehabilitation programme at the different locations to monitor compliance with the study protocol and activity pacing framework. The Chief Investigator will be observing for a checklist of key points that are included in the delivery of the pacing framework in the rehabilitation programme (see Appendix 11 for the Chief Investigator's checklist)

### **2.2.4 Data analysis**

Descriptive statistics will summarise the demographics of the sample, and compare between patients who complete/do not complete the programmes and between the hospital locations. The feasibility study will not be powered to detect clinically important or statistically significant effects. Analysis will focus on estimating confidence intervals and effect sizes for differences in means or medians to inform the design of future trials, together with indicating likely recruitment/retention/compliance rates. The IBM SPSS Statistics 24 program will be used to analyse the data.

## **2.3 Stage III: Acceptability qualitative study**

### **2.3.1 Sampling principles and procedures**

#### **2.3.1.1 Participants**

The acceptability of the pacing framework/rehabilitation programme will be discussed in semi-structured telephone interviews with a sample of the patients and healthcare professionals (physiotherapists and psychological wellbeing practitioners) who were involved in the feasibility study.

#### *Inclusion criteria:*

- Patients with an initial GP/hospital consultant referral to The Pennine Acute Hospitals NHS Trust with diagnoses of chronic low back pain, chronic widespread pain, fibromyalgia or CFS/ME, with a minimum symptom duration of 3 months (as per the feasibility study).
- Patients who attended a minimum of the first two sessions of the rehabilitation programme, who consented to the study and completed the first questionnaire booklet. Patients do not need to have completed the programme, since the interviews will include patients who both completed and did not complete the programme.
- Qualified healthcare professionals delivering the rehabilitation programmes who received training in using the activity pacing framework: physiotherapists and psychological wellbeing practitioners employed by The Pennine Acute Hospitals NHS Trust and Pennine Care NHS Foundation Trust.

#### **2.3.1.2 Sample size**

Patients and healthcare professionals participating in the feasibility study will be invited to participate in the interviews until there is a sample of approximately 15-20 patients and 6-8 healthcare professionals, or when data saturation is reached. Purposive sampling of patients will be undertaken to recruit patients with chronic low back pain, chronic widespread pain/fibromyalgia and CFS/ME; patients who were satisfied/unsatisfied with the programme (using the satisfaction scale in the T2 questionnaire booklet completed in the last week of the programme); and patients who did/did not

complete the programme. Used in this way, purposive sampling will enable wider discussions into both the favourable and less favourable opinions regarding the programme to enable the framework/programme to be further developed in the future. Purposive sampling with healthcare professionals will ensure that both physiotherapists and psychological wellbeing practitioners are invited to be interviewed.

### **2.3.1.3 Recruitment**

Potential participants will be identified from those patients who tick the check box to agree to be contacted for an interview in the T2 questionnaire booklet (completed on the last week of treatment). In order to invite patients who did not complete the programme to participate in the interviews, patients who consented to the feasibility study, completed the first questionnaire (T1) and attended a minimum of the first two sessions of the programme will also be contacted. This will allow patients who did not complete the programme to discuss any barriers or challenges that arose. All patients, whether they completed the programme or not, will be invited to participate in the interviews over the telephone by the Chief Investigator. Patients who are interested in participating in the interviews will be sent a letter of invitation, an information sheet explaining the aims/nature of the interviews and that the interviews will be digitally recorded, together with a consent form (see Appendices 12, 13 and 14 respectively).

Healthcare professionals will be invited to participate in the interviews either in person, or via email/phone. They will be given an information sheet explaining the aims/nature of the interviews, and that the interviews will be digitally recorded (see Appendices 15 and 16). Healthcare professionals will be asked to sign and date the consent form and complete some basic demographic information (age, gender, profession and duration of expertise in chronic conditions) (see Appendices 17 and 18).

Both patients and healthcare professionals will be asked to sign the consent forms and return them in pre-paid envelopes within one week. They may receive a telephone call if no contact has been made within one week to ask if

they still wish to participate in the interviews. They will also be asked to confirm their consent at the start of the audio-recorded interviews.

## **2.3.2 Data collection methods**

### **2.3.2.1 Outcome evaluation**

The interviews with patients will be held once they have stopped attending physiotherapy: either through their completion or non-completion of the programme. It is therefore envisaged that the interviews will occur approximately two months after recruitment commences for the feasibility study (see *Figure 2. Timetable of the study*). Patients will be invited to participate in either telephone or face-to-face semi-structured interviews by the Chief Investigator (DA). Face-to-face interviews will be undertaken by the Chief Investigator (DA) in the physiotherapy departments or patients' homes according to their preferences. If the interviews occur in patients' homes, The Pennine Acute Hospitals NHS Trust lone-worker policy will be followed. The interviews will discuss the content of the programme, the information regarding pacing, patients' opinions/experiences of pacing, the use of activity diaries and goal setting sheets, and the ease of completing the questionnaire booklets. Discussions will also involve identifying any potential barriers with attempting/committing to pacing, for example, symptoms or habits.

The interviews with healthcare professionals will be held throughout the period of data collection for the feasibility study. Telephone or face-to-face semi-structured interviews will be used according to healthcare professionals' preferences and availability. Face-to-face interviews will be undertaken by the Chief Investigator (DA) and they will occur in the physiotherapy departments or healthcare professionals' homes. The interviews will discuss the content and clarity of the framework and its usability in the clinical setting. The interviews will discuss any barriers to adherence with the pacing framework (for example, patients' symptoms or practical issues). (See *Appendices 19 and 20 for the interview outlines for patients and healthcare professionals*). The interviews with all participants are envisaged to last between 20-60 minutes. Interviews will be digitally recorded and transcribed verbatim. Both

patients and healthcare professionals will be invited to read and check their own transcription for accuracy and invited to receive a report of the findings.

### **2.3.2.2 Process evaluation**

Qualitative interviews are considered to be a useful method of process evaluation of complex interventions (Moore et al., 2015). The qualitative acceptability interviews will explore the fidelity of the feasibility stage with regards to adherence by both the patients and healthcare professionals to the activity pacing framework/rehabilitation programme. The interviews will help to identify possible contextual factors between patients/clinicians/locations/number of sessions that may influence the findings. This process will assist the development of future studies that implement the pacing framework.

### **2.3.3 Data analysis**

The qualitative data from the interview transcriptions will be analysed using Framework analysis. Framework analysis is a five-stage iterative matrix method, considered to be comprehensive and transparent, and allows for both inductive and deductive data analysis methods (Ritchie et al., 2003). The NVivo program (Version 11) will be used to manage the qualitative data.

Data analysis commences during the undertaking of the interviews and the transcription, and continues during analysis of the transcriptions. The early commencement of data analysis during data collection/transcription facilitates the development of subsequent interviews and the detection of data saturation when no new concepts emerge (Morse and Field, 1996). Data analysis will be undertaken by the Chief Investigator working alongside a researcher (LMcG) with an expertise in qualitative research methods, together with two patients who are sitting on the study advisory panel.

### **2.4 Refining the activity pacing framework**

Key findings from the feasibility and acceptability studies will be used to refine the pacing framework. Data from the feasibility and acceptability outcome evaluations will be synthesised using a seven-stage process in keeping with convergent mixed methods data analysis (Creswell and Piano-Clark, 2011).

This process will commence with separate data analyses of the feasibility questionnaire data and the qualitative interviews using quantitative and qualitative methods respectively. Key points for comparison between the quantitative and qualitative data will be determined. Once the data have been compared, the findings will be merged and interpreted. This synthesis of databases is beneficial to the validation of the findings through the triangulation of data from different sources (Creswell and Piano-Clark, 2011).

The validity of the feasibility data will be limited since the sample size will be too small to infer statistical changes in pacing or symptoms. However, some patterns may arise in the quantitative data. The findings from the qualitative interviews may help to explain some patterns in the quantitative data. Findings from the synthesised data will help to refine the pacing framework and the definition/model of pacing. For example, it may emerge that some facets or aims of pacing are more frequently implemented or possibly mis-interpreted. Such elements may require a greater or lesser emphasis in the framework.

The activity pacing framework will be further refined using the findings from the process evaluations. The process evaluations include the healthcare professionals' checklist of compliance, Chief Investigators' checklist of observations of the programme and feedback from the meetings with the healthcare professionals, together with aspects of the acceptability qualitative interviews (for example, regarding compliance/adherence). The process evaluation may bring to light practical problems of using the framework/appendices which can be modified to increase the usability of the framework. The process evaluation may also show differences in the programme delivery and adherence across different locations/clinicians/duration of programme (five/six weeks); differing levels of acceptability across patients with different conditions; or possibly different changes in symptoms across different locations/conditions. Such findings could refine the framework through the acknowledgement of such potential differences/barriers and suggestions of methods to address these discrepancies.

The rate of attrition of the programmes, the completion of the questionnaire booklets (T1, T2 and T3), and the completion of activity diaries/goal setting sheets will be used to re-consider the format, length, burden and usability of these documents in the clinical setting. Information regarding attrition and compliance will help to modify the appendices and the questionnaire booklets to improve their usability in order to maximise recruitment and retention rates, and to improve the experience for patients and healthcare professionals in future studies. As a feasibility study, the purpose is to test the framework and methods of recruitment in order to prepare for a future clinical trial.

### **3.0 ETHICAL AND REGULATORY CONSIDERATIONS**

#### **3.1 Assessment and management of risk**

It is not expected that participants will be at any risk from participating in the study. Patients' participation in the feasibility study involves their completion of questionnaires at the beginning, end and at 3-months follow-up of their attendance of a rehabilitation programme. Rehabilitation programmes have been running in the physiotherapy departments at these sites for over a decade and the healthcare professionals running the groups are experienced in delivering these programmes. The activity pacing framework will standardise and structure the instructions of a coping strategy that is usually discussed in the programmes.

Contained within the feasibility questionnaire booklet is a measure of depression (PHQ-9) which asks one question regarding suicidal ideation. If patients indicate that they have suicidal thoughts, this will be managed according to the usual risk pathway within the hospital sites. Patients will have access to the psychological team, step-up services/emergency telephone numbers or advised to attend the Emergency Department.

During the acceptability interviews, no risk of harm is expected for either patients or healthcare professionals. The subject of the interviews: the activity pacing framework, is not considered to be sensitive or upsetting. However, if either the acceptability or feasibility studies have the potential to harm the well-being of an individual, they will be withdrawn from the study immediately and interviews will be stopped appropriately should sensitive/upsetting discussions arise.

In the case of any adverse event, this will be documented following the usual protocol in The Pennine Acute Hospitals NHS Trust incident reports. The Research Ethics Committee will also be notified.

### **3.2 Benefits**

Participants will be advised that they may not receive any direct benefit from participating in the study. However, the information gathered from the study will contribute to the development of future practice and treatment.

### **3.3 Research Ethics Committee (REC) and other regulatory review and reports**

The study will be conducted in accordance with the UK Policy Framework for Health and Social Care Research and other applicable guidance. The study will not commence until all regulatory approvals are in place, which will include HRA approval, REC approval and confirmation from local R&D that the Trust/s have Capacity and Capability to carry out the research.

The Chief Investigator will complete and submit annual progress reports to the Sponsor as requested and prior to submission to NHS REC, in accordance with the terms and condition of the study approval.

The study will be subject to the standard procedures for monitoring and auditing of studies by the sponsor.

Any changes to the protocol will be agreed with the sponsor prior to submission to NHS research ethics committee for review with the exception of where urgent safety measures apply.

All staff working in the study will have completed appropriate training to undertake the duties delegated to them by the Principal investigator such as ICH-GCP.

### **3.4 Patient and Public Involvement**

Patient and public involvement (PPI) commenced in the original development of the study to develop an activity pacing framework before Stages I and II. The current study is guided by a research team, together with an advisory team who comprise of two patients with chronic pain/fatigue and two clinicians. In the preparation of Stage III of the study, PPI have been involved

in commenting on the study documents, for example, patient information sheets, the activity pacing framework and questionnaire booklets. PPI will also be invited to work alongside the researchers during the qualitative data analysis from the acceptability interviews.

### **3.5 Data protection and patient confidentiality**

In Stage III: Feasibility study, all patients will be identified using unique study codes. Healthcare professionals will also be identified using study codes so that their checklists can be collected anonymously. These study codes will be carried forwards for those who are involved in the Stage III. Acceptability interviews.

Throughout the data analyses for the feasibility and acceptability studies, participants' data will be identified by these unique codes on SPSS data files. Participants' codes and personal data (such as addresses/telephone numbers) will be kept secure on a password protected Microsoft Excel worksheet housed in a password enabled and encrypted laptop, and on The Pennine Acute Hospitals NHS Trust secure network. This information is required to invite patients to complete the 3-months follow-up questionnaire and to participate in the acceptability interviews.

The data will be stored for 10 years after data collection or the last publication, whichever date is the latter. This is with the exception of participants' personal data which will be removed from the password enabled and encrypted laptop as soon as it is no longer required.

Those patients who do not consent to the study will also be allocated a unique study code. However, no personal information regarding name, address, date of birth or NHS/department number will be stored on the Excel spreadsheet. Basic information from those patients who do not consent to the study, for example, age, main condition, ethnicity and duration of condition will be entered onto an SPSS data file to allow estimates of the representativeness of those patients who consent from all of those who attend the programme. These data will be anonymised using the unique study codes, and they will

not be linked to patients' records or to information regarding their identifiable data.

### **3.6 Dropouts/Withdrawals**

Participants will be advised that they are free to withdraw from the study at any point without explanation. Where possible, the reason for withdrawal will be recorded. Once participants have completed the feasibility or the acceptability study, they may be able to withdraw their data. However, participants will be advised that this will only be possible before data analysis has commenced (month 15) since data analysis will involve the convergence of data (*see Figure 2. Timetable of research activities*).

### **3.7 Indemnity**

Participants will be advised that in the unlikely event that they feel they have been harmed by taking part in the research study due to negligence that they may have grounds for legal action against The Pennine Acute Hospitals NHS Trust. However, the participant may have to pay for any legal action. The normal Pennine Acute Hospitals NHS Trust complaints procedures and indemnity will apply.

### **3.8 Costs/resources**

For Stage III: Feasibility study, no costs will occur to patients. They will attend rehabilitation programmes as per usual practice in the physiotherapy departments. For healthcare professionals, there will be a time requirement in order to undertake training in using the activity pacing framework (half a day) and follow-up meetings/telephone calls as needed with the Chief Investigator. The research costs include postage and printing to administer the questionnaires.

For Stage III: Acceptability study, the costs/resources include the use of digital recorders, and printing/postage to send study information packs/consent forms and transcripts for checking. For participants, the cost will be their time to undertake the interview. For any face-to-face interviews, the Chief

Investigator will travel to the participants' nearest physiotherapy department/participants' homes, according to their preferences.

### **3.9 Conflict of interest**

The Chief Investigator (DA) will be involved in recruitment, data collection, data analysis and dissemination. To reduce bias, the Chief Investigator will not be responsible for delivering the rehabilitation programmes.

The Chief Investigator, Dr Deborah Antcliff, is funded by an HEE/NIHR ICA Clinical Lectureship award (ICA-CL-2015-01-019). There is no conflict of interest.

## **4.0 WHAT HAPPENS AT THE END OF THE STUDY?**

### **4.1 Dissemination/Publication**

Participants will be able to request a summary of the findings of the stage(s) of the study in which they were involved. The findings of the study will be disseminated as appropriate to patients/carers at patient forums/support groups (for example, CFS/ME and fibromyalgia support groups and the NIHR Leeds Biomedical Research Centre, LBRC, PPI group). The study outcomes will also be distributed via traditional media (newsletters), social media (for example, the LBRC webpage), presentations at national/international conferences and publication in national/international peer-reviewed journals.

### **4.2 Future Study**

Following refinement in the present study, the activity pacing framework will be used in a clinical trial. The pacing framework will structure and standardise the instructions of pacing in rehabilitation programmes for patients with chronic pain/fatigue. Data regarding patients pacing behaviours, symptoms, function and quality of life will be collected pre- and post-treatment and at 3-months follow-up in order to explore the effects of pacing on patients' symptoms. The trial will also include the EuroQol (EQ-5D-5L) in order to estimate cost analyses of the treatment. The clinical trial will compare the outcomes from the programme underpinned by the pacing framework to a control arm that is not structured using the framework. Analyses will compare the efficacy of the framework-based programme, together with cost-effectiveness. This future trial seeks to add data regarding the effects of pacing to add clarity to the current state of confusion regarding the possible benefits or ineffectiveness of pacing (White et al., 2011).

Further research will develop and test a patient-friendly activity pacing guide based on the findings of the pacing trial. Future research will aim to validate both the pacing framework for healthcare professionals and the guide for patients across wider medical conditions, for example rheumatological conditions.

## **5.0 CONTACTS FOR QUERIES**

Participants will be advised that they are able to contact the Chief Investigator, Dr Deborah Antcliff (Senior Physiotherapist and Health Education England/National Institute for Health Research Integrated Clinical Academic (HEE/NIHR ICA) Clinical Lectureship researcher) throughout the study to ask questions.

The contact details are: Deborah Antcliff  
(0161) 778 3882  
[Deborah.Antcliff@nhs.net](mailto:Deborah.Antcliff@nhs.net)

Physiotherapy Department  
Fairfield General Hospital  
The Pennine Acute Hospitals NHS Trust  
Rochdale Old Road  
Bury  
BL9 7TD

## 6.0 TIMETABLE

### Key milestones:

**Project start:** Ethical approval received and agreement with The Pennine Acute Hospitals NHS Trust Research and Development Department.

**Month 1:** *Feasibility study:* train healthcare professionals in using the activity pacing framework (half-day training).

*Feasibility study:* Begin contacting patients enrolled in rehabilitation programmes to invite them to participate (T1). Recruitment and T1 data collection will continue for 15 months.

**Month 2:** *Feasibility study:* commence T2 data collection at the end of the 5/6-week's rehabilitation programme. T2 data collection will occur for 16 months.

**Month 3:** *Acceptability study:* Commence recruitment for semi-structured interviews. Conduct the interviews and analyse the qualitative data during data collection. Continue for 15 months or until data saturation is reached.

**Month 4:** *Feasibility study:* 3-months follow-up (T3) data collection commences. Continue for 17 months or until a suitable sample size is reached (aiming for n=50)

**Month 15:** *Feasibility study:* data analysis of quantitative data and writing up the findings

*Acceptability study:* write up the findings

**Month 16:** Refine the activity pacing framework

Develop the pacing definition and conceptual model.

(See Figure 2. Timetable of research activities)

<b>Study duration: 22 months</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>	<b>14</b>	<b>15</b>	<b>16</b>	<b>17</b>	<b>18</b>	<b>19</b>	<b>20</b>	<b>21</b>	<b>22</b>
<b>Stage III. Feasibility study</b>																						
Train healthcare professionals using the framework	X																					
Patient recruitment	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X							
Data collection: questionnaire administration: T1 (initial)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X							
Data collection: questionnaire administration of T2 (6 weeks)		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
Data collection: questionnaire administration of T3 (3 months follow-up)				X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
Data analysis															X	X	X	X	X	X	X	X
Write up study															X	X	X	X	X	X	X	X
<b>Stage III. Acceptability study</b>																						
Recruitment			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
Data collection (interviews)			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
Data analysis			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
Write up study															X	X	X	X	X	X		
Refine pacing framework																X	X	X	X	X	X	X
Develop pacing definition and conceptual model																X	X	X	X	X	X	X

Figure 2. Timetable of research activities

## References

- Andrews, N.E., Strong, J. and Meredith, P.J. 2012. Activity pacing, avoidance, endurance, and associations with patient functioning in chronic pain: a systematic review and meta-analysis. *Arch Phys Med Rehabil.* **93**, pp.2109-2121 e2107.
- Antcliff, D., Campbell, M., Woby, S. and Keeley, P. 2015. Assessing the Psychometric Properties of an Activity Pacing Questionnaire for Chronic Pain and Fatigue. *Physical Therapy.* **95**(9), pp.1274-1286.
- Antcliff, D., Campbell, M., Woby, S. and Keeley, P. 2017. Activity Pacing is Associated With Better and Worse Symptoms for Patients With Long-term Conditions. *Clinical Journal of Pain.* **33**(3), pp.205-214.
- Antcliff, D., Keeley, P., Campbell, M., Oldham, J. and Woby, S. 2013. The development of an activity pacing questionnaire for chronic pain and/or fatigue: a Delphi technique. *Physiotherapy.* **99**(3), pp.241-246.
- Antcliff, D., Keeley, P., Campbell, M., Woby, S. and McGowan, L. 2016. Exploring patients' opinions of activity pacing and a new activity pacing questionnaire for chronic pain and/or fatigue: a qualitative study. *Physiotherapy.* **102**(3), pp.300-307.
- Beissner, K., Henderson, C.R., Jr., Papaleontiou, M., Olkhovskaya, Y., Wigglesworth, J. and Reid, M.C. 2009. Physical therapists' use of cognitive-behavioral therapy for older adults with chronic pain: a nationwide survey. *Phys Ther.* **89**, pp.456-469.
- Birkholtz, M., Aylwin, L. and Harman, R.M. 2004. Activity pacing in chronic pain management: one aim, but which method? Part two: National activity pacing survey. *Br J Occup Ther.* **67**, pp.481-487.
- Breivik, H., Collett, B., Ventafridda, V., Cohen, R. and Gallacher, D. 2006. Survey of chronic pain in Europe: prevalence, impact on daily life, and treatment. *Eur J Pain.* **10**, pp.287-333.
- Brooks, R. 1996. EuroQol: the current state of play. *Health Policy.* **37**, pp.53-72.
- Burton, C., McGorm, K., Richardson, G., Weller, D. and Sharpe, M. 2012. Healthcare costs incurred by patients repeatedly referred to secondary medical care with medically unexplained symptoms: a cost of illness study. *J Psychosom Res.* **72**, pp.242-247.

- Cameron, I.M., Crawford, J.R., Lawton, K. and Reid, I.C. 2008. Psychometric comparison of PHQ-9 and HADS for measuring depression severity in primary care. *Br J Gen Pract.* **58**, pp.32-36.
- Cane, D., Nielson, W.R., McCarthy, M. and Mazmanian, D. 2013. Pain-related activity patterns: measurement, interrelationships, and associations with psychosocial functioning. *Clin J Pain.* **29**, pp.435-442.
- Chalder, T., Berelowitz, G., Pawlikowska, T., Watts, L., Wessely, S., Wright, D. and Wallace, E.P. 1993. Development of a fatigue scale. *Journal of Psychosomatic Research.* **37**, pp.147-153.
- Clauw, D.J. and Crofford, L.J. 2003. Chronic widespread pain and fibromyalgia: what we know, and what we need to know. *Best Pract Res Clin Rheumatol.* **17**, pp.685-701.
- Craig, P., Dieppe, P., Macintyre, S., Michie, S., Nazareth, I., Petticrew, M. and Medical Research Council, G. 2008. Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ.* **337**, pa1655.
- Creswell, J.W. and Piano-Clark, V.L. 2011. *Designing and conducting mixed methods research.* 2nd ed. California, USA: Sage Publications Ltd.
- Devlin, N.J. and Brooks, R. 2017. EQ-5D and the EuroQol Group: Past, Present and Future. *Appl Health Econ Health Policy.* **15**(2), pp.127-137.
- Fayaz, A., Croft, P., Langford, R.M., Donaldson, L.J. and Jones, G.T. 2016. Prevalence of chronic pain in the UK: a systematic review and meta-analysis of population studies. *BMJ Open.* **6**, pe010364.
- Ferreira-Valente, M.A., Pais-Ribeiro, J.L. and Jensen, M.P. 2011. Validity of four pain intensity rating scales. *Pain.* **152**, pp.2399-2404.
- Jack, K., McLean, S.M., Moffett, J.K. and Gardiner, E. 2010. Barriers to treatment adherence in physiotherapy outpatient clinics: a systematic review. *Man Ther.* **15**, pp.220-228.
- Jenkinson, C., Layte, R., Jenkinson, D., Lawrence, K., Petersen, S., Paice, C. and Stradling, J. 1997. A shorter form health survey: can the SF-12 replicate results from the SF-36 in longitudinal studies? *J Public Health Med.* **19**, pp.179-186.

- Jensen, M.P., Turner, J.A. and Romano, J.M. 1994. What is the maximum number of levels needed in pain intensity measurement? *Pain*. **58**, pp.387-392.
- Kindermans, H.P., Roelofs, J., Goossens, M.E., Huijnen, I.P., Verbunt, J.A. and Vlaeyen, J.W. 2011. Activity patterns in chronic pain: underlying dimensions and associations with disability and depressed mood. *J Pain*. **12**, pp.1049-1058.
- Konnopka, A., Kaufmann, C., Konig, H.H., Heider, D., Wild, B., Szecsenyi, J., Herzog, W., Heinrich, S. and Schaefer, R. 2013. Association of costs with somatic symptom severity in patients with medically unexplained symptoms. *J Psychosom Res*. **75**, pp.370-375.
- Kroenke, K., Spitzer, R.L. and Williams, J.B. 2001. The PHQ-9: validity of a brief depression severity measure. *J Gen Intern Med*. **16**, pp.606-613.
- Lowe, B., Decker, O., Muller, S., Brahler, E., Schellberg, D., Herzog, W. and Herzberg, P.Y. 2008. Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Med Care*. **46**, pp.266-274.
- Maniadakis, N. and Gray, A. 2000. The economic burden of back pain in the UK. *Pain*. **84**, pp.95-103.
- McCracken, L.M. and Dhingra, L. 2002. A short version of the Pain Anxiety Symptoms Scale (PASS-20): preliminary development and validity. *Pain Research & Management*. **7**, pp.45-50.
- McCracken, L.M. and Samuel, V.M. 2007. The role of avoidance, pacing, and other activity patterns in chronic pain. *Pain*. **130**, pp.119-125.
- Miles, C.L., Pincus, T., Carnes, D., Taylor, S.J. and Underwood, M. 2011. Measuring pain self-efficacy. *Clin J Pain*. **27**, pp.461-470.
- Moore, G.F., Audrey, S., Barker, M., Bond, L., Bonell, C., Hardeman, W., Moore, L., O'Cathain, A., Tinati, T., Wight, D. and Baird, J. 2015. Process evaluation of complex interventions: Medical Research Council guidance. *BMJ*. **350**, ph1258.
- Morse, J.M. and Field, P.A. 1996. *Nursing research: The application of qualitative approaches*. 2nd ed. London: Chapman & Hall.

- Murphy, S.L., Lyden, A.K., Smith, D.M., Dong, Q. and Koliba, J.F. 2010. Effects of a tailored activity pacing intervention on pain and fatigue for adults with osteoarthritis. *Am J Occup Ther.* **64**, pp.869-876.
- NICE. 2007. *Chronic fatigue syndrome/myalgic encephalomyelitis (or encephalopathy)*. NICE Clinical Guideline 53. London.
- Nicholas, M.K. 2007. The pain self-efficacy questionnaire: Taking pain into account. *Eur J Pain.* **11**, pp.153-163.
- Nielson, W.R. and Jensen, M.P. 2004. Relationship between changes in coping and treatment outcome in patients with Fibromyalgia Syndrome. *Pain.* **109**, pp.233-241.
- Nielson, W.R., Jensen, M.P. and Hill, M.L. 2001. An activity pacing scale for the chronic pain coping inventory: development in a sample of patients with fibromyalgia syndrome. *Pain.* **89**, pp.111-115.
- Nielson, W.R., Jensen, M.P., Karsdorp, P.A. and Vlaeyen, J.W. 2013. Activity pacing in chronic pain: concepts, evidence, and future directions. *Clin J Pain.* **29**, pp.461-468.
- Nijs, J., Paul, L. and Wallman, K. 2008. Chronic fatigue syndrome: an approach combining self-management with graded exercise to avoid exacerbations. *J Rehabil Med.* **40**, pp.241-247.
- Ogden, J. 2007. *Health psychology. A textbook*. 4th ed. ed. Maidenhead: Open University Press.
- Reid, S., Wessely, S., Crayford, T. and Hotopf, M. 2002. Frequent attenders with medically unexplained symptoms: service use and costs in secondary care. *Br J Psychiatry.* **180**, pp.248-253.
- Ritchie, J., Spencer, L. and O'Connor, W. 2003. Carrying out qualitative analysis. In: Ritchie, J. and Lewis, J. eds. *Qualitative research practice: A guide for social science students and researchers*. London: Sage Publications Ltd, pp.219-262.
- Schwarzer, R., Lippke, S. and Luszczynska, A. 2011. Mechanisms of health behavior change in persons with chronic illness or disability: the Health Action Process Approach (HAPA). *Rehabil Psychol.* **56**, pp.161-170.
- Schwarzer, R., Luszczynska, A., Ziegelmann, J.P., Scholz, U. and Lippke, S. 2008. Social-cognitive predictors of physical exercise adherence: three longitudinal studies in rehabilitation. *Health Psychol.* **27**, pp.S54-63.

- Sharpe, M. 2002. The report of the Chief Medical Officer's CFS/ME working group: what does it say and will it help? *Clinical Medicine*. **2**(5), pp.427-429.
- Sim, J. and Lewis, M. 2012. The size of a pilot study for a clinical trial should be calculated in relation to considerations of precision and efficiency. *J Clin Epidemiol*. **65**, pp.301-308.
- Smarr, K.L. and Keefer, A.L. 2011. Measures of depression and depressive symptoms: Beck Depression Inventory-II (BDI-II), Center for Epidemiologic Studies Depression Scale (CES-D), Geriatric Depression Scale (GDS), Hospital Anxiety and Depression Scale (HADS), and Patient Health Questionnaire-9 (PHQ-9). *Arthritis Care Res (Hoboken)*. **63 Suppl 11**, pp.S454-466.
- Spitzer, R.L., Kroenke, K., Williams, J.B. and Lowe, B. 2006. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med*. **166**, pp.1092-1097.
- Wallman, K.E., Morton, A.R., Goodman, C., Grove, R. and Guilfoyle, A.M. 2004. Randomised controlled trial of graded exercise in chronic fatigue syndrome. *Med J Aust*. **180**(9), pp.444-448.
- Ware, J., Jr., Kosinski, M. and Keller, S.D. 1996. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Medical Care*. **34**, pp.220-233.
- White, P.D., Goldsmith, K.A., Johnson, A.L., Potts, L., Walwyn, R., DeCesare, J.C., Baber, H.L., Burgess, M., Clark, L.V., Cox, D.L., Bavinton, J., Angus, B.J., Murphy, G., Murphy, M., O'Dowd, H., Wilks, D., McCrone, P., Chalder, T., Sharpe, M. and group, P.t.m. 2011. Comparison of adaptive pacing therapy, cognitive behaviour therapy, graded exercise therapy, and specialist medical care for chronic fatigue syndrome (PACE): a randomised trial. *Lancet*. **377**(9768), pp.823-836.
- White, P.D., Sharpe, M.C., Chalder, T., DeCesare, J.C., Walwyn, R. and Group. 2007. Protocol for the PACE trial: A randomised controlled trial of adaptive pacing, cognitive behaviour therapy, and graded exercise as supplements to standardised specialist medical care versus standardised specialist medical care alone for patients with the chronic

fatigue syndrome/myalgic encephalomyelitis or encephalopathy. *BMC Neurol.* **7**, pp.6-25.