PSYCHOLOGICAL FACTORS AND EXPERIENCE OF PATIENTS UNDERGOING TOTAL HIP REPLACEMENT

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ABSTRACT

This study aimed to comprehensively explore the relationship between psychological factors and pain, function and quality of life. A mixed method approach comprising two longitudinal and one cross-sectional elements, was conducted, with results being triangulated to give a multi-perspective view of the relationships.

In the longitudinal elements, the questionnaire used in the quantitative phase was developed from validated tools, with cognitive interviews incorporating a think-aloud technique, used to validate the questionnaire package. Diary and interview schedules for the qualitative phase were developed from the existing literatures in this field. Additionally, a cross-sectional review of the pre-operative education programme in five centres was examined through participant observation.

One-hundred and five patients scheduled for initial assessment were recruited into the quantitative phase. Of these, thirty-nine were successfully recruited to the quantitative phase and sixteen were followed up at six months post-operative. Twelve of the participants in the quantitative phase also participated in the qualitative phase, with five being successfully followed up at six months post-operative. Results indicated that pain, function and quality of life were highly associated with self-efficacy, pain catastrophising, functional expectations, pre-operative depression, post-operative anxiety and post-operative negative affect. The qualitative element identified five themes: physical symptoms; management and awareness; support; well-being; and cognitive aspects of the self-regulatory model. Evaluation of the content of the education programme identified that all information provided to the patients was in line with the guidelines. Triangulation of the mixed methods identified the congruence of major relationships between pain, function and quality of life with self-efficacy and expectations in the longitudinal elements.

Self-efficacy and expectations should be considered throughout the hip surgery journey. Interventions, such as use of a reflective diary and talking to former patients who have undergone hip replacement, will enhance self-efficacy and adjustment of expectations, thus promoting better pain control, functional recovery and helping to tackle negative emotions.

DEDICATION

Dedicated to my parents, sister, and brother

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ABBREVIATIONS

ADL	Activity of daily living
ASES-11	Arthritis Self-Efficacy Scales
AUC	Area under the curve
BDI	Beck Depression Inventory
BMI	Body mass index
COT	College of Occupational Therapists
CSQ	Coping strategies questionnaire
EQ-5D-5L™	EuroQol Quality Life Scale; 5 domain; 5 level
ES	Effect size
GP	General practitioner
HADS	Hospital Anxiety and Depression Scale
HLC	Health locus of control
HOOS	Hip disability and Osteoarthritis Outcome Score
HOOS-PS	Short-form of HOOS
ICC	Intraclass Correlation Coefficient
ICF	International Classification of Functioning Disability and Health
IQR	Interquartile range
LJMU	Liverpool John Moores University
NICE	The National Institute for Health and Care Excellence
NJR	National Joint Registry
NRES	National Research Ethics Service
NRS	Numerical rating scale
NSAIDs	Non-steroidal anti-inflammatory drugs
OHS	Oxford Hip Score

OT	Occupational therapists
PANAS	Positive and Negative Affect Scale
PBC	Perceived behavioural control
PCS	Pain Catastrophizing Scale
PROMs	Patient Reported Outcome Measures
QOL	Quality of Life
RCoA	Royal College of Anaesthetists
r_s	Spearman's rho
SCT	Social cognitive theory
SEM	Standard Error of Mean
SER	Self-efficacy in Rehabilitation
SES	Self-efficacy Expectation Scale
SF-36	Short-Form 36 Health Survey
SF-MPQ version 2	Short-Form McGill Pain Questionnaire
SRH	Self-Rated Health
SRM	Standardised Response Mean
SRM	Self-regulatory model
STAI	State-Trait Anxiety Inventory
THR	Total Hip Replacement
TPB	Theory of planned behaviour
VAS	Visual Analogue Scale
VTE	Venous thromboembolism

Chapter 1: Introduction

This thesis was an exploration of the relationships between psychological factors and pain, function and quality of life (QOL) in patients undergoing total hip replacement (THR). The three elements consist of one quantitative and two qualitative elements under the design of mixed methods research. In the longitudinal elements, a quantitative approach aims to explore the relationship between psychological factors and pain, function and QOL. This study looks to support the suggestion of Osteoarthritis: the National Institute for Health and Care Excellence (NICE) guidelines, which are to examine the pre-operative predictors of surgical outcomes[1]. Concurrently, the qualitative study aims to describe events from the perspective of patients throughout their THR journey. The diary and interview method is utilised to reflect in-depth details of patients' experiences. The longitudinal study of quantitative and qualitative phases required ethics approval from the National Research Ethics Service (NRES) Committee and Research Ethics Committee of facilitating hospitals before data collection. In addition, another qualitative element was designed to investigate the effects of a pre-operative programme on psychological factors, pain, function, and QOL. Contents of the programme are also evaluated against standard UK guidelines. Results of the three elements were integrated into two sets for enhancing the understanding by giving broader and deeper perspectives[2]. First, the longitudinal quantitative and qualitative approaches were triangulated in order to explore the congruence of two phases. Secondly, the effects of the pre-operative programme were investigated by looking at psychological factors, pain, function and QOL as well as the whole experience of patients throughout the THR.

In this chapter, the background of THR is described and includes hip osteoarthritis, THR surgery, effects of THR on the patient and the recovery process. Relevant principles of pain are presented in this chapter due to the fact that chronic osteoarthritis pain is related to dysfunction and is an indication for THR. In addition, relevant literatures relating to psychological factors with pain, function, and QOL as well as evaluation of the pre-operative education programme are also discussed.

Hip replacement is one of the most common surgeries in the UK[3]. This is performed to treat uncontrollable chronic pain originating from the hip joint that limits daily activity, disturbs sleep, and where previous treatments have been unresponsive[1]. This elective surgery is increasing faster than knee replacement[3] and the eleventh annual report of National Joint Registry (NJR) reported that 80,194 primary hip replacement procedures were completed in 2013. The main reason for hip replacement was osteoarthritis (more than 70,000 procedures), which accounted for 91% of primary hip surgery in 2013 in the UK[4].

1.1 Hip osteoarthritis

Osteoarthritis is the most common degenerative disease of the joint[5]. It commonly affects the main joints such as knee, hip, hand and wrist, foot and ankle. Severity and impact depend on site of osteoarthritis, pain level and degree of functional loss. Hip osteoarthritis treatments have been sought by approximately three hundred thousand people per year who are aged 45 and over, based on consultation with general practitioners (GPs)[5]. This prevalence tends to increase with age and the highest increase has been reported in people aged 75 years and over (11% in men and 16% in women)[5].

The joint at the hip is a ball and socket type. There is an articulation between the head of the femur (thigh bone or ball), and acetabulum (pelvis bone or socket). In the articulation, there are cartilage, synovial fluid, synovium, joint capsule and a joint cavity. Cartilage covers the surface of the joint and synovial fluid is contained in the cavity. Synovium and joint capsule seal the joint space and attach with bone[6]. Cartilage and synovial fluid have their function in smooth movement by providing lubrication to the joint. The most important part is the cartilage which is unable to recover, if it is damaged[7].

Osteoarthritis is a condition where the cartilage in the hip joint is damaged. At an early stage of damage, cartilage becomes thinner and rougher whilst the synovium and capsule become thicker. When the disease develops gradually, in around 1-5 years, the tissue damage continues with inflamed synovium and thickening and tightening of the capsule including huge loss of cartilage. This results in a deforming of the joint, bone rub and the

presentation of symptoms such as pain, stiffness and lack of mobility[5,7]. These restrict the patient's movement, including limitation of personal care and active hobbies[1,5,8].

When patients are no longer able to tolerate severe pain in the groin area[9] they usually visit the GP who then diagnoses and subsequently provides treatment. The UK clinical guideline suggests three core interventions: education and self-management; pharmacological; and non-pharmacological treatments[1].

Education and self-management consists of patient information, self-management interventions and thermotherapy. Patients receive knowledge of osteoarthritis in order to increase their understanding of the condition and how its progressive symptoms should be managed. Following this, self-management interventions are suggested in order to encourage a change in behaviour of patients so as to reduce risk factors. These interventions include exercise, weight loss, appropriate footwear and pacing. Moreover, thermotherapy (using hot and cold packs) is considered as an additional treatment in order to relieve symptoms[1]. Pharmacological treatments consist of paracetamol, non-steroidal anti-inflammatory drugs (NSAIDs) and opioids. Several recent studies showed the clinical efficacy of NSAIDs; however, their side effects should be considered in relation to co-morbidities of patients such as gastrointestinal bleeding[1,9], liver and renal toxicity[1]. Other treatments include weight loss for overweight patients, assistive devices and THR. Where treatment fails to effectively relieve the pain, for example, resulting in limitation on daily activity and disturbed sleep at night[1], patients will usually be referred to a surgeon to assess the severity of osteoarthritis at the orthopaedic clinic[6].

1.2 Hip replacement

Hip replacement aims to relieve severe pain caused by osteoarthritis and/or hip dislocation[4] that has been unresponsive to other treatments and to improve the mobility of patients[9]. Hip replacement is the primary hip surgery, classified as Total Hip Replacement (THR), or hip resurfacing[11,12], whereas hip revision is surgery to an existing replacement joint due to some complications after primary surgery, such as a failed artificial joint[11], aseptic loosening and infection[13].

Initially, the process of THR and hip resurfacing are broadly the same, with initial incision of the skin and muscle, bone disconnection, removal of the surface layer of acetabulum socket and putting an artificial cup at acetabulum socket to fit with the femoral head[11]. The THR process involves inserting a stem (a femoral prosthesis)[6] into the thigh bone (femur), whereas hip resurfacing involves a substitute cap that covers the head of femur[11]. An artificial cap or a prosthesis at the head of femur fits into a cup at the acetabulum socket. During the THR process, surgical approaches and procedure type based on stem and cup materials are varied depending on patients' characteristics and the benefits to each approach.

According to the National Joint Registry (NJR) report,[14]the two most common surgical approaches are posterior (65%) and lateral incision (31%). The posterior approach is utilised with patients in the lateral position[15] and involves making an incision along the posterior edge at the upper extremity of the femur bone[16]. The direct lateral approach is utilised with patients lying face up[15] and a longitudinal skin incision is made along the mid-lateral line[17]. The posterior technique is seen as giving safe, easy and fast access[18] as well as giving the best scores in patients' reports of pain, functioning and satisfaction at 1-3 years post-operative[19]. However, some disadvantages were reported in comparison studies with other techniques, in particular with lateral techniques. The posterior approach had a higher rate of dislocation than the other approaches[20–22] and resulted in nerve lesions without injury[23] whilst the lateral approach possibly decreased the risk of nerve injury[6]. However, the dislocation rate associated with posterior incision can be reduced by the soft-tissue repair process[21,24], and increasing the femoral head size[22,25].

In addition to these two techniques, two materials are used for THR; cemented and cementless. The cemented procedure uses an acrylic cement as a glue to fit the stem into the femur bone, while components of the cementless procedure have a roughened surface allowing bone growth for a long-life bond. Sometimes one of cemented component is selected, known as the hybrid procedure[12,26]. The selection of materials is based on the characteristics of patients in relation to their age, how active their lifestyle and their bone strength. Cemented components are usually chosen for less active, older patients[26], and patients with weak bone structure, for example, those with osteoporosis[26]. Cementless

materials are utilised in more active[12,26] and younger patients[26,27]. Recent comparative studies of these two procedures indicate that there is no difference with regard to clinical and functional outcomes in the late recovery period, mortality rate and complications rate between them. In the early recovery period, cemented procedures gave better clinical outcomes than cementless types[28]. An English study of cost effectiveness compared the cost of cemented, cementless and hybrid THR. The least cost effective procedure was the cemented type, whereas the most cost effective procedure was the hybrid, except in women over eighty years of age[29]. In addition to procedure types, pre-operative preparation and post-operative management should be considered in order to improve post-operative health status.

1.3 Relevant procedures of total hip replacement

After unresponsive treatment for hip osteoarthritis, patients are referred by their GP for an initial assessment by a consultant orthopaedic surgeon. At this initial assessment the patient's history is taken and they undergo a physical examination which includes hip x-rays. If a patient decides to undergo THR on the consultant's advice, they are placed on the waiting list[30] and will be contacted to attend the hospital pre-admission clinic, usually within 6-8 weeks[12]. The pre-admission clinic carries out tests to screen patient health status in preparation for receiving anaesthesia and THR[12,30]. Any co-morbidities affecting THR are identified at this point[12], and an echocardiogram[12] and blood pressure[30] are taken. The hospital will assess infection control[12] and other relevant microbiological assessments[30]. In addition, a dental check-up is required to prevent infection from gum disease[12,30]. Prior to admission patients are advised to identify a carer who will help them through the pre-operative and post-operative periods and plans are made to prepare the patient's domestic environment, for example, by providing special aids and appliances[12].

The clinic provides an opportunity for the health care team to arrange the education programme for the patients. This includes discussing medication use, providing advice from the occupational therapist (OT) about special equipment (mentioned above) to assist before and during the recovery period[12], providing a plan of provisional discharge[30], and

an assessment of risks and complications. In particular, risk of venous thromboembolism (VTE) are evaluated in order to put in place the appropriate prophylaxis following THR[30].

On the day of admission it is recommended that patients get to the ward in enough time to allow routine processes to be completed; i.e. marking of the relevant THR leg; signing of a consent form and receiving anaesthesia. Anaesthesia is either by epidural or general anaesthetic. Epidural administration is via spinal injection to numb the lower part of body in order to block pain. Sedative medications may be added. General anaesthesia affects the whole body whereby patients are put to sleep during the operation and may be drowsy afterwards[12]. Following THR, patients are moved to the recovery room or high-care unit with a drip in their arm giving them fluid and medication and a drain from the wound to release fluid. When the patient is fully awake they are moved to the ward with a pad or pillow between their legs to stabilise their position. Intravenous drip and hip draining are removed within 24 hours[30].

The patient is also prescribed analgesia, anticoagulant therapy and a short-course antibiotic to manage pain, enhance functional movement, prevent VTE and infection[31]. Multimodal analgesia such as paracetamol with oral oxycodone is prescribed after THR[32]. In the discharge period, pain medications are similar to those prescribed on the ward[31] and are continued for a minimum of six weeks following THR[33]. Regimens of anticoagulant are appropriately designed following a risk assessment of bleeding. Patients without increased bleeding risk may receive a combination of mechanical and pharmacological prophylaxis. Mechanical prophylaxis consists of wearing stockings, using foot pumps and walking as soon as possible after THR, whereas anticoagulant medication such as low molecular weight heparin, Fondaparinux, or aspirin are started 12 hours post-operatively and continued for around four-to-six weeks. Patients with history of deep vein thrombosis, pulmonary embolism or proven thrombophilia are prescribed full anticoagulation with warfarin which is continued for eight weeks[30]. Additionally, the risk of infection is reduced by prophylactic antibiotics. Rare cases of deep infection (which occurs 1 in 100 cases) is managed by hip revision[30].

Common complications include dislocation, wear and tear of plastic components, bleeding and wound haematoma and joint loosening[12]. Prevention of hip dislocation (which occurs in 1 out of 20 cases) requires hip specific exercises and a brace to keep the joint position with the possibility of re-surgery. Most of the risks and complications can be managed successfully but patients need to make contact with their health professionals if they experience pain, increased swelling in the hip and leg [33] or any sign of infection in any part of the body[31].

The enhanced recovery programme may be applied for patients who show good progression. This depends on factors such as age, general health status, muscle strength and conditions of other joints. The aim of the enhanced recovery programme is to enable patients to walk and move within 12-18 hours after THR and to be discharged within 2-3 days. The patients on the ward initially walk supported by a frame and then progress to elbow crutches or sticks under the supervision of physiotherapists and OTs. The physiotherapist will also demonstrate the exercises required to strengthen leg and hip muscles and discuss hip precautions such as no crossing of legs and only sleeping on the back for 6 weeks after the operation. Before discharge the physiotherapist and the surgeon investigate the patient's movement, general health and wound healing. The OT reviews the patient's home circumstances, for example, the height of the toilet seat to see whether any helping aids for daily activities are required. If patients are taking regular medications due to their other co-morbidities, they must consult with the rheumatologist or orthopaedic consultant[12].

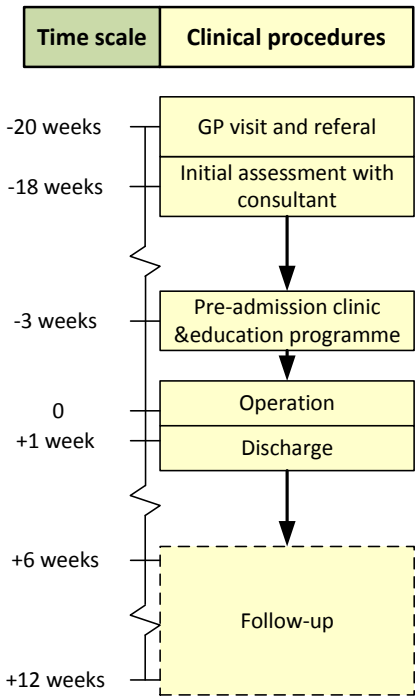
Once home a District Nurse will come out to change bandages and remove stitches from the wound following the good healing. Patients can contact the hospital direct if they have any issues or complications with the wound, particularly in relation to risk of blood clots and infection. Return to normal sex life is possible around 6-8 weeks post-operatively but care must be taken due to some positions being unsuitable[12].

Patients must carry out exercises, classified as regular exercises and hip specific exercises. Cycling, playing golf, and bowling are allowed 12 weeks post-operatively. However, exercise such as running on a hard surface, sports requiring sudden turns (i.e. tennis) and

extreme hip movements (i.e. skiing) are not recommended. Patients are prohibited from twisting their body, bending their hips past 90 degrees, crossing their legs or feet and rolling their knees or toes inwards[12].

At 6-12 weeks after the operation, patients are routinely checked in order to avoid complications, in particular with aseptic loosening (loosening without infection). Patients are checked annually for five years and then every two or three years depending upon the type of implants used[30].

Figure 1: An overall journey of hip replacement with timelines



This figure is adapted from British Orthopaedic Association. Primary Total Hip Replacement: A guide to good practice by British Orthopaedic Association[30]

The normal THR journey is represented in Figure 1. THR is typically an elective treatment to eliminate chronic pain, stiffness, and functional limitations caused by hip osteoarthritis. The patients are usually referred to the hip consultant by their GP for initial assessment. Prior to admission, a pre-operative assessment and education programme is arranged to prepare patients for both the THR and recovery. Following THR, post-operative care is provided for the patients in relation to rehabilitation, prevention of risks and complications

and pain management. However, some patients may require a longer period of hospital admission due to co-morbidities and increased risk of infection.

The aim of this care is to help the patients regain physical function, good recovery and cope with post-operative acute pain. In around 7-23% of cases of hip replacement patients will develop chronic post-operative pain[34]. Previous studies have explored pain and functional improvement following THR and identified two key dimensions associated with patient improvement; physical and psychological dimensions. These dimensions are described in the next section on the mechanism of osteoarthritis pain and major factors relating to pain.

1.4 Mechanism of osteoarthritis pain

In this section the pathway of osteoarthritis pain is considered. Pain signals are transmitted from local nociceptors at the hip to the brain. The mechanism of promoting and inhibiting pain is described with respect to the gate control theory and neuromatrix theory[35].

The gate control theory explained a hypothetical mechanism similar to a gate at the dorsal horn within the spinal cord. The gate controlled nerve impulse from peripheral sites to the brain and the brain processes. Inhibiting and promoting pain signals were proposed by Melzack and Wall. Large-diameter nerve fibres (A-beta) inhibit the pain signal by closing the gate, whilst small nerve fibres (A-delta and C) promote pain signals by opening the gate[36]. In the dorsal horn of the spinal cord, A-delta and C fibres that synapse with the secondary afferent neurones open the gate to continue transmitting pain signals to the brain[37]. In addition, the other inhibition system was hypothesised at the reticular system in the higher level of spinal cord. When this balance of promotion and inhibition pain systems is lost it possibly leads to a weak pain control mechanism resulting in persistent pain[36]. However, the gate control theory has since been revised. Melzack proposed the neuromatrix theory to describe the complex system of pain[38].

A complex construction of pain pathways and the nervous system is named as ‘the neuromatrix’. The neuromatrix involves the spinal cord, thalamus, somatosensory cortex, and limbic system[35]. In addition to the neuromatrix in the model, inputs and outputs are described in this theory. Inputs are classified into three dimensions: sensory signalling

systems; cognitive-related brain areas; and emotional-related brain areas. Pain signalling, and musculoskeletal inputs from damaged joints, including pathologic inputs from endocrine and immune systems, come into the neuromatrix via sensory systems. Moreover, cognitive-related brain areas provide memories of past experiences, attention, meaning and anxiety that combine with inputs from emotion-related brain areas, which are part of the limbic system and relevant homeostatic/stress mechanism. All three dimensions contribute inputs to the neuromatrix producing the output patterns of pain perception and pain behaviours**.** Pain perception is composed of three dimensions: sensory; affective; and cognitive dimensions, whilst action programmes and stress-regulation programmes are exhibited in pain behaviours. All inputs and outputs are described in parallel working despite sequential processes. When relevant homeostasis mechanism and stress-regulation programmes fail to modulate pain, damaged tissue, stress-regulation programmes and pain perception may be integrated to generate chronic pain[38].

This neuromatrix framework is used to describe the mechanism of chronic osteoarthritis pain. A review of the osteoarthritis pain literature describes the deficiency of pain inhibition at the remote anatomic sites in hip osteoarthritis patients. After patients undergo THR, they respond to the mechanical pain in a similar manner to the control group. This might partially support the mechanism of inhibiting pain and pain perception in osteoarthritis and THR patients[35].

Psychological dimensions of the neuromatrix consist of emotional process, cognitive process, pain perception and pain behaviours[35,38]. All dimensions are categorised into three processes – cognitive, emotional, and behavioural.

- Cognitive process: patients' beliefs; expectations; and appraisal[36].
- Emotional process: anxiety; depression; and negative emotion[36].
- Behavioural process: coping ability[39].
- Overlapping component of the three processes: catastrophising[39].

In existing studies, pain, function and quality of life (QOL) have been recognised in the outcomes of patients with orthopaedic conditions. The studies are used widely in many

countries and the national UK report, in particular with Patient Reported Outcome Measures (PROMs) study[40]. PROMs aims to measure the effectiveness of care in six elective surgeries provided for National Health Service (NHS) patients. THR is included in this national report. Validated questionnaires specified with THR and overall QOL are utilised in the PROMs study[41]. QOL is utilised to assess the result of illness, disease and treatment in the progress of patients[42]. The definition of QOL is described in the NICE guideline of osteoarthritis[1] as

'Refers to the level of comfort, enjoyment and ability to pursue daily activities'[1 p.xii]

As noted above, relevant psychological factors with pain, function and QOL are categorised into emotion, cognitive, and behavioural processes. These consist of patients' beliefs, expectations, appraisal, anxiety, depression, negative emotions, coping ability and catastrophising. The theoretical frameworks related to health beliefs are described in the next section.

1.5 Theoretical frameworks relevant to health beliefs

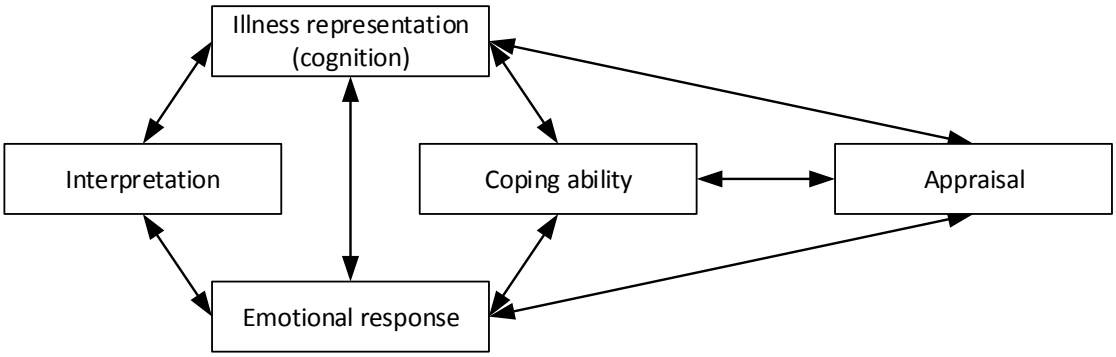
Health beliefs of patients are considered to be key predictors of health-related behaviours. Health-related behaviour is classified as health, illness and sick-role behaviours aimed at disease prevention, seeking treatment and returning to a normal health state[43,44]. They are not only predicted or changed by knowledge but also health beliefs[43]. The relationships between beliefs and behaviours with relevance to the THR area have been described by four key theoretical frameworks. They consist of Leventhal's self-regulatory model (SRM), health locus of control, social cognitive theory (SCT) and theory of planned behaviours (TPB).

1.5.1 Leventhal's self-regulatory model (SRM)

SRM is a theoretical framework of understanding illness cognitions and management. This model comprises two major parts as illness cognitions and three stages of illness management[43]. When patients are diagnosed or identify that they are ill, they have a strong desire to become well again and return to normal. Three stages are described as interpretation (illness representation from cognition or emotion), coping (managing the health problem to be in an equilibrium state between health and illness) and appraisal

(assessing how successful the coping stage has been). Moreover, illness representation is defined by Leventhal and colleagues as the common beliefs in health and illness status that are always to be found in patients[45]. Illness representation is categorised as having five dimensions; (1) 'Identity' dimension - the patient's beliefs about their condition with symptoms interpreted and labelled by the patient or diagnosed by health professionals[43,45]. (2) Perceived 'cause' of the illness - originated from either biological, psychosocial causes or combination of both causes. (3) 'Time line' - the duration of illness in terms of acute and chronic period[43]. Timeline will be re-examined as duration of recovery and well progression[45]. (4) 'Consequences' dimension - the patient's belief about how their illness affects all aspects of their life including physically, psychologically and socially[43]. (5) 'Curability/controllability' dimension is the belief of patients in the treatment and control of their illness either managed by themselves or other people[43]. The emotional response of the patient such as fear, anxiety or depressionis also included[43]. Illness representation and emotional response are associated with three coping processes in terms of either cause or effect. In particular, the coping processes are continuing once patients achieve the target of health status without illness[43]. SRM framework is represented below.

Figure 2: All dimensions in the Leventhal's self-regulatory model[43]



Different dimensions of illness cognitions were further explored by quantitative and qualitative research, which was developed into a questionnaire to evaluate patient's beliefs[46,47]. This measured beliefs in all dimensions of the model in relation to various health threats such as diabetes, arthritis, pain[46,47], asthma[47] and total joint arthroplasty[48]. Bethge and colleagues conducted a study in Germany to explore the effects of illness

representation on post-operative function in total knee replacement and THR patients[48]. In particular, those THR patients who expected to endure their illness and receive effective hip surgery reported significantly improved pain and function at one year post-operatively. This result confirmed that the prognosis for post-operative pain and function related to illness representation in particular 'controllability' dimension. This result showed the benefits of a pre-operative education programme[48], such as counselling[43,48], in order to modify the patient's perceptions of their illness[48]. The appropriate intervention to change a patient's belief can change their whole coping process.

The advantage of this framework is describing the effects between patients' belief and coping process. This supports the development of appropriate intervention to change patients' beliefs. However, this framework is concerned with the issue of the relationships between illness representation and coping processes that remained unclear direction. In the Illness Perception Questionnaire developed from this theory, a question in Time-line dimension ('My illness will last for a long time') is possibly classified as either an illness representation or a coping process[43]. In addition, belief in Controllability/Curability of health threat appears to be similar to health locus of control in Attribution theory.

1.5.2 Health locus of control (HLC)

Locus of control is defined as a set of beliefs in individual people related to the prediction of outcomes in particular events from their own actions, or other people[49]. These were categorised into two dimensions of HLC from Attribution theory: internal; and external HLC, by Wallston *et al.* in 1976[50]. The set of these beliefs is also classified into three types: control of illness by patients themselves; leaving it to fate's hands; and control by other powerful people such as the doctor. This concept was developed into the HLC[50] and Multidimensional HLC questionnaires[51] by Wallston and colleagues.

In the UK, Gibson investigated the predictors of pain and function following total knee replacement and THR from pre-operative to three-month post-operative period[52]. Psychological predictors consisted of catastrophising, multidimensional HLC and five types of personality. In 105 THR patients, pain control efficiency was a strong predictor of less pain and improved function whereas catastrophising significantly predicted worse pain

and poorer function at the pre- and post-operative period. Belief in control illness by doctor were not strongly related to physical function and other beliefs were not identified as the strong predictors of function[52]. However, another study in arthritis patients indicated multidimensional HLC effects on the prediction of health status and medical expenditure. Osteoarthritis patients who believed in controlling their illness by chance or fate reported worse health status and higher costs to treat their arthritis[53]. Therefore, HLC possibly has correlations with health behaviours.

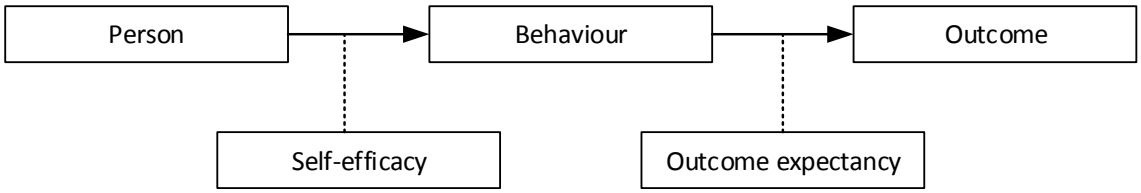
Additionally, the concept of locus of control possibly remains unclear. Firstly, the effectiveness of coping ability may be predicted by either particular or general locus of control. Secondly, internal and external locus of control may have a corroborative impact on coping ability. Additionally, meeting the health professionals is possibly defined as two ways whether internal HLC (I look for the appropriate treatment) or external HLC (GP is a powerful person to make me well).

In addition to health beliefs in SRM and HLC, the other key belief is self-efficacy. Self-efficacy is defined as the belief that people are able to complete a necessary behaviour to achieve their specific goal[54]. This belief is closely associated with confidence of the patients in their own capability conceptualised in social cognitive theory (SCT) and theory of planned behaviour (TPB).

1.5.3 Social cognitive theory (SCT)

This framework is outlined by Bandura and illustrates the role of self-efficacy and behaviour on the outcome. The three dimensions are person, behaviour and outcome. Self-efficacy is the major factor having an impact on behaviour and varies in level, strength and generality. In addition, the outcome expectancy is a factor affecting the outcome of behaviour. Definition of the outcome expectancy is the values of a particular outcome that the person given[55] from whether the positive or negative results of physical ability, social norm and self-evaluation[56]. Thus, self-efficacy and outcome expectancy represent personal belief in the ability that links behaviour and the outcome. All dimensions in this theory are illustrated in Figure 3.

Figure 3: All dimensions in social-cognitive theory[56]



Self-efficacy is promoted from four information sources: mastery experiences; vicarious experiences; verbal persuasions; and physiological and affective states. Mastery experience refers to learning from other people who have successfully gone through THR. This benefits the patients by fostering coping mechanism[57,58]. Vicarious learning also promotes self-efficacy through observing the capabilities of others in society[58]. The observer seems to engage the positive result of coping techniques from other people who have similar characteristics rather than many different characteristics. For example, THR patients knew about the experiences of hip and knee replacement but THR patients may prefer to ask the patients experienced in THR to foster the coping techniques and experiences. Moreover, a clear positive outcome in behaviours' model is effectively fostered by the observer[57]. In addition, verbal persuasion influences the communication from other people or health professional in encouraging the patient to do the specific tasks. This also includes self-persuasion[58]. The last source is physiological and affective states relating to success of management in physical function, health status and stress[58].

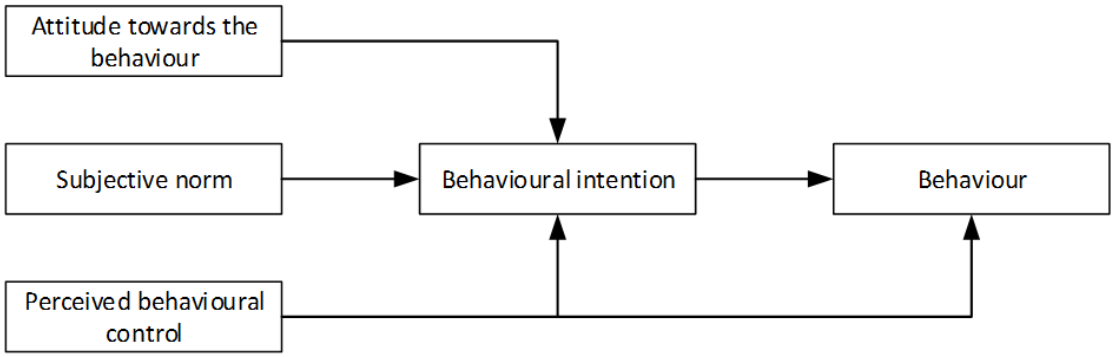
The previous study was conducted in the US by Moon and Backer to explore the relationships between post-operative behaviours of rehabilitation exercises with self-efficacy and the outcome expectancies in patients undergoing total knee replacement and THR[59]. Self-efficacy scales and the outcome expectancy scale were utilised to measure these factors on the first day post-operative, whilst capabilities of rehabilitation exercises were self-reported on the second day post-operative. The result was that self-efficacy was the only predictor of physical behaviours. Higher self-efficacy level related to longer distance of walking ability and higher performances of leg exercises despite no significant relationship between the outcome expectancy and rehabilitation behaviours. The researcher argued that no correlation of the outcome expectancy was possibly unclear due to one-item measurement and lack of reliability and validity. Then, this should be explored

in the further study[59] although self-efficacy is mentioned in the other framework of TPB, which is similar to a subset of 'perceive behavioural control' dimension[60].

1.5.4 Theory of Planned Behaviour (TPB)

Ajzen proposed this theory to describe change of health-related behaviours resulting from behavioural intention (intending to change behaviour). Behavioural intention is a result from three types of consideration[61]. (1) 'Attitude towards the behaviour' is a belief in whether positive or negative outcomes from behaviour evaluation, while (2) 'Subjective norm' is the beliefs perceived from social norms or pressure[60,61]. (3) 'Perceived behavioural control' (PBC) comprises a belief in an action of a particular behaviour regarding internal (i.e. skills, information) and external control factors (i.e. obstacles, opportunities) that associate with the past behaviours. Particularly, PBC also directly relates to health behaviour[61]. All dimensions are represented in Figure 4.

Figure 4: All dimensions in theory of planned behaviour



Construction of TPB was tested in osteoarthritis patients[62,63] and patients undergoing total joint replacement[64]. In 2008, Dixon and Johnston conducted a study of investigating theoretical frameworks of disability in 13 osteoarthritis patients[62]. They participated in the method of triads using repertory grid and interview that asked about activities. Thus, health psychologists judged the similarity of disability frameworks with three models: SCT; TPB; and WHO's International Classification of Functioning Disability and Health (ICF). The result indicated that 13 personal frameworks of disability were corroborated with TPB, SCT and ICF. Impairment (problems of body function or structures) in ICF medical model was proposed to triangulate with TPB as a predicting factor on all dimensions of TPB. Additionally, the outcome expectancy in SCT was also compatible with attitude dimension

in TPB. Similarly, self-efficacy in SCT was overlapped correspondence with PBC[62]. Ajzen stated that PBC comprised self-efficacy and controllability (beliefs in control to perform particular behaviours)[60]. Both of them have been examined in prediction of the intentions and behaviours improvement[60] in spite of only one report for controllability predicting intentions[65].

Following this integrated model of TPB, Dixon *et al.* examined TPB and the integrated model using a structural equation modelling approach in osteoarthritis[63] and total joint replacement patients[64]. In 2008, cross-sectional study of activity limitations in 190 osteoarthritis patients was conducted[63]. 100-yard walking was selected for behaviour in TPB, and an indicator of the activity limitations in the TPB questionnaire. Fitness of two models was examined. First TPB model reported that attitude towards the behaviour, social norm, and PBC dimensions were significantly related to intention but only PBC correlated with behaviour. However, no significant correlation between intention and behaviour in TPB was identified. The other integrated model indicated the significant prediction of behaviour by impairment, intention, and PBC, while attitude towards the behaviour and social norm were excluded from this model due to no fit in the model. Moreover, intention was predicted by impairment and PBC as well as PBC being predicted by only impairment[63]. The final integrated model was also investigated in total joint replacement patients that utilised the same approach. The result reported the similarity of model at pre-operatively two weeks and post-operatively one year[64].

These four frameworks can be applied to attempt to explain cognitive and behavioural processes regarding the neuromatrix theory. Focusing on health belief, SRM presented broad health beliefs but particular controllability/curability belief is similar to HLC. This belief is focused on the cause to reach the expected outcome from self, other people or fate. There is no commonality between HLC and self-efficacy because self-efficacy is a belief in capability of particular behaviour[56]. According to SCT, self-efficacy is concerned with the outcome expectancy to reach the outcome of behaviours. In addition, self-efficacy is integrated with controllability affecting behaviour intention and behaviours in TPB. As described above, the fitted model of health belief and health-related behaviours should be TPB but this lacked an emotional aspect in the model. However, emotional

aspects were recognised and included in the PBC dimension as an effect of past experience[66].

The next section describes some studies that compared locus of control and self-efficacy including the selection of patients' belief in this project. Following this, the associations of each psychological factor with pain, function, and quality of life (QOL) are reviewed in the quantitative method studies whilst most qualitative studies tend to ably describe appraisal and coping abilities in experience of patients rather than quantitative-designed studies.

1.6 Relevant psychological factors

1.6.1 Patient's belief

There are two studies comparing HLC and self-efficacy. First, Waldrop *et al.* conducted a study to explore the predictor of function at discharge focusing on belief in pain and function of patients undergoing hip and knee surgery[67]. The belief was categorised in three types: broad beliefs (i.e. dispositional optimism); moderately broad beliefs (i.e. perceived health competence); and specific beliefs (i.e. self-efficacy expectancies). Perceived health competence is the degree of personal belief and confidence in their action related to health status. This was derived from HLC familiarising internal HLC. A result indicated that self-efficacy of rehabilitation significantly predicted independence of function. Patients, who strongly believed in doing rehabilitation exercise, reported their successful function in rehabilitation[67]. However, some other studies reported that optimism and perceived health competence were able to predict functional ability.

Moreover, Cross and colleagues conducted an Australian cross-sectional study to examine the relationships between self-efficacy, multidimensional HLC, health status and medical expenditure in arthritis patients[53]. All patients who had stronger belief in coping arthritis (self-efficacy) reported better health status and lower costs. In rheumatoid arthritis patients, no significant association of HLC with health status and costs was identified. In the osteoarthritis group, patients with higher external HLC reported worse pain and function. In particular, patients with a stronger belief in chance reported a higher number of visits to GP which increased medical expenditure[53]. From these two studies, the key predictor of health-related behaviours highly tends to be self-efficacy even though it is

varied in particular tasks in behaviour of coping with their health threat. Therefore, pre-operative self-efficacy consists of belief in managing of hip symptoms, pain, and function, whilst post-operative self-efficacy is similar to pre-operative period including belief in benefits of rehabilitation.

Self-efficacy is reported in a few studies that were performed in a mix of THR and knee replacement patients. Three aspects of self-efficacy are noted in the published articles, these are self-efficacy for pain, function and rehabilitation. Self-efficacy of pain was reported as having a significant relationship with specific functional outcomes at two days post-operative in cross-sectional design[59]. Self-efficacy of function at three months post-operatively was related to function at nine months post-operative[68]. Two studies of self-efficacy of rehabilitation at post-operative six weeks was significantly correlated with depression at the same time[69] as well as function and QOL at six months post-operative[70]. Patients who reported high level of self-efficacy seemed to reflect their good improvement of functional recovery.

Additionally, the other study aimed to examine the predictors of depression and physical function in recovery period of total joint arthroplasty. Hope and self-efficacy of rehabilitation were hypothesised as the predictors. This study reported that hope was a significant predictor for pre-operative depression whereas post-operative depression was predicted by self-efficacy of rehabilitation. However, physical function was unable to predict by these factors. Hope and self-efficacy may be potential factors for emotional adjustment despite physical function[69]. Therefore, self-efficacy may associate with functional abilities and emotional adjustment through THR journey.

In addition, outcome expectancies and controllability are also concerned with regards to relevant frameworks of self-efficacy. The outcome expectancy is described above in Moon and Backer study (see page 14) as unclear correlation with rehabilitation behaviours[59]. The review of measuring self-efficacy in arthritis patients also stated that the outcome expectancy has been less attention than self-efficacy[71]. The outcome expectancy in SCT has been reported in correspondence with attitude towards the behaviours in TPB[72]. Due to this similarity, the outcome expectancy is seemed to be non-significant prediction of

health-related behaviours as well as attitude towards the behaviour was not correlated with intention and behaviours in the final integrated model applied from TPB as described above[63,64] (see page 16). Thus, self-efficacy and controllability should be emphasised as patients' belief in the association with pain, function and quality of life.

1.6.2 Expectations

Expectations of pain and function following surgery have been explored in several existing studies in order to predict the outcomes of THR. A large study in Europe reported that pre-operative expectations of pain and function significantly predicted post-operative function and stiffness at one year. More optimistic expectations before THR were related to improved function and stiffness after undergoing THR[73]. In another study, more optimistic expectations of pain relief before THR were associated with greater pain relief at one year post-operatively[74]. Another two studies reported that patients with worse pre-operative function had more optimistic expectations[75,76]. The patients who were more positive and optimistic before undergoing THR appeared to achieve better post-operative outcomes in relation to pain, function, and stiffness.

Expectations were assessed during the post-operative period by using the same questions as used to measure pre-operative expectations. Patients could answer from the following categories: not at all; somewhat; completely or greatly; and 'this question did not apply to me'. Three studies reported that positive expectations resulted in an overall better pre-operative physical function[77,78], better pre-operative mental well-being[76,78], less post-operative pain and better post-operative function[76–78]. The patients who reported better function and mental well-being before the operation tended to reach their pre-operative expectations due to the possibility of no post-operative pain and better post-operative function.

1.6.3 Anxiety, depression, and fear

Many existing studies reported on the relationships between anxiety and depression with pain, function and QOL in cross-sectional and longitudinal designs. During the pre-operative period, anxiety levels had a significant impact on QOL[79]. At two years post-operative, pain levels were significantly predicted by post-operative depression[80]. In

longitudinal relationships, pre-operative anxiety[79,81–83] and depression[81,82] were significantly correlated with QOL at three[79] and six months post-operatively[79,81–83]. In addition, there was a significant link between the amount of depression suffered before surgery and pain, function and stiffness at six-eight weeks post-operative[84]. Levels of anxiety and depression also predicted pain and satisfaction at one year post-operative[85]. Previous studies reported that increased anxiety or depression scores before the operation would lower levels of pain control, physical function and QOL after the operation. These studies illustrated the potential link between anxiety and depression in the pre-operative and post-operative period of THR.

In addition to QOL outcomes, self-rated health (SRH) is used to measure a patient's self-perceived health state. SRH is widely used in studies of health services in relation to change of physical function and progression of recovery from illness. SRH asks patients one question, that is, to rate their present general health and gives a score which accounts for physical health, mental health as well as social aspects by using five levels: excellent; very good; good; fair; and poor[86].

A Canadian study examined the relationship between SRH and mental well-being, physical health and social health by structural equation modelling within and across time at pre-operative and post-operative three months and six months. This study was conducted in patients undergoing THR and knee replacement. Findings reported there was a significant relationship of SRH with mental well-being in pre-operative and post-operative periods. Moreover, longitudinal analysis of SRH significantly predicted physical health. The mental well-being aspect consisted of anxiety, depression and fatigue, while physical health was measured by a specific questionnaire about osteoarthritis and hip and knee surgery[87]. Patients with worse anxiety, depression and fatigue were more likely to report poorer health state.

A systematic review of the relationships between various psychological factors and pain, function and QOL were reported in three groups of patients: THR; knee replacement; and mix of THR and knee replacement patients. The relationships between factors and pain, function and QOL in THR patients were reported less than in other groups. Mental health, anxiety and depression were associated with the outcome but there was limited

evidence[88]. Thus, anxiety and depression seem to be highly associated with post-operative pain, function and QOL. However, other factors are likely to be supported by further evidence in THR patients.

In addition to anxiety and depression, two studies explored the effects of fear and anxiety on pain, function and QOL. A cross-sectional study to measure pre-operative anxiety, fear of surgery and anaesthesia was conducted in patients undergoing surgery that required anaesthesia. Results showed that fear of surgery and anaesthesia significantly correlated with anxiety[89]. The other longitudinal study was conducted on patients undergoing elective surgeries. It was reported that the pre-operative fear of surgery was significantly associated with long-term outcomes of increased pain levels, dysfunction as well as poorer QOL at six months post-operative[90]. The patients with increased pre-operative fear reported increased pre-operative anxiety and poorer post-operative pain control, poorer function and QOL. Fear may be the cause of anxiety which ultimately leads to poor effective pain control.

1.6.4 Pain catastrophising

Pain catastrophising is described as:

> *'an exaggerated negative mental state brought to bear during actual or anticipated painful experience'*[91 p.52]*.*

Three dimensions consist of rumination, magnification and helplessness. A few studies reveal that high pain catastrophising before surgery seemed to synergise post-operative persistent pain[92], raise incidence of chronic pain development and reduce post-operative QOL indirectly[93]. These studies were conducted in patients undergoing total knee replacement. In relation to THR patients, results were reviewed in relation to chronic osteoarthritis pain[94]. A study in the UK reported that a significant predictor of pain was the amount of catastrophising in the pre- and post-operative period[52]. THR patients with higher catastrophising reported worse pain and dysfunction.

1.6.5 Other relevant factors

Personality type has been explored in three existing studies. In a longitudinal study of THR patients, there was a significant correlation of pre-operative neuroticism with post-

operative QOL at six months[83]. Higher neuroticism patients tended to experience worse post-operative six-month QOL. In addition to neuroticism, optimism influenced significant improvement of post-operative function at three months[95]. Optimism at 24 hours pre-operatively was a significant predictor of pain at 48 hours post-operatively in patients undergoing THR and knee replacement[96]. Patients who reported higher optimism before THR possibly had better post-operative pain and function.

In addition to these psychological factors, a number of other predictors of post-operative pain, function and QOL were identified in The National Institute for Health and Care Excellence (NICE) guideline for osteoarthritis (2008) and previous studies of patients undergoing THR. These were age, gender, overweight body mass index (BMI), smoking status, co-morbidities, pre-operative pain, function and QOL. The patients who reported better post-operative pain and function, were

- younger than sixty years of age[97].
- lower BMI[97].
- assessed as no other joint surgery needed[1].
- higher pre-operative walking[1] and less pre-operative pain[97].

Smoking was associated with post-operative risks and complications. Patients who currently smoked, especially if for a high number of years, reported an increased risk of systemic complications after THR[1]. Systemic complications may cause delayed recovery that tend to affect slow recovery of physical function.

All in all, previous quantitative reports showed that various psychological factors influenced pain, function and QOL of patients undergoing THR. They were anxiety, depression, fear, expectation, self-efficacy, pain catastrophising and personality types. Anxiety and depression had been identified as the strong predictors of pain, function and QOL, whereas others were illustrated in a mix group of patients between THR and knee replacement or a few studies in THR patients. Thus, all of them should be included to explore the relationship with pain, function and QOL in the longitudinal study utilising a quantitative approach.

1.7 Experience of patients undergoing total hip replacement

In addition to the quantitative studies, qualitative findings were reviewed to explore the experience of patients undergoing THR and look at ways of coping with pain, dysfunction and recovery. The existing studies were performed during the pre-operative or post-operative period.

1.7.1 End-stage osteoarthritis period

In 2007, McHugh *et al.* explored the experience of osteoarthritis patients awaiting joint replacement in relation to pain and functional management in the UK[98]. Semi-structured interviews were utilised to question the reason for undergoing joint replacement, pain, symptom management and osteoarthritis impact on daily living. Data of twenty-one (14 hip, 7 knee) participants were analysed by framework analysis. This reported four types of management: services use and treatments from experiences; health professionals' support; self-management; and family members' support. There were a few treatments for pain and function by health professionals during the waiting period for THR. Patients also tried self-coping techniques in order to manage their symptoms. Family increasingly provided support with daily activities during the waiting period. The researcher suggested to the health care team that effective osteoarthritis pain management during the waiting period should be in place, particularly a community matron to provide information[98].

In addition, another study was done in 2009 by McHugh and Luker to explain factors relating to the decision of individuals undergoing total joint replacement. Twenty-seven osteoarthritis participants (17 hip, 10 knee) referred for surgery were interviewed in four main areas, namely, osteoarthritis management, referral process, decision of undergoing surgery and information support. Findings from the thematic analysis reported that relevant factors for making the decision to undertake the operation were pain and physical activities, opinions of family and health professionals, consideration of risks and benefits, and information support from family, health professionals and acquaintances. Information and appropriate guidance of optional treatments may help patients in making decisions for surgery as well as reducing fear and raising confidence[99].

In 2014, Johnson *et al.* explored the experiences of end-stage osteoarthritis patients waiting for THR by using in-depth interviews pre-operatively and post-operatively. The interviews included topics such as the effect of osteoarthritis on relationships and mental well-being, sources of information about THR, pain experience in the peri-operative period and adjustment the lifestyle to the new hip. The findings of inductive thematic analysis reported two main themes – unavoidable experience of the patients to pass the waiting period of THR, and time in healthcare context. Subjective experience in waiting period of participants reflected different perception and interpretation of time in healthcare system. The waiting period was targeted and measured that impacted on multidimensional aspects of patients. It was also suggested that the health care team should consider the different perceptions, interpretations and experiences of patients when supporting them during the waiting period[100].

1.7.2 THR treatment period

In 2005, Bergh *et al.* conducted face-to-face interviews in elderly patients undergoing hip surgery in order to explore ways of describing pain. Sixty participants (38 THR and 22 hip fracture) were interviewed at two days post-operative. Data analysis was descriptive qualitative content analysis. Four main themes to describe pain were classified; objectification, compensating, explaining and existentialising. The study recommended further study in order to detail patients' experience of both acute and chronic pain in natural settings[101].

In 2009, an Australian study by Grant *et al.* reported the recovery process of THR. Ten patients older than 65 years of age were interviewed at 4-6 months post-operatively. Open-ended questions focused on physical function, recovery progress, barriers and supports, discharge process, goal setting, change and the patients' perspectives about their recovery. Field notes were utilized to record observations before and immediately after interviews. A grounded theory model of the recovery process of THR revealed three key dimensions which related to physical, psychological and social aspects. They were composed of reclaiming physical ability, re-establishing roles and relationships and refocusing self. The progression of recovery was associated with co-morbidities, positive

attitude, relationship, and receiving support of the patients. The authors of this study suggested that these aspects related to recovery should be incorporated into the design of intervention in order to regain physical function[102].

In 2010, Joelsson and co-workers conducted interviews with fifteen patients after THR to research pain experience and post-operative management. Five open-ended questions related to three topics; pain, pain effects and coping methods. Analysis reported on two main themes; (1) experience of pain in terms of specified bodily activities, and post-operative pain intensity immediately after surgery to later after surgery, and (2) coping with pain after THR in relation to professional care and self-care. The researcher suggested that post-operative pain management in the first few days should be improved to reduce fear of movement and enable patients to regain physical activities[103].

In 2011, Demierre *et al.* explored the experiences of patients' illness at one month pre-operative. Twenty-four participants undergoing total joint replacement were recruited to take part in semi-structured interviews. Four topics scoped the course of treatment; illness before making the decision for surgery, expected outcomes, pre-occupation of patients including pre-operative representations and emotions. Transcripts were analysed by thematic discourse analysis demonstrating two themes: the path leading to decision for surgery and living with prosthesis after the operation. Researchers suggested that appropriate information and preparation should result in realistic expectations and awareness of the new hip[104].

Additionally, Nasr aimed to explore experiences of patients in management following THR in the UK (2011). Twenty patients were eligible for narrative interviews. A single open-ended question was started to explore experiences of participants about the condition of their hip, treatment and any other experiences up until data collection. As a result, there were various psychological managements to rearrange focus on their life from disease issue to other circumstances such as comparative, problem-focused, emotion-focused, spiritual and self-oriented coping. Additionally, they focused on their positive site of experiences and lessen risks of THR. This study recommended that the qualitative findings

should be integrated with the national results of PROM study to investigate THR outcomes and QOL[105].

In 2012, McHugh conducted a study to explore patients' experiences and examine the expectations of patients undergoing THR by in-depth interview around 6-8 months after THR. There were four topics which comprised decisions according to THR, THR expectations, recovery process and support systems. Framework analysis of twenty-five transcripts reported the findings of three themes; THR expectations, recovery challenges and support in daily life. This study proposed that health care teams should discuss the appropriate outcomes and management in order to assist patients with adjusting their expectations. However, optimal points of progress during the recovery period may depend upon age. This optimal period possibly takes longer than patients expect, in particular in relation to walking distances and resumption of work[106].

1.7.3 Longitudinal studies

The first longitudinal study was conducted in Japan in 2006, by Fujita *et al.* to explore the experience of osteoarthritis patients undergoing THR. Twenty patients voluntarily participated in a semi-structured interview which consisted of three topics: osteoarthritis experience before THR; reasons for undergoing THR and opinions about osteoarthritis; and everyday life after surgery. Content analysis results showed that the main causes of concern for participants were pre-operative disabilities, limitations caused by the artificial stem, risks of dislocation at six weeks post-operative and inconvenience of movement in the long-term. Future research should explore alternative treatments and patient perceptions of risks and complications. New osteoarthritis patients may be supported by the experiences of other veterans, both positive and negative experiences[107].

In 2012, Smythe *et al* carried out a phenomenology study of a physiotherapist undergoing THR. The study described the initial stage of osteoarthritis until post THR, giving in depth clinical practice views. Fragments of the story were analysed by thematic findings. At the beginning of osteoarthritis, the patient recognised the diagnosis of his symptoms. Pain led to limitation of mobility but the patient attempted to keep his mobility and sense of self. Following intolerable pain, he underwent THR and reported feeling vulnerable during the

post-operative experience. Confidence in his coping abilities enabled him to regain physical activities and recover. This study recommended that sharing experiences of THR would reassure and guide patients[108].

Another in-depth study was conducted by Johnson *et al*. to explore patient experiences of using pain relief from end-stage osteoarthritis to recovery of total joint replacement. Twenty-four participants (14 hip and 10 knee) were recruited for face to face interviews in relation to pre-operative, peri-operative and post-operative pain management. In particular, participants were asked for their attitudes towards pain relief and analgesia use through surgery. A result of thematic analysis showed that attitude toward pain relief changed across three points of time. Before the operation, pain relief was hardly ever used because of the relatively short period and a tolerance of living with chronic pain. Pain relief was highly required during the hospital stay due to patient willingness and motivation to cope with post-operative acute pain and to enhance physical function. Once back home and during the early post-operative period, patients returned to their pre-operative patterns. This result enhanced the ability of health professionals to understand patient attitude towards pain relief. This may lead to improved communication strategies that enhance appropriate pain management during the joint replacement period[109].

1.7.4 Other relevant literatures

In 1998, Griffiths and Jordan used a diary approach followed by semi-structured interviews in a qualitative study in the UK. The study explored the perspective of patients who had undergone lower limb fracture surgery. Topics in the diary comprised of the perceptions of participants about their surgery and related to coping strategies in dealing with stress, hospitalisation and temporarily difficult movement. Nine participants completed the diary over a six-week period. This was followed up by supplementary interviews and a grounded theory approach was utilised for data analysis. It was found that stressors and uncertainty during the period were mitigated by a participant's optimism to control recovery, guidance given to achieve their goal of 'returning to normality' and support received from hospital. Stressors related to negative feelings and psychological factors such as shock, alien

environment, fear of falling, and anxiety of recovery. Practical ways could be developed to support adaptation and pain management[110].

Previous studies offered suggestions to assist patients during THR. Prior to the operation, effective optional treatments[98,99] and appropriate information[98,100] could support patients in making the decision of whether or not to undergo THR[107]. Health professionals could support patients by providing appropriate pain management advice during the waiting period before the operation. In early recovery period, the pain management programme is different from pre-operative coping with pain that aims to reduce fear of movement and support physical function of patients[103]. Recovery of physical function was also related to health professionals understanding the fears and confidence of patients in their recovery. It was suggested that patients were given psychosocial information about recovery in order to educate them and their carers[102]. Previous research recommended two important sources of information - health professionals and THR veterans. It was recommended that the health care team adjusted the expectation of patients about their reasonable outcomes[104,106], duration of full recovery according to their age[106], and awareness of new hip[104]. Positive experiences of THR veterans were able to reassure and guide patients in a helpful way[107,108].

A thorough literature search indicates that there are few longitudinal studies that analyse the experience of patients from end-stage osteoarthritis to THR recovery. From the majority of these results, patients reported belief, coping ability, appraisal and expectations based on their perspective. Thus, the qualitative study should be conducted in longitudinal design in order to describe the quantitative relationships of pain, function and QOL with psychological factors. In addition to these, other potential factors that possibly relate to psychological factors, pain, function and QOL may be the information provided in the hospital. An overview of the THR procedure and its effects are given to the patients undergoing THR at the first stage. This potential information is reviewed in the next section.

1.8 Pre-operative education programme

A pre-operative education programme is arranged to provide preparatory information for patients undergoing THR. The programme usually takes place around six weeks before hip surgery[30]. Health professionals in the surgical team fully explain the process of hip surgery and describe the regular care that will be received in the recovery period, provided by the hospital staff[111]. Such programmes are a key component of enhanced recovery programmes operated by multidisciplinary health professionals[112]. They are named differently, for example, hip school or joint school. In the UK, this and THR procedures were described in three major guidelines produced by Royal College of Anaesthetists (RCoA)[113], the British Orthopaedic Association (BOA) blue book[30], and College of Occupational Therapists (COT)[7].

The RCoA guideline explains all six steps for health professionals and step two deals with the pre-operative care by the hospital team. There are two aims of the pre-operative education programme. First, patients can understand what is going to happen, what they will feel like and what can be done if things don't quite go to plan. The other aim is to reduce levels of anxiety. Health care professionals give advice about therapy during the pre-operative care period[113]. BOA practice guideline states that patient education should be incorporated in the pre-admission clinics. Doctors and nurses set up the clinics which are attended by allied health professionals such as physiotherapists, OTs, pharmacists and social workers. The aim of the clinics is to improve the efficiency of hospital admission, rehabilitation and discharge planning. This also provides an opportunity for patients to discuss the risks and benefits of the operation with medical professionals[30]. The COT practice guideline is recommended for OTs in order to provide the most appropriate care for patients undergoing THR. Seven recommendations are established from previous research evidence in relation to occupational therapy intervention. All recommendations cover the THR journey, from patients making a decision to undergo THR through to recovery. The aim is to reduce anxiety, strive for low readmission rates, decrease length of hospital stay, reduce demand on support services, maximise independence, resumption of occupational roles, and reintegrate patients into the community[7].

In addition to practice guidelines, recent studies have been undertaken to determine the programme's effectiveness for patients. These studies reported better outcomes in participants undergoing pre-operative education, including lower pre-operative anxiety[111,114], less post-operative pain[115], reasonable expectations of post-operative function [116] and shorter length of hospital stay[116]. Little evidence showed that pre-operative education improved post-operative outcomes, in particular with pain, physical function and length of hospital stay. A previous study conducted in New York aimed to examine the effects of programme information provided by telephone or face-to-face individual sessions in the hospital via an information booklet in comparison to non-participation. Length of stay was reduced by one day in the participant group[116]. A review of thirteen randomised control trials of total joint arthroplasty (THR and total knee replacement) education programmes focused on post-operative pain outcome. In this review, eight studies reported no significant difference of post-operative pain outcomes between the control and intervention groups[117].

Although there are several quantitative studies reporting the advantages of an education programme, few studies have explored the content, delivery methods and service structure. A Canadian study was qualitatively designed to explore programme content using semi-structured interviews with twenty-two patients undergoing total joint arthroplasty. This study had emergent themes of educational needs and relevant factors so the authors produced a clinical checklist of educational topics, including general educational needs, pre-admission visit, pre-operative period, surgery, hospital stay, post-operative period, rehabilitation period and follow-up[118]. Moreover, a recent qualitative study in the UK was conducted to investigate the literature that patients undergoing THR received from OTs. The content of 111 information leaflets and booklets, comprehensive information and daily activities following THR were evaluated. The contents covered surgery, possible risks and complications, diet, hip exercises and advice on daily activities. The facts and advice given in the literature were compared and their deficiencies noted[119].

In conclusion, past qualitative studies explored the effect of the programme by interviewing patients as well as evaluating the quality and content of information in either

booklet or leaflet provided on the internet. Qualitative design should be performed to evaluate the programme through the eyes of patients undergoing THR.

The relationships between psychological factors and expectations with pain, function and quality of life (QOL) have been explored using quantitative and qualitative approaches. Quantitative research focused on each process in the neuromatrix, including investigation of emotional process (anxiety and depression) and cognitive process (self-efficacy and related beliefs). Behavioural process was explored by the majority of qualitative studies. Moreover, no previous study integrates the result of these processes to comprehend overall related aspects in patients undergoing THR in order to understand the nature of patients. This is also included the effects of standard procedure in the hospital performed. In particular, the pre-operative education programme should be evaluated from the views and experiences of patients from pre-operative period to recovery period. This project is then designed to use mixed-method approaches to build up an overall picture of patients undergoing THR, emphasising on psychological aspects.

As noted earlier, there are three major elements of the current study. The quantitative element is designed to cover various psychological factors in association with pain, function and QOL. The first qualitative element is expected to describe the experience of patients undergoing THR from end-stage osteoarthritis to the recovery period. The other qualitative element is designed to explore the nature and effects of the pre-operative education programme. All of the three studies may answer the following research questions.

1. What are the predictors of post-operative pain, physical functioning, and QOL?
2. What are the experiences of patients undergoing THR from referral to recovery period?
3. What is the impact of pre-operative educational programme?

All three elements are described in the next chapter which discusses the methodology and rationales of research inquiries.

Chapter 2: Methodology

This chapter outlines the methodology of this study and comprises the aim and objectives as well as an explanation of how these are addressed in selection of research inquiries. It continues with ethical consideration, and the description of five components of the study, that is, research instruments development; questionnaire survey; diaries and interviews; evaluation of pre-operative programme; and triangulations. Each component is explained giving full details of rationale of method selection, and data analysis.

2.1 Aim and objectives

This study aimed to explore the relationship of psychological factors and expectations on pain, function and quality of life in patients undergoing THR. This was realised through the following objectives.

1. To investigate the extent and nature of the relationship between psychological factors and expectation with pain and functioning on quality of life
2. To explore the perspective of patients in pain with relevant psychological factors throughout the patient's treatment and recovery journey
3. To evaluate the pre-operative programmes that operate in the participating centres for patients receiving THR
4. To describe the impact of congruence, or lack thereof, between psychological factors and expectations with outcomes on pain, function and quality of life in patient's journey

2.2 Choice of research inquiries

As described in chapter 1, three studies were conducted in accordance with the aim and objectives: a quantitative survey; a qualitative element in longitudinal design; and a qualitative observation.

First, the mail survey approach was utilised in the quantitative element. Mail survey requires support from the hospital staff to administer the survey. The benefit of this is fast distribution to a large population via several health centres[120]. One limitation faced by the researcher is the lack of ability to access the hospital patients' database in order to use electronic survey, telephone and interview approach for research. Not all patients are able

to answer the questionnaire left at the health centre. Therefore, mail survey is the appropriate method to collect quantitative data.

In the qualitative element, a diary-interview method was selected in order to record the experience of patients every day. This method can capture the experience of patients during a certain period in their lives, despite obvious gaps in data[121]. A follow up interview is valuable to fill in any gaps in data and confirm any important points contained within the diary entries[122]. Almost all existing research has selected the interview approach to collect narrative data. However, a study in the UK conducted a diary-interview approach to collect data from hip fracture patients after surgery. Results gained from this study indicated the needs of patients, including any stress factors experienced during their recovery period and the advantages of the diary-interview as a self-monitoring tool[110]. This meant less error of recall memory[110,123].

The researcher observed events that happened in the hospital in order to explore what information patients received from the hospital pre-operation programme. This was deemed more appropriate than use of video records or photographic evidence due to economical reasons[121] and is a different approach from past studies, which used data from interviews[118] and documents[119] only. The observation also gives a more realist understanding of the education programme as experienced by the patient. The researcher observed as a participant to reduce any researcher bias[124].

2.3 Components of the study

The longitudinal elements build upon existing literature by employing a mixed methods approach in a discrete clinical area. Prior to the main elements, preliminary work was also undertaken to develop research instruments – questionnaire, diary, and interview schedule – under the quality assurance process. In the major elements of the study, the four-design approaches consisted of the questionnaire survey, diary and interviews within a survey screening through THR journey as well as observation of pre-operative education programme. Finally, data from these parts were triangulated to describe the relationship between the patients' perspective, psychological factors and patients' expectations regarding recovery. Overall study design and project timeline is illustrated in Figure 5.

Data were collected on four occasions via surveys to examine results of the pre-operative education programme, THR surgery and post-operative care. Measuring before initial assessment was the baseline of characteristics (**Q1**) and screening the participants, whilst collecting at pre-operative one month (**Q2**) might explore an effect from the pre-operative education programme. After operation at one month (**Q3**) and six months (**Q4**), these measurements are objected to seek THR result and post-operative care in recovery period. Accordingly, a few studies reported that the good clinically important difference of hip scores was assessed during six to twelve months after THR[125,126]. This longitudinal survey, diary-interview method and direct observation of the pre-operative education programme are illustrated in Figure 6.

Figure 5: Overview of study designs

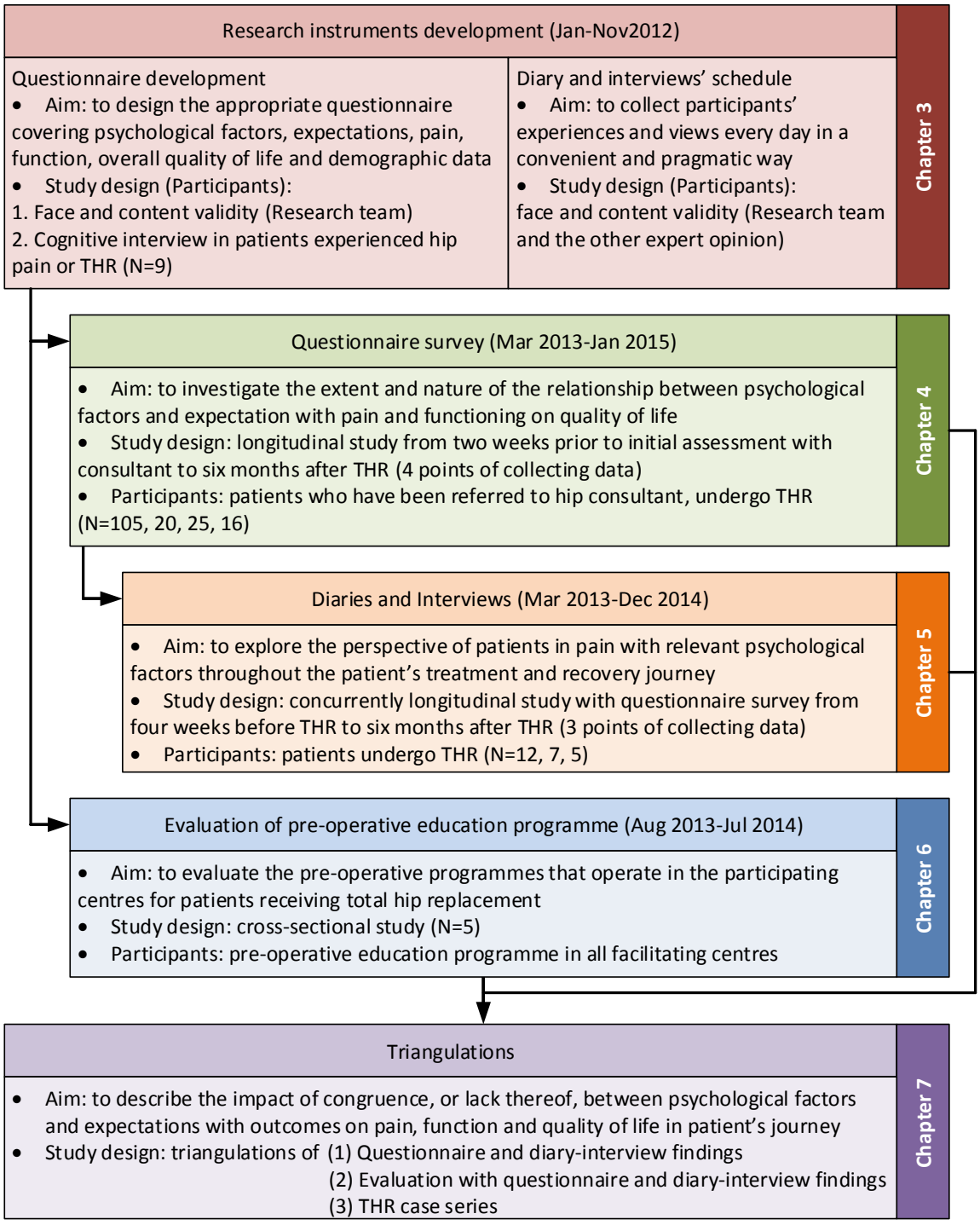
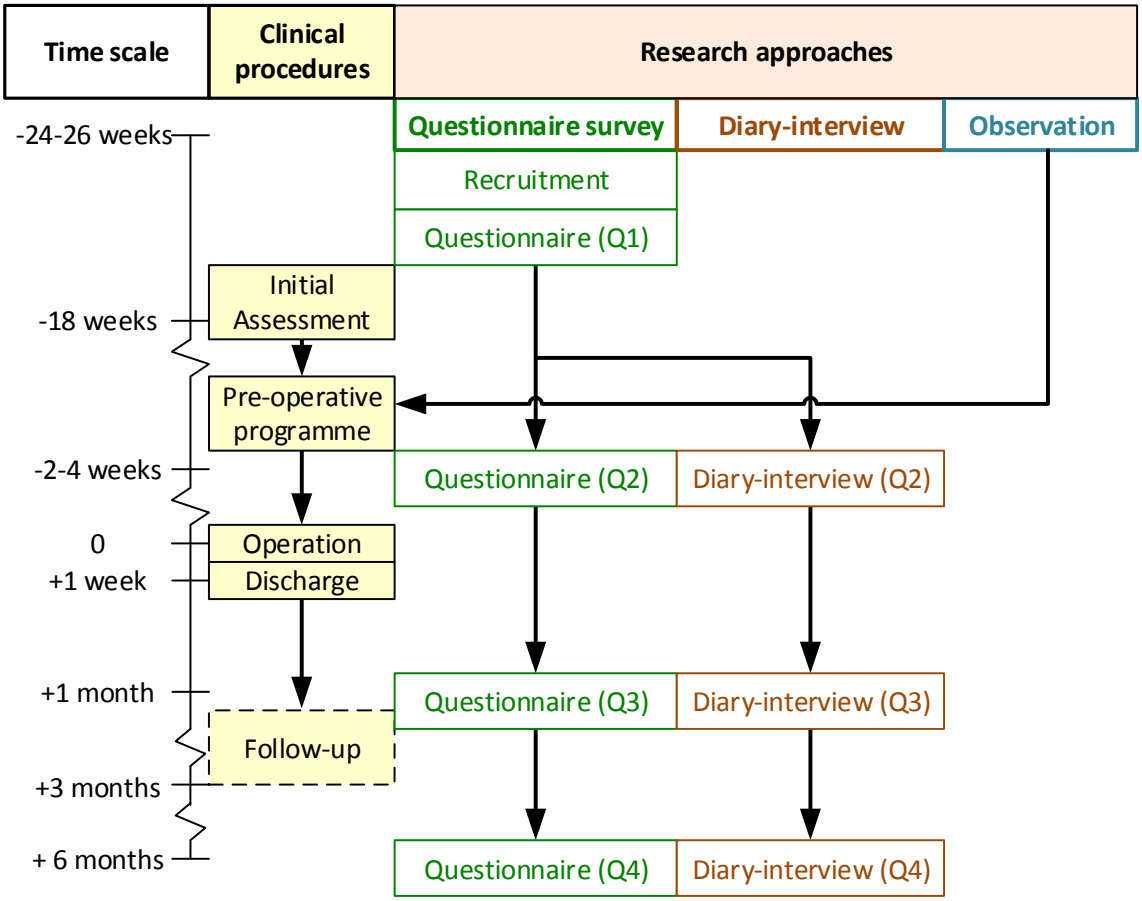


Figure 6: Longitudinal study design for questionnaire survey, diary-interview and observation



Q1: prior to initial assessment, Q2: at around one month pre-operative, Q3: at one month post-operative, Q4: at six months post-operative

2.3.1 Research instruments development

Two main objectives are established to develop three research instruments. First, the quantitative element aims to investigate the extent and nature of the relationship between psychological factors and expectation with pain and functioning on quality of life. A literature review was undertaken to review the relevant psychological factors and expectations of pain and function. A wide range of psychological factors and outcomes were selected to develop a single questionnaire built from carefully selected validated questionnaires and designed to explore their quantitative relationships. Additional questions were also constructed to collect relevant characteristics and other factors with respect to the participants, and to enable screening against the inclusion criteria.

Regarding reviews of previous qualitative studies, they reported pain perspective and experience through THR and the recovery process. Therefore, pain experience was

concerned to explore the perspective of patients in pain with relevant psychological factors throughout the patient's treatment and recovery journey. This may explain the quantitative relationship that was conducted concurrently. A diary was considered the most appropriate method to capture pain experience and daily views of patients over a short period[127]. The diary was mailed to participants following confirmation of THR and a face to face interview was then conducted after analysis of the diary to confirm, explore, and expand upon critical points from the diary.

2.3.1.1 Rationale of questionnaire development

Validated questionnaires were selected through psychometric properties. Inclusion criteria were set up to screen several questionnaires, which consisted of content validity, construct validity, internal consistency, test-retest reliability and responsiveness[2,3]. Two other characteristics were included in the criteria. They were duration of self-completion and number of studies using the questionnaire in patients undergoing THR because of covering various psychological factors and outcomes, and the purpose of this study.

Following the selection, combining validated tools can impact on their validity from the previous reports. Consequently, in order to minimise the impact of re-design, two additional validation steps were included in the development phase for the questionnaire, whereby the amalgamated questionnaire was first iteratively developed by expert review and secondly subject to extensive piloting by cognitive interviews. This aimed to evaluate any errors in the responses to the questionnaire, and explore any items that posed particular problems[130] from the process of thinking and interpreting the questions[131] to assess the content validity. It has been utilised in the developmental process of high quality and robust questionnaires in many areas such as dietary survey[132], education[133], and health[134] that was classified as two main techniques: think-aloud and verbal probing techniques. Think-aloud technique required participants to read out loud and independently reflect their thoughts with at least involvement of researcher. The other technique was probing to ask further questions depending on their responses[130,135].

2.3.1.1.1 Cognitive interview schedule

To guide the cognitive interview, an interview schedule was developed (Appendix 13). There are four parts to this schedule which comprised of introduction, warming up, actual interview and closing session. First, an introduction part was used to introduce the researcher and explain details of the interview. Following this, the researcher prepared the participant to become familiar with the think-aloud process within one question. Next, the participant started reading the question out loud and answered some questions, the verbal probing technique. Finally, the closing session was that the interviewer asked other opinions about the questionnaire.

2.3.1.1.2 Data collection of cognitive interviews

Purposive sampling was utilised to invite participants via pain psychology research panel. Participants, who either suffered from pain in their hip or had experience of hip surgery, were over 18 years old, and comprehended English, were received an email of invitation to interview with the patient information sheet (Appendix 10) and the participation form (Appendix 11). Prior to the interview, each participant completed a consent form giving consent to take part and allow the interview to be recorded (Appendix 12). The researcher also had the role of the interviewer and noted down important points during interview for further analysis. This was summarised with the recorded information in order to identify errors in the questionnaire so that the questionnaire could be revised and finalised to use in the questionnaire survey. Two rounds of interviews took place. The second round was arranged to confirm that issues had been adequately addressed following implementation of changes from the first round. Full details of questionnaire development have been described in chapter 3.

2.3.1.2 Rationale of diary and interview schedule development

Diary questions were constructed from previous literatures[110,136]. Structure and format were subject to iterative review by the research team and other expert opinions to assess content and face validity. The purpose of the final design was to elicit a broad range of experiences and opinions from participants. Following on from this, the diary was returned and analysed, face-to-face basis interviews were conducted to expand upon critical points and to explore incomplete issues from the analysis of the diary[137]. Four relevant topics of

this development rationale comprised reflective techniques, critical incident technique, diary, and interview schedule.

Reflective techniques were applied in developing the diary and reflecting significant events from the diary in the interview part. This technique was selected to mainly develop knowledge in health education, teaching and learning areas. A few reports were found from the perspective of patients or caregivers. As a result of a Canadian study on Alzheimer's caregivers, the most important type of diary used was the reflective diaries. A reflective diary provided precise details in experience of caregivers such as daily life, feelings and significant events and that was also a benefit in the therapeutic writing of emotional support for caregivers[138].

Moreover, critical incident technique is one type of reflective technique that was utilised to reflect the participant's feelings, while interviewing is based on the critical events in the diary. Critical incident technique was applied to many areas such as organisational psychology, nurse, and education[137] including health care[139]. This technique was applied to explore the critical incidents from diary entry prior to face-to-face interview.

A solicited diary was utilised to capture pain experiences and views from participants without possible bias[140] in their own words[141]. It was a daily record of participants specifically in the open-ended question designed[142]. In addition, this approach was useful in that it ably recorded the transition of life experience, especially in recovery from surgery, and emphasises changes[110]. The diary was also a vehicle used to address situations that the researcher was not able to observe[122] in particular with day-to-day activities in an appropriate period - a range of one or two weeks[136]. In the qualitative element, a two week period was selected to be an appropriate length of time to balance between deep enough data and less overloaded tiredness[136]. However, there were some disadvantages of the diary approach such as the possibility of over or under-reporting[141], accuracy and verifiability, dropout, and need for literacy ability[143]. These disadvantages were considered and prevented by using interviews following the diary being returned in order to confirm data in the diary entry. In addition, follow-up diary with interview possibly maximised

recruitment due to frequently contacting participants. Full details of diary development were described in chapter 3.

Moreover, the interview schedule was dependent upon the content of individual diaries and was responsive to the comments made therein. It was constructed in three parts: introduction, probes, and closing session to guide semi-structured interview. The introduction part explained the aim of the element and the participants' role during the interview. Next, the probes part consisted of exploring, reflection of and expanding critical points from data in the returned diary. In the closing session, participants were asked about comments in the diary and interviews as well as any views that they had.

2.3.2 Questionnaire survey

A self-completed questionnaire survey was utilised to explore the relationship between various psychological factors and expectations with pain, function and QOL from before the patient's initial assessment to six months postoperatively. The first survey was also used to screen participants against the inclusion criteria described in the subsequent chapter (page 42) and invite them to participate in the longitudinal survey, including diaries and interviews.

2.3.2.1 Data collection

2.3.2.1.1 Sampling methods and recruitment

Purposive sampling was used for recruitment of NHS centres around the Merseyside area and recruitment of participants in the longitudinal elements. First, six NHS centres around Merseyside area were recruited due to geographic location and limitation of research budgets. To implement the purposive sampling with the longitudinal elements, the patients were asked to participate voluntarily in the questionnaire survey and continue with the diaries and interviews[144].

Due to the fact that recruitment was through NHS sites and the independent researcher, an indirect recruitment approach was taken to maintain patient confidentiality. Recruitment was supported by the hip orthopaedic consultants and the administrative staff working in their teams. Information packs were sent out by the administrative staff in all centres according to the agreed process for each site with the surgeons and

administrative staff during initial discussions. It was based on the local procedures for sending the first appointment letter, as well as the available support from the administrative staff. Additionally, the questionnaire was completed at the participants' home to avoid framed answers, undue influence within medical setting and take away any time pressure. Full details are described in chapter 4 (page 70).

2.3.2.1.2 Inclusion and exclusion criteria

Patients, who were over eighteen years of age, understood English and had been diagnosed with chronic pain at the hip, were referred to one of the surgeons facilitating recruitment. They were eligible to receive the information pack and invited to take part in the quantitative element. When they decided to undergo THR, they were eligible for continued inclusion in further mailings as well as the diary-interview element. However, participants who did not comprehend English were ineligible because this study employed two methods that required participants to convey their pain perspective. Following the screening and return of reply slip, the participants who had experience of THR or did not schedule for THR were excluded. The previous THR might result in their psychological factors and expectations affecting their experience.

2.3.3 Diary and interview

Diary-interview method was used to conduct an in-depth inquiry into pain-related experiences of patients[127] related to the THR procedure, both in terms of time and cost. The aim was to explore patients' experience of pain in relation to their THR and psychological factors. Following the initial expression of interest via the reply slip returned as part of the questionnaire survey, patients were contacted and invited to participate in diaries and interviews. This comprised of interviews which took place after a two-week diary was completed. The diary was completed on three occasions during treatment and recovery. Qualitative data collection was longitudinal and aligned to the same periods of time as the questionnaire survey illustrating in Figure 6.

2.3.3.1 Data collection

2.3.3.1.1 Inclusion and exclusion criteria

Participants were invited from a panel of those taking part in the questionnaire survey. The number of participants proposed was thirty or until saturation of data. Inclusion criteria were the same as for the questionnaire survey screening criteria. Diaries and interviews needed participants to convey their pain perspectives via written and oral communication. As such, it was vital patients had full comprehension of English and had not had previous experience of THR as this might affect psychological factors and expectations.

2.3.3.1.2 Procedure

Following on from an initial expression of interest, participants were contacted and given the information pack which consisted of the participants' information sheet for diaries and interviews (Appendix 5), consent form (Appendix 6) and two-week diary around one month (Appendix 7) prior to THR. When the diary was completed, participants returned the diary via the free post envelope, along with the signed consent form, to the researcher. Content in the diary was preliminarily analysed to explore critical points for face-to-face interviews. A semi-structured interview took place on University premises or in the home of participant and lasted for approximately one to two hours. Interviews were recorded, with consent, and later transcribed verbatim. This process was repeated for two further diaries, which were distributed along with the questionnaire at post-operative one month and six months.

2.3.3.1.3 Data analysis

Diaries and interviews were transcribed and analysed by thematic analysis. This analysis technique explored and clustered important themes from participants' transcription of both diary and interview at each point of time. Thematic networks tool was utilised to alleviate structure of these themes in three levels of extraction which are Basic Themes, Organising Themes, and Global Themes. Basic Theme is the most primary theme from textual transcription that is clustered with other basic themes concerning context to support Organising Theme. This is a more intangible and significant family of similar Basic

Themes. Finally, Global Theme is the highest-order theme resulting from group of familiarised Organising Themes. This technique illustrated the structure of themes that was interpreted to textual description for final report[145].

2.3.4 Evaluation of pre-operative patient education

Facilitating centres that supported the recruitment of the questionnaire survey were included in this element by purposive sampling. Five centres were contacted requesting that the researcher be allowed to observe the pre-operative programme. This aimed to evaluate the pre-operative programme in terms of content and delivery approach as well as explore the effects on the expectations of participants. The narrative field notes were utilised after observing the programme as a participant. Data analysis was thematic method and compared to the content of programme in all centres. In addition to this, ethical approval was not required for this service evaluation[146,147].

2.3.5 Triangulation

Mixed methods approaches are required to enable the describing of the complex relationship between various psychological factors related to pain, function and QOL in patients' journey. This study used a convergent design to engage quantitative and qualitative approaches. Both were triangulated to best understand the relationships between various factors and patient outcomes from a quantitative perspective, with in-depth follow up of a subset of participants to six months post-operatively[148]. The other triangulation embraced the findings of observing the pre-operative programme with comments of participants from interviews, post-operative experience, and comparison of psychological, expectations variables and hip outcomes[149].

2.4 Ethical consideration

Due to the participation of patients from NHS trusts as well as information gained from those patients via interviews, questionnaires and diaries, this study required ethical approval from the National Research Ethics Service (NRES) Committee and Research Governance Committees of the facilitating hospitals before data collection. As part of this, informed consent, patient safety issues, patient confidentiality and anonymity were important considerations.

2.4.1 Formal review process

As the study involved data collection from NHS patients, an NHS Research Ethics Committee, as well as the Research Governance office at all involved Trusts, were asked to approve this research in order to conform with the research governance framework within the NHS[150].

The project was given a favourable opinion by the Liverpool Central NHS Research Ethics Committee on 31st December 2012 (REC reference number: 12/NW/0850). Liverpool John Moores University (LJMU) Research Ethics Committee has also endorsed this full ethical approval on 5th September 2013 (Reference number: 13/PBS/007) (Appendix 1). Following ethical approval from the NRES Committee, this study was then submitted to the Research Governance departments at five hospitals (Centre A, B, C, D and E) and permissions confirmed to conduct the study in accordance with the Research Governance Framework, Trust Policies and Procedures, and all relevant legislation since March 2013. All approvals were received prior to any patients being recruited.

Pilot work to validate the questionnaire was undertaken using individuals who either have hip pain or had experience of hip surgery. The participants were recruited through pain psychology research panel. As such, this work was approved by the LJMU Research Ethics Committee on the 14th June 2012 (approval number 12/NSP/038) (Appendix 9).

2.4.2 Informed consent

Patients in facilitating centres were sent an information pack by the administration teams, at the same time as their appointment details for their first consultation with the surgeon. The information pack contained the participants' information sheet that explained why this research was being done and what they would need to do if they agreed to take part (Appendix 2). Further explanation was given to each patient in writing and stated that the hip surgeon, referred to the patient via the GP, had agreed to support recruitment for this study. Additional information provided also included details of diary participation, participation in the interviews, patient confidentiality, the right to withdraw from the study, and any other issues according to the questionnaire about feelings and expectations. In addition to the participants' information sheet, a form of contact details

(Appendix 3), the questionnaire (Appendix 4), and free-post envelope were contained in the pack. Once the questionnaire was returned, informed consent was implied as the instruction on the first page of the questionnaire. That was also used with further questionnaires.

In taking part in the diaries and interviews element, the information sheet (Appendix 5) provided details of what the participants needed to do, and details of safety issues. The consent form (Appendix 6) asked for permission in writing to use diaries and record interviews. Consent was obtained by return of a signed consent form with the first diary (Appendix 7). Copy of this consent was duplicated and provided for the participant when the interview took place.

In development of the questionnaire, cognitive interviews were conducted at the University premises. The information sheet (Appendix 10) and participation form (Appendix 11) were attached in the email inviting participants via pain psychology research panel. A signed consent form (Appendix 12) was received prior to conducting the interviews. The copy of the form was duplicated and provided for the participant following the interview completed.

2.4.3 Safety issues

The quantitative element involved the participants spending an appreciable amount of time completing questionnaires. Delivery and return of the questionnaires were organised to minimise the burden on participants by free post envelope. This technique is also utilised in the diaries and interviews element, which is aimed to minimise the impact on participants by conducting interviews at their homes where most convenient.

Furthermore, it is possible that, through participation, patients will be sensitised to their experience of pain or the impact that their clinical circumstances have on their QOL. However, prior research has indicated that reflection, such as that which involvement in this study might stimulate, has been beneficial for patients in coping with their condition[110,151]. Contact details of support organisations were included in the participant information sheet to facilitate ready access to these should the patient be required.

2.4.4 Confidentiality and data handling

Confidentiality and anonymity were taken very seriously throughout the study and no personal information was given to anybody outside of the research team. All patients were allocated a pseudoanonymisation code on the first page of the questionnaire and diary, which was linked to the recruiting centre, patient code, and time-point of completion (A001-1). This system was also used to name each participant on any electronic audio records and verbatim transcripts.

Questionnaires contained pseudoanonymisation codes, with the code-break only being accessible by the research team and stored in a separate file. Additionally, personal contact details were only accessible by the researcher and, in extreme circumstances (e.g. illness or absence), the supervisory team.

A pseudoanonymous format was used for storing all data during this research, with a confidential password for protection of the coding system. When any quotations from diaries and transcripts of interviews in this research were documented and published they were anonymised, with any references to places or persons that might allow identification replaced with pseudonyms. Digital recordings of interviews were stored for sufficient time to allow transcription and checking of transcripts and then securely deleted. Any information collected during the interviews which may have led to the interviewees being identified was removed from the transcript.

Manual files were stored in a locked filing cabinet in a locked-room at the university and a pseudoanonymisation master file was password protected and stored on the university computer network on a drive only accessible by the researcher's personal account. All other documents are being stored securely within the school and will be retained for a five-year period or minimum period of time requirement for publishing. At the end of the study, all personal data will be confidentially destroyed and the data fully anonymised by destroying the coding document by secure deletion.

2.5 Summary

This chapter has briefly explained the methodology by presenting ethical considerations and the components of the study with the rationale of methodology selection. The

recruitment process was also included to describe the method of recruitment from the NHS for an independent researcher. The next four chapters of this thesis are dedicated to the development of research instruments, questionnaire survey, diaries and interviews as well as observation of pre-operative education programme respectively. In each chapter, the description of study procedures and findings are reported. The discussion of the findings is also concluded in terms of the current research and new knowledge.

Chapter 3: Research instrument development

This chapter describes the process of research instrument development. It consists of two main parts - questionnaire development, and diary and interview schedule development. The research instruments were used to gather information about the psychological factors and expectations with pain, function and QOL in patients' experiences throughout their THR journey.

3.1 Questionnaire development

Validated questionnaires have been used wherever possible to explore psychological factors, expectations, pain, function, and QOL. This is to maximise the quality of data collected through the present study and to facilitate comparison with other data sets in order to place the data in context. Validated questionnaires were selected according to pre-defined criteria and merged into a single questionnaire with additional questions in order to present a cohesive and easy to complete questionnaire. Cognitive interviews with patients who had hip pain or history of hip replacement surgery took place in order to further refine and ensure validity. These interviews improved the amalgamated questionnaire by the clarification of some difficult questions and improved formats.

3.1.1 Aim and objectives

The aim was to design an appropriate questionnaire covering psychological factors, patient expectations, pain, functioning, and overall QOL including taking demographic data into account. To achieve this aim, three objectives were realised below:

1. To identify and select appropriate validated questionnaires examining psychological factors, pain, functioning, and overall QOL;
2. To design suitable additional questions for related demographic characteristics of participants and expectations of future pain and functioning;
3. To refine the amalgamated questionnaire and maximise validity through think aloud cognitive interviews with participants similar to the target population.

3.1.2 Validated questionnaire identification and selection

3.1.2.1 Method

Relevant studies were searched for in PubMed and ScienceDirect by using search terms such as total hip arthroplasty or THR, outcome measures (pain, function and QOL), and psychological factors including expectations. Returned article titles and/or abstracts were reviewed to explore relevant psychological factors and expectations which impact on pain, function and QOL. Validated questionnaires used in each study were identified and subjected to the selection criteria to create a shortlist of suitable measures, which were: self-report style; number of items; time to complete the questionnaire; previous studies using the questionnaire in hip osteoarthritis or hip surgery patients and psychometric properties. Content validity, construct validity, internal consistency, test-retest reliability, and responsiveness of the standardised questionnaire were used to screen appropriateness of validity and reliability evaluation and limits for these are shown in Table 1. Additionally, the research team suggested amendments to the questionnaire and designed additional questions exploring participants' demographic data and expectations around future pain and function.

Table 1: Screening criteria of psychometric properties for standardised questionnaire

Psychometric properties: definition	Criteria of psychometric property
Content validity: components of items covered objectives thoroughly[128]	Clear definition of measurement's purpose in target population, measured concept, items' selection, and investigators[129]
Construct validity: the relations to other validated questionnaires[128]	Correlation coefficients ≥ 0.4[152]
Internal consistency: the homogeneity from correlation between items[128]	Cronbach's alpha (0.70 - 0.95)[129]
Test-retest reliability: comparative correlation of the same questionnaire on two other occasions[128]	Intraclass Correlation Coefficient (ICC) or weighted kappa ≥ 0.70[129]
Responsiveness: ability to detect changes over time[128]	Standardised response mean (SRM) > 0.8[125] or effect size (ES) > 0.8[153] or area under the curve (AUC) > 0.7[129]

3.1.2.2 Review and selection of questionnaires

3.1.2.2.1 Validated questionnaire identification

Psychological factors included from recent studies were anxiety[79,81–83,85,87,88], depression[80–82,84,85,87,88], personality type (optimism[95,96]/neuroticism[83]), pain catastrophising[92–94], self-efficacy[59,67–70,154], surgical fear[89,90], fear of anaesthesia[89], and expectations[73,76,78]. Patient expectations that focused on clinical outcomes were related to pain and functions in the pre-operative and post-operative period. The other outcome was overall QOL. Some questionnaires measured multiple psychological factors and these were chosen in some cases to reduce the length of the questionnaire and maximise completion rates. For example, anxiety and depression were usually measured in the same validated questionnaire, and optimism and neuroticism were included in mood state questionnaires. In addition, a related concept in patient belief was explored in a qualitative study. According to theory of planned behaviour (TPB), controllability was included in this measurement but only walking ability was used to measure controllability[60,63,64]. However, patients undergoing THR need to cope with many problems, not just walking ability, as mentioned in chapter 1. Thus, controllability may be explored in the diaries and interviews element.

3.1.2.2.2 Pain and functioning in hip osteoarthritis and surgery

The proposed primary outcome for the research was to look at pain and functioning, which formed the core of the format and instructions around which the other questionnaires were framed. Two validated questionnaires were considered against the selection criteria, which were the Oxford hip score (OHS) and the Hip disability and Osteoarthritis Outcome Score (HOOS). Details of each questionnaire are shown in Table 2.

HOOS was selected for this element as it relates specifically to pain and functioning of the hip, it was previously utilised in hip and THR studies[87,125,155,156], It included an appropriate number of items and could be completed in a reasonable time. OHS was also considered because of its practical use in many previous studies, including a national study of PROMs and the objective to measure pain and function in patients undergoing THR only. However,

as this measure related to lack of hip movement in large angle[157], and hip-related QOL, OHS was rejected.

HOOS was developed by The Osteoarthritis Research Society International. There are five subscales comprising five items of symptoms, ten items of pain, seventeen items of function in activity daily living (ADL), four items of function in sport and recreation, and four items of hip related QOL. The 5-Likert scale boxes were scored from zero to four and transformed to 100 normalised scores in each subscale. A 100 score represents no symptoms with 0 (zero) representing extreme symptoms.

3.1.2.2.3 Pain intensity

The nature and intensity of pain are usually measured by two standardised questionnaires. First, the Pain Numerical Rating Scale (Pain NRS) was selected as this is simplest for self-completion, and uses only one question to rate pain level. Despite the fact it has no way of measuring the nature of pain. Therefore, a similar type of scale, the Short-Form McGill Pain Questionnaire (SF-MPQ version 2) was selected for inclusion in the present study owing to its clarity for patients and has 22 items relating to nature of pain in terms of somatic and neuropathic pain. Appropriate psychometric data regarding criteria are reported in Table 2 on page 57.

3.1.2.2.4 Overall QOL

Two validated questionnaires were explored: the Short-Form 36 Health Survey (SF-36); and the EuroQol Quality Life Scale (EQ-5D-5L™). EQ-5D-5L™ was more appropriate than SF-36 due to its short form, five-minute self-completion, ease of answering and high responsiveness. All details of these are compared in Table 2 on page 57.

EQ-5D-5L™ was developed by The EuroQol Group to assess overall quality of life consisting of EQ-5D profile in five aspects and visual analogue scale (VAS) for SRH. Five aspects are mobility, self-care, usual activities, pain/discomfort, and anxiety/depression items to measure current levels in five levels of perceived problems. There are no (level 1), slight (level 2), moderate (level 3), severe (level 4), and extreme (level 5) problems. EQ-5D profile can be transformed for single index value based on the country from the crosswalk value sets. In UK populations, a calculated range from the lowest score to the highest score (-

0.594 - 1.000) which is equivalent as EQ-5D profiles (55555 – 11111). VAS scores in a range from 0 to 100 represent the worst to the best health that respondent can imagine, which recorded SRH of respondents. A box is also provided so that respondents can rate their health on VAS. Moreover, in case of different values between scale and box, the value in the box is chosen. It has been reported that participants spend only a few minutes to complete this survey[158–162].

3.1.2.2.5 Anxiety and depression

The State-Trait Anxiety Inventory (STAI), the Beck Depression Inventory (BDI-II), and the Hospital Anxiety and Depression Scale (HADS) were considered. HADS was selected owing to deeper exploration of both anxiety and depression, shorter time of completion, wider use in previous research than other measurements and good test-retest reliability. Table 3 (page 58) shows their psychometric data.

HADS was developed by Zigmond and Snaith in 1983. It is a measurement to identify anxiety and depression in clinical setting and investigate the severity. There were fourteen items divided into seven items of anxiety and seven items of depression. Each item is answered in a range from zero to three, and then summation of each dimension is interpreted in three levels between zero and twenty one. Possible clinical disorder is in a range of 8 to 10 and probable clinical disorder is between 11 and 21. This survey is completed in a few minutes and measures level of anxiety and depression in the past week[152,163].

3.1.2.2.6 Personality type (Optimism and neuroticism)

A validated questionnaire, the Positive and Negative Affect Scale (PANAS), was selected to measure mood state in terms of positive and negative affectivity state. Details of this questionnaire were shown in Table 3 on page 58.

PANAS is twenty items of questionnaire that was developed by Watson *et al.* in 1988[164]. Each part of mood state consists of ten items for self-completion with five-point Likert scales from one (very slightly or not at all) to five (extremely). Summation of ten items is reported from ten to fifty. According to timeframe of the HOOS questionnaire, participants were asked to complete this questionnaire in the past week[15].

3.1.2.2.7 Pain catastrophising

Measurement of pain catastrophising can be performed using one of two validated questionnaires, which are Coping strategies questionnaire (CSQ) and Pain catastrophizing scale (PCS). PCS was selected for the present study as it specifically explores catastrophising in rumination and magnification in addition to CSQ as well as covering helplessness, coping and pessimism[165]. Pessimism and pain coping were also measured in personality type, and self-efficacy questionnaires respectively. Other details are illustrated in Table 3 on page 58.

PCS was developed by Sullivan et al in 1995 to measure pain cognition in three components. They comprise magnification, rumination and helplessness that associate with frequency of feelings and thoughts in participant experienced in pain situation during the past week. There are thirteen items with five point scales that is scored from zero to four. Summation of all items is calculated (0-52)[165].

3.1.2.2.8 Fear

A visual analogue scale of fear in surgery and anaesthesia was selected and amended to an eleven point rating scale for understanding of improvement and coherence with the questions in SF-MPQ-2 and pain expectations. Although a previous study reported only construct validity with the other questionnaire, reliability data in terms of internal consistency and test-retest reliability are reported in Table 3 on page 58. This is resulted from the quantitative phase (chapter 4).

Eleven-numerical rating scale was used to measure fear of hip surgery and anaesthesia. There was only one item in each aspect to ask participants for how much fear that they have in a range of none (0) to worst possible fear (10).

3.1.2.2.9 Self-efficacy

Measurement of self-efficacy required the inclusion of three questionnaires; exploring self-efficacy in osteoarthritis, hip surgery, and rehabilitation because of illness of participants at each point of time that they need to manage. Three standardised questionnaires were selected to measure self-efficacy. They were: the Arthritis Self-Efficacy Scales (ASES-11); Self-efficacy Expectation Scale (SES); and Self-efficacy in

Rehabilitation (SER). Psychometric data of these questionnaires were attained with the pre-defined criteria as shown in Table 4 on page 59.

First, SES consisted of eight questions; four questions related to hip function management and the others were associated with post-operative symptoms management. Participants are asked for their level of confidence using a five-point scale of agreement from strongly disagree (zero) to strongly agree (four). It is usually completed within five minutes. Total scores are computed by summation from all items in a range of 0-16[166].

In addition, ASES-11 was developed by Lorig et al in 1989. It comprised five questions of self-efficacy in pain management and six items related to controlling arthritis symptoms. Participants were asked with the question of 'how certain are you that you can …' and rated each item on a ten-point scale in a range of very uncertain (one) to very certain (ten). This was completed within five to ten minutes.

SER consisted of twelve questions to ask participants for their confidence level in managing of rehabilitation as '*During my rehabilitation, I believe I can do …*' with eleven scales from I cannot do (zero) to certain I can do it (ten). This survey was completed within five to ten minutes. Average scores from the twelve items were computed to report confident level[166].

3.1.2.2.10 Expectations

Expectations of patients were divided into two parts related to their symptoms: pain and function. A pain expectation measure was adapted from the numerical rating scale (NRS) and the short-form of HOOS (HOOS-PS) was used as a basis to create a measure for expectations of function. Both of them had adequate validity and reliability reported in Table 4 on page 59.

Participants were asked their pre-operative expectations for four future points of time at two weeks pre-operative, one-month, six months and one year post-operative in the first questionnaire. Following this, the further questionnaires measured the expectations at the future points of time that were continued to reduce. For instance, the second questionnaire asked for expectations at post-operative three points of time, whereas the questionnaire at six months post-operative assessed expectations at only one year post-

operative. Expectations of pain were developed from numerical rating scale in a range of no pain (zero) to worst pain (ten)[152]. In HOOS-PS to measure functional expectations, the participants were required to rate their difficult levels of physical functions on five-Likert scale in a range of no difficulty (zero) to extreme difficulty (four) at the same points of time as pain expectations. There were sitting, getting in/out of bath or shower, sitting, running, and twisting/pivoting on loaded leg[167,168]. Summation of difficult levels was transformed to a range of 0-100 regarding nomogram, which zero represents no difficulty[167].

Table 2: Comparison of self-completed standardized questionnaire in functioning at hip, pain nature and QOL

Criteria	Validated questionnaire					
	OHS	**HOOS**	**Pain NRS**	**SF-MPQ (v.2)**	**SF-36**	**EQ-5D**
Scale	5-Likert ordinal	5-Likert ordinal	11-scale ordinal	11-scale ordinal	Ordinal (varied)	5-Likert and VAS
Number of items	12	40	1	22	36	6
Duration of self-completion	5 minutes[169]	10 minutes[169]	30 seconds	15 minutes[152]	5-10 minutes	5 minutes[a]
Content validity (to measure…)	Pain and function outcome after THR[157,169]	Patients' opinion about hip with or without OA[157,170]	Pain intensity[152]	Pain intensity and cover all kinds of pain[152]	Health status in 8 subscales[152]	Health status in 5 subscales[152]
Construct validity	0.68-0.82 (WOMAC[b])[171]	0.49-0.66 (SF-36)[125]	0.86-0.95 (Pain VAS[c])[172]	0.40-0.60 (BPI[d])[173]	0.27-0.68 (EQ-5D)[174]	0.27-0.68 (SF-36)[174]
Internal consistency	0.87[171], 0.86-0.92[175]	0.74-0.98[176]	-	0.73-0.95[173]	0.56-0.96[152]	0.70[177]
Test-retest reliability	0.90[171]	0.75-0.97[176]	0.95-0.96[172]	0.94[178]	0.44-0.66[179]	0.86-0.90[152]
Responsiveness	ES (2.38-3.10)[157]	SRM (1.29-2.11)[125]	AUC (0.83-0.89)[180]	SRM (1.31[173], 1.53[178])	ES (0.1-2.6)[174]	ES (0.7-1.3)[174]

[a]Duration was measured during cognitive interviews in this present study.
[b]WOMAC, Western Ontario and McMaster Universities Arthritis Index
[c]VAS, Visual Analogue Scale
[d]BRI, Brief Pain Inventory

Table 3: Comparison of self-completed standardized questionnaire in relevant psychological factors

Criteria	Validated questionnaire					
	STAI	**BDI-II**	**HADS**	**PANAS**	**PCS**	**Fear VAS**
Scale	4-Likert ordinal	4-Likert ordinal	4-Likert ordinal	5-Likert ordinal	5-Likert ordinal	VAS
Number of items	40	21	14	20	13	2
Duration of self-completion	10 minutes	10-15 minutes	2-5 minutes	4 minutes	5-10 minutes[a]	30 seconds
Content validity (to measure…)	anxious feeling's level	severity of depressive symptoms	as a screening tool for anxiety and depression	positive and negative mood states	pain catastrophising specifically	fear of surgery and anesthesia
Construct validity	0.73(TMAS[b])[181]	0.74, 0.77(STAI) [152]	0.52-0.81(STAI), 0.61-0.83(BDI) [152]	0.58(PA), -0.36(NA) (BDI)[164]	0.80(FPQ[c])[165]	0.55, 0.66 (STAI)[89]
Internal consistency	0.86-0.95[181]	0.73-0.92[152]	0.78-0.93[182]	0.84-0.90[164]	0.75-0.95[183]	0.57-0.96*
Test-retest reliability	0.31-0.86[181]	0.60-0.90[182]	0.70-0.76[182]	0.39-0.71[164]	0.75[165]	0.55-0.93*
Responsiveness	AUC (0.87)[184]	AUC (0.78)[185]	AUC (0.86, 0.96)[186]	-	-	-

[a]Duration was measured during cognitive interviews in this present study.
[b]TMAS, The Manifest Anxiety Scale
[c]FPQ, Fear of Pain Questionnaire
*Report from data of the quantitative phase

Table 4: Comparison of self-completed standardized questionnaire in relevant psychological factors

Criteria	Validated questionnaire			
	ASES-11	**SES**	**SER**	**HOOS-PS**
Scale	10, ordinal	5, ordinal	11, ordinal	5-Likert ordinal
Number of items	11	8	12	5
Duration of self-completion	5-10 minutes	5 minutes[a]	5-10 minutes[a]	5 minutes[a]
Content validity (to measure…)	self-efficacy in arthritis	self-efficacy in function of daily living	self-efficacy in rehabilitation	hip function
Construct validity	-0.61-0.30(CES-D[b])[187]	0.61(SER)[166]	0.61(SES)[166]	0.70(WOMAC)[168]
Internal consistency	0.82-0.91[187]	0.88, 0.90[166]	0.94[166]	0.79[168]
Test-retest reliability	0.87, 0.90[71]	-	0.78[188]	0.86[189]
Responsiveness	-	-	-	SRM (1.50)[168]

[a]Duration was measured during cognitive interviews in this present study.
[b]CES-D, the Centre for Epidemiological Studies-Depression

Prior to performing cognitive interviews, the first version of questionnaire consisted of five main parts: psychological factors; expectations; hip pain, function and QOL; overall QOL; and demographic characteristics. In relation to psychological factors, measured aspects were: anxiety and depression (HADS); mood states (PANAS); pain catastrophising (PCS); self-efficacy of pre-operative arthritis (ASES-11), post-operative function and other symptoms (SES), and rehabilitation (SER); and fear of surgery and anaesthesia. Expectation of pain and function was also measured at two weeks pre-operative, and one month, six months, and one year post-operative. The SF-MPQ-2 and HOOS were used for the nature of pain, including intensity of pain and pain related aspects (symptoms, related function, daily activity, and QOL). EQ-5D-5L™ was used to assess overall QOL.

3.1.2.2.11 Amendment of questionnaires: structure and format

Prior to test of face validity in cognitive interviews, the first version of questionnaire was amended by the research team. In order to maximise clarity, create a coherent structure, and present a single questionnaire, the instructions in most of the validated questionnaires were edited and the formats were amended where necessary. First of all, the type of scale was ranked in order to simply complete the questionnaire starting from four-adjectival scale to eleven-numerical scale, continued with filling in the table of expectations, and ended with additional open-ended questions. Consequently, instructions, scale format, and style of answering were revised to simplify completion and fit with other questionnaires as summary in Appendix 14. Finally, additional questions were added in the demographic data with comments of the research team. Characteristics of participants were measured using specifically written questions, with open questions. As reviewed in chapter 1 on page 22, characteristics of participants were concerned in the association with pain, function and QOL. Demographic data included gender, age, height and weight for calculating BMI, smoking status, accommodation, getting helper during last week, living status, usual transport, working status, annual household income, and co-morbidities. Permission to use the validated questionnaires was obtained prior to the study commencing.

3.1.3 Cognitive interviews

As described above, the questionnaire was compiled predominantly from validated questionnaires with a few additional items added and amended where necessary. To ensure that the questionnaire was simple to follow, retained content validity and was understood by the target population, the draft amalgamated questionnaire was first iteratively developed by expert review as described above and secondly by think-aloud cognitive interviews with participants demographically matched to the target population. These participants, suffered from pain in their hip or experienced in THR, were over 18 years old, and comprehended English, were invited to interview by email. The interviews were completed during two cycles throughout July-August and November 2012.

3.1.3.1 Method

Potential participants were contacted via the pain psychology research panel. The participants were received an invitation email with the participants' information sheet (Appendix 10) for the inclusion, exclusion criteria, and other details of the study, and participation form (Appendix 11). Interested parties who replied email of invitation were contacted for an interview arranged. Interviews took place on the University premises or the participant's own home. At the start of the interviews, participants gave written informed consent (Appendix 12). During the interviews, participants read the questions out loud and verbalised what they were thinking with their answer, including their thought processes in reaching that answer. Interviews were audio recorded and notes taken. Subsequent analysis identified difficulties with completion or comprehension and these were addressed through adaptations to the questionnaire, without altering the structure of validated components wherever possible.

3.1.3.2 Result

Interviews of around an hour using a think aloud technique were conducted with 9 individuals in two series. Seven participants took part in the initial round of interviews, after which, the questionnaire was revised with iterative expert review. The second round was conducted in two other participants. Their experiences of hip pain varied from mild

hip pain to around a ten-year recovery from hip replacement or resurfacing displayed in Table 5.

Table 5: Demographic data of participants in cognitive interviews

No.	Age	Sex	Hip history	Numbers of co-morbidities	Surgery history
1	73	Male	Mild pain, unknown cause	3	No
2	68	Female	Osteoarthritis	4	No
3	61	Female	Osteoarthritis	1	No
4	53	Female	Osteoarthritis	9	No
5	73	Male	Osteoarthritis	8	Shoulder: 5 months ago
6	67	Female	Pain caused by accident	5	No
7	73	Female	Osteoarthritis	1	Hip: 1 year ago
8*	90	Male	Osteoarthritis	1	Hip: 1.5 year ago
9*	88	Male	Osteoarthritis	3	Hip: 10 years ago

*Two participants took part for the second round of cognitive interviews.

In amalgamating the questionnaires, the format and instructions were changed to create a clear and coherent structure. Following the first round of cognitive interviews, clarification footnotes were added. The final version of the questionnaire was further improved through iterative expert review. The original format and structure of the validated questionnaires was retained as much as possible throughout this process. Seven elements of the questionnaire were refined following the cognitive interviews. All improvements are listed in Table 6. In addition, questions relating to numbers of floors in participants' home, date of surgery, and date of completing questionnaire were added to obtain more details about participants. A list of questions about co-morbidities were changed to two open questions, they were: 'Do you have any other diagnosed medical conditions?' OR 'Have you been diagnosed with any new condition(s) since you complete the last questionnaire?' and 'Please tell us about how the listed condition(s) affect your pain or movement (if they do)'.

The revised questionnaire was also subject to two final think-aloud cognitive interviews in the second round to confirm that issues had been adequately addressed. The final version of the questionnaire took around 30 minutes to complete in a cognitive interview, suggesting that this would be the maximum time taken, and participants did not report any further issues. Finally, four different versions of the questionnaire were prepared from

the final version of master questionnaire to reflect the differences relating to the four time points of administration throughout the study. These final questionnaires were submitted to obtain ethical approval from the NRES Committee.

Table 6: Refinement from cognitive interviews comments

Domain	Comments	Amendments
PCS	• Most of participants asked for the exact time of instructions.	• 'In the past week' was added.
	• Two subjects raised an issue of other painful events in an item of 'I keep thinking of other painful events'	• An item was explained at footnote as 'This refers to other situations involving pain other than at your hip'
Fear VAS	• A patient who had undergone shoulder surgery asked for specific surgery.	• 'Surgery' was identified as 'Hip surgery'.
ASES-11	• The instruction was not quite clear in three participants 'How certain are you when you will cope before the surgery'.	• This instruction was changed to 'How you will cope until now' for pre-operative period and 'How you will cope with your pain' for post-operative period.
	• There were two doubted questions which were 'You can decrease your pain quite a bit' and 'You can manage arthritis pain during your daily activities as compared with other people with arthritis like yours'.	• They were explained at footnote as 'This refers to being able to reduce pain using treatment or techniques' and 'This question asks how you think you managed compared to other people – are you better, worse or the same as others?' respectively.
HOOS	• Some subjects confused nearby adjectival choices.	• Between differently adjectival scales, more spaces were added.
	• Three participants asked the definition of 'Straightening your hip fully'.	• Footnote was added as 'This means making your hip joint straight, such as when stretching out on a bed'.
	• Four participants asked for more explanation of 'twisting/pivoting on loaded leg'	• This was then defined as "This means turning on your foot, whilst putting weight on it" at footnote.
SF-MPQ-2	• Most of subjects asked for the difference of all characteristics and related pain symptoms.	• This was moved out and pain level was also measured in HOOS part.
Expectation	• Format of this part was quite difficult to complete and understand.	• A gap between preoperative and postoperative period was added.
	• A subject undergoing hip replacement mentioned that 'running' and 'Twisting/pivoting on your loaded leg' have not been permitted to do.	• These questions would the participant like to imagine their function in the future in all difficult levels of mobility.
Demographic data	• 'What is your usual transport?' and 'Has anyone helped you with daily activity during the last week?' were unclear.	• Both 'usual' and 'during the last week' were emphasized by bold and underline to clarify the question.

After provisional opinion from the other NRES Committee (Liverpool Central), two further amendments were made by adding a sentence on the cover page to clarify the fact of voluntary participation for a further questionnaire and a question listing the medication of participants in the demographic data part.

3.1.4 Final version of the questionnaires

Following the cognitive interviews, four versions of the questionnaire were developed to correspond with the four occasions they were to be completed. Two questionnaires were designed for pre-operative period at baseline and around one month, whilst two others were developed for recovery period at one month and six months. Similarity in four questionnaires consisted of the outcomes, anxiety and depression, emotional states, pain catastrophising, fear of THR and anaesthesia. The differences in the four questionnaires were: demographic data, aspects of self-efficacy, and expectations.

Unique to the first questionnaire were questions regarding the characteristics of the patient. These were their gender, birth year, weight, height, smoking status, socio-economic status, other comorbidities and their effects in pain and mobility, and history of medications use. Weight and height were calculated as BMI. In addition, previous THR was also asked in this part to screen participants regarding inclusion criteria. At one month pre-operative, other questions were added that comprised of one or both hip replacement, and all information sources about THR. New co-morbidities and their effects in pain and movement function were repeated in all questionnaires. Second, pre-operative questionnaires measured self-efficacy in three aspects of osteoarthritis symptoms, pain, and function. However, post-operative questionnaires asked the patients to report self-efficacy of hip symptoms in recovery, pain, function and rehabilitation. Third, expectations were developed to measure the expected outcomes of pain and function in four future points of time in the first questionnaire: at two weeks pre-operative; one month, six months and one year post-operative. Four points of time were continually reduced in further questionnaires. All of them are presented in Appendix 4.

Details of all variables with score interpretation are shown in Table 7. All details of each validated questionnaire are described earlier on page 51 - 55.

Table 7: Summary of variables, standardised questionnaires, scores and interpretation

Variables	Questionnaires	Scores	Interpretation
Hip pain	HOOS	0-100	Extreme to no pain
Hip symptoms, function (activity daily living), function (sport), and hip-related QOL	HOOS	0-100	Extreme to no symptoms
Overall QOL (single index value)	EQ-5D-5L™	-0.594-1.000	Low to high
Self-rated health	EQ-VAS	0-100	the worst and the best health
Anxiety and depression	HADS	0-21	8-10 as possible and 11-21 as probable clinical condition
Positive and negative affect	PANAS	10-50	Low to high
Pain catastrophising	PCS	0-52	Low to high
Self-efficacy of symptoms (Pre-operative)	ASES-11	1-10	Low to high
Self-efficacy of symptoms (Post-operative)	SES	0-16	Low to high
Self-efficacy of pain	ASES-11	1-10	Low to high
Self-efficacy of function	SES	0-16	Low to high
Self-efficacy of rehabilitation	SER	0-10	Low to high
Fear of hip surgery and anaesthesia	Numerical rating scale	0-10	No fear to worst possible fear
Pain expectation	Numerical rating scale	0-10	No to extreme pain
Functional expectation	Developed HOOS-PS	0-100	No to extreme difficulty

Peer review and cognitive interviews were undertaken for the face validity of a single questionnaire. It consisted of various validated questionnaires which improved characteristics of instructions, format of items and scale, and simply self-reported completion. Adjectival scale or items were not altered from the standardised questionnaire therefore this did not require other studies to investigate psychometric properties. In addition to questionnaire development, the diary and interview schedule were also developed by the research team, as explained in the next part.

3.2 Diary and interview schedule development

Due to the nature of osteoarthritis patients, their symptoms relate to difficulty in movement. To capture these aspects, a diary was also used with a sub-group of the main element in order to collect participant experiences and views which were taken every day in a convenient and pragmatic way. Following the diary return and analysis, face to face interviews were conducted to confirm and further explore critical points from the diary. The diary structure and format has been subject to iterative review by the research team and is designed to illicit a broad range of experiences and opinions from the participants. The interview schedule (Appendix 8) is dependent on the content of individual diaries and responsive to the comments made therein.

3.2.1 Aim and objectives

This development aimed to design the appropriate diary and schedule of interviews according to qualitative approaches. To achieve this aim, two objectives were realised as set out below:

1. To explore the experience of patients undergoing THR and design suitable open-ended questions considering this experience;
2. To design appropriate questions of interview schedule related to critical points from the diary.

3.2.2 Diary development

Recent literature was reviewed in order to scope questions about pain experiences from qualitative pain diary research in hip osteoarthritis and hip surgery. All relevant articles were selected in order to explore the impact of pain and THR on daily activities. The researcher designed the format, instruction and open-ended questions in the diary which covered a two-week period. The research team suggested comments to improve face and content validity. Finally, the diary was amended again following the other expert opinions.

Seven existing studies were included to explore the relevant aspects of pain experience. Their period of data collection covered end-stage hip osteoarthritis to recovery after hip surgery. Three qualitative approaches -focus group, interview and diary- were utilised in these studies. Related topics covered daily activities[105,107,190], weakness[190],

feeling[104,107,110,190] including fear[190], pain level[98,103,107,110], difficult movement[98,103–105,107,110,190], pain and difficult movement management[98,103,104,107,190], support from other people (health professionals and family members)[98,110], social aspect[104], sleep ability[110] and expectations for improvement[107]. First of all, these topics were clustered in four groups comprising of daily activities and feeling, pain symptoms and management, mobility and social interaction including sleep ability and other health related factors such as news, specific advice, decisions, and thoughts.

Following review by the research team, rearrangement of clustered topics, amendment of instruction and format were undertaken. Most of them were grouped together for every day questions in terms of pain symptoms, daily activities, feeling, mobility, social interaction, and other factors to look at the overall health of participants and pain symptoms rather than dividing each group question into each day. Pain management and sleeping ability were looked at via an additional three-day of questions in order to reduce the daily amount of time focusing on coping with pain and its effects at night. This categorisation is shown in Table 8. In addition, some instructions were emphasised as bold text and the response to questions about sleeping ability were changed from a tick box of yes or no answer to one which required the participant to descriptively write an answer. Three open-ended questions were used in the diary, varying across the two week period. Questions about pain symptoms, daily activity, feeling, mobility, social interaction, and other factors were included on day 1 and day 7. A question of pain coping asked the participants to describe their management on day 2, 5, 8, 11 and 13, whilst the other question of sleep ability was included on day 3, 6, 9, 12 and 14. Prior to diary use, there were two comments of further review by a community pharmacist. First, one page each day was increased to two pages to encourage the participant to give more written information. Second, a question about the important things relating to participants' health was changed from 'news, specific advice, decisions, thought, etc.' to 'news items, advice you have been given, any decisions you have made, or any thoughts you have had' to allow for ease of communicate to the layperson.

Table 8: Groups of topics from previous qualitative research related to hip osteoarthritis and THR

Questions in diary	Topics from previous research
Pain symptoms, daily activity, feeling, mobility, social interaction and other factors	• pain and symptoms • daily activities • weakness • feeling including fear • difficult movement • difficult movement management • support from other people • social aspect • expectations for improvement
Pain management	• pain management
Sleep ability	• sleep ability

Throughout the development process the diary was validated to check it was suitable to use with patients undergoing THR. Due to the relative ease and lack of time pressure for participants to write in the diary at home, this was considered as a one-way communication that might need more clarification of some ambiguous issues. Accordingly, a critical incident approach, using a semi-structured interview, was selected and the interview schedule was developed, which is described in next part.

3.2.3 Interview schedule development

The interview schedule was developed and assessed for face validity by the research team. The final schedule was constructed in three parts: introduction; probes; and closing session. The introduction part explained the aim of the study and the role of participants during the interview. Next, the probes part consisted of exploring, reflection and expanding critical points from data in the returned diary. Finally, the closing session asked the participants about their comments in the diary and interview as well as any views that they had. The final question asked participants to confirm continual participation in further questionnaires, diaries and interviews (Table 9).

Table 9: Three main parts of interview schedule

Interview schedule	
Introductory session	• Introduce the interviewer • Explain the purpose of the study and questions in the interview
Main session: Probes	Explore situations • Could you tell me a bit more about … situation? (positive or negative critical incidents from the diary) • How did it come about? • What happened afterwards? • How did you feel about it? • Was there something that you or someone else could have done to stop it happening? Reflect (Confirm the meaning of critical incidents) • Could you read this section again? Looking back on it now, what do you think? • Would you put something different with hindsight? Expand (Explain the meaning of critical incidents) • What did you mean by this? • Could you clarify what the issue was here?
Closing session	• Thank participants and explain what will happen after the interview • Confirm transcript of the interview • Confirm their interests for taking part in further diaries and interviews

3.3 Summary

All research instruments were developed iteratively and validated for face validity. A single questionnaire was developed through the review process and cognitive interviews as well as diary and interview schedule were created by the research team. All of them were approved by the NRES Committee, LJMU Research Committee, and Research department of relevant hospitals prior to conducting the Questionnaire Survey and Diary and Interviews.

Chapter 4: Questionnaire surveys

4.1 Introduction

This longitudinal element was conducted to explore the relationship between psychological factors and expectations with pain, function and QOL. This chapter starts with the aim and objectives, and continues with the method. Statistical findings are composed of descriptive statistics with comparisons, correlations, and linear regression that are finalised with a discussion and conclusion.

4.2 Aim and objectives

The questionnaire survey aimed to investigate the extent and nature of the relationship between psychological factors and expectation with pain and functioning on QOL. To achieve this aim, there are three objectives realised below:

1. To compare level of psychological factors and expectations between patients undergoing the first THR, experienced in THR, and no THR at this moment;
2. To compare psychological factors, expectations, pain, function and QOL between each point of time;
3. To examine relationship between psychological factors and expectations with pain, function, and QOL in cross-sectional and longitudinal designs.

4.3 Methods

4.3.1 Recruitment

There were two steps of recruitment. First, the hip surgeons were invited to support the recruitment of hospitals and patients. Following this, the surgeons and their support staff helped with recruiting participants from their respective centres.

4.3.1.1 Recruitment of facilitating surgeons

Twenty-five hip surgeons were initially invited to support recruitment to the study. The surgeons working at five NHS trusts around Merseyside area received an email sent either directly to orthopaedic consultants or indirectly via pharmacists working at the trust. Surgeon names and contact details were initially drawn from details of surgeons

conducting hip replacements published on hospital and NHS websites, as well as through networks of the research team. Following a positive response, the researcher arranged face-to-face meetings with the surgeon to describe the study and explain the recruitment process. Any questions that the surgeon had were answered at this initial meeting or via a later email if they could not be answered at the meeting. In some cases, administrative staff also attended part of the meeting such that they could understand the elements of the recruitment that they would be participating in. One further trust was approached later in the recruitment phase to help boost recruitment and the same process was used to approach surgeons and gain agreement to support recruitment. Overall, sixteen surgeons working in five centres agreed to support the recruitment.

Ethical approvals were granted by Liverpool Central REC in December 2012 and the research governance of each of the facilitating Trusts between March and July 2013. More details of ethical consideration were described in chapter 2 on page 45.

Regarding the agreed process of recruitment, information packs were sent out by the administrative staff in all centres. The process was based on the local procedures for sending the first appointment letter and availability of support. Central administrative staff in centre A, B and D and the secretary of hip surgeons in centre C and E administered the information packs. In each pack, there was an invitation letter, personalised to be from hip orthopaedic consultant, patient information sheet of the survey, Contact Details form, the questionnaire and a freepost envelope. They were posted with the first appointment letter via the teams described above. For centre A, packs were supplied with first class postage already applied. In centre B, packs were supplied without postage and these were incorporated into the invitation letter. For the remaining centres, packs were supplied with second-class stamps.

4.3.1.2 Recruitment of patients

Patients who had been referred to the consultant supporting recruitment with chronic hip pain were invited to take part in the study.

Eligible patients were:

- Over eighteen years old

- Able to complete the questionnaire in English

Patients were excluded from the study in cases of:

- No THR planned at this time
- Previous history of THR

On the return of the questionnaire, participants' experience in hip surgery and other co-morbidities were examined. Their schedule to undergo the first THR was consecutively confirmed after two weeks of their appointment by posting reply slip or calling to the participants. They who were undergoing THR received further questionnaires on three occasions at around one month pre-operative (Q2), one month post-operative (Q3), and six months post-operative (Q4). A reminder questionnaire or a reply slip was mailed out to non-responders at two weeks after sending out original mailing. Alternatively, they were reminded via either calling or email, which one of them was preferred to be contacted. Patients who were not undergoing a THR at this time, or who met any of the exclusion criteria for continuation left the study after return of questionnaire at baseline. Their responses were included for the comparison of data at baseline between recruited participants and those not meeting the inclusion criteria for continuation. This may be useful to examine the difference of pain, function, psychological factors and demographic data between these groups, in particular with recruited and THR experienced participants.

4.3.2 Measures

Development of the final versions of the questionnaires used in this part of the study is described in chapter 3. According to the aim, the primary outcomes were composed of hip symptoms, hip pain, hip function, hip-related QOL, overall QOL, and SRH. Psychological factors and expectations were predictors. In addition, there were baseline characteristics associated with osteoarthritis and THR.

4.3.3 Data analytic approach and sample size

Sample size was estimated with respect to statistical analysis. Multiple regression was utilised in accordance with the aim of this study to investigate the relationship of predictors and outcomes. Number of participants was calculated from power analysis depending on power value (0.8), number of predictors (N=18), and effect size

(R^2=0.26)[191,192]. Regarding Cohen's convention, there have been three effect sizes: large (R^2=0.26); medium (R^2=0.13); and small effect size (R^2=0.02)[192]. Previous literatures using multiple regression, effect size were calculated in a range of medium to large effect (0.07-0.53)[70,76,87], therefore the total sample size should be between 77 and 157 approximately[191,192].

Prior to data analysis, all variables were analysed for normality assumptions to select the appropriate analytic approaches for comparison and correlation. Three criteria of Kolmogorov-Smirnov test with Lilliefors Significance Correction (p-value $\geq$ 0.05), skewness and kurtosis (-1.96 < Z < 1.96) were considered to accept normality assumptions. Based on their normality, either mean (± Standard error of mean; SEM) or median (interquartile range; IQR) was reported for continuous data. Number of participants with per cent (N (%)) was reported in the table for categorical data.

Descriptive statistics of all variables and demographic data were reported. Wilcoxon rank-sum, and χ^2 tests assessed the difference of all variables and demographic data between (1) Three sub-groups at baseline based on their status about THR and (2) Responders and non-responders at six months post-operative to support consequent data analysis in the recruited participants. To examine the significant difference of all variables changes over time, Wilcoxon signed-rank test was performed with sequential matches. In addition, Spearman's correlation was utilised to test for the cross-sectional and longitudinal relationships of psychological factors and expectations with the outcomes. Particularly, demographic data was included to cross-sectional analysis at baseline.

Following correlation analysis, there were two categories of results. In the first category, only correlations were reported in separately large and moderate effect sizes. Effect sizes were interpreted from correlation coefficients (Spearman's rho; r_s). Large effect size is that correlation coefficient is more than 0.50, whilst moderate effect size is categorised in a range of correlation coefficient between 0.50 and 0.30[192]. The top three correlation coefficients of psychological factors were ranked to report the possible predictors. On the other category, multiple linear regression was performed to describe the possible association of psychological factors, and expectations with outcomes. Criteria of including

predictors in models were sample size, parametric data variables, large values of coefficients ($r_s \geq \pm 0.50$), and results of the previous studies. Anxiety[79,81–83] and depression[81,82,84] were reported as the potential predictors. In cross-sectional relationship, there were two points of time that were able to conduct regression analyses composed of recruited participants at baseline and one month post-operative. Owing to sample size, two other points of time had less sample size than benchmark to perform the regression. At least 25 participants were required to conduct this analysis regarding one predictor for large effect size expected[191]. This was also screening longitudinal relationships, model of pre-operative predictors at baseline with post-operative outcomes at one month was only analysed. Different transformations (logarithm, square root and reciprocal) were attempted to improve non-parametric variables and some of them were achieved normality assumptions.

Hierarchical method was selected in all models. Either anxiety or depression with large effect size was entered in the first order of predictors therefore remaining high correlated predictors were included regarding the above criteria. Listwise deletion was utilised to include participants who completed all variables. Casewise diagnostics revealed multivariate outliers in all analyses with scatter plots of the standardised predicted and standardised residuals values. Numbers of outliers were able to be outside ±2.0 for 5% of cases but not more than ±2.5 as well as outside ±2.0 for 1% of cases. If outliers were confirmed more than this range, the regression was performed again excluding outliers. To control multicollinearity of several predictors in the model, value of variance inflation factor was established as being below 2. Statistical significance was established at p-value less than 0.05 and statistical analysis was performed with the use of SPSS (version 22).

At baseline, multiple regression was performed for four outcomes: hip symptoms; pain; function (ADL); and overall QOL. Other outcomes and some of highly correlated predictors were non-parametric data. Transformation had been done, although some variables were unable to achieve normality assumptions, which were hip function (sports), hip-related QOL, SRH, and pre-operative two-week expectation of pain. They were then excluded from the regression analyses. Square root transformation of depression was included in the first

box with enter method and remaining variables were entered in the second order by forward method.

At one month post-operative, simple linear regression analysis was performed in the outcomes of hip symptoms, hip pain and hip-related QOL. According to above criteria, anxiety was the predictor that was included in the model with enter method following successful transformation of square root. In addition, longitudinal linear regression was conducted. The outcomes were hip pain and hip-related QOL at one month post-operative. The predictor was pre-operative fear of anaesthesia at baseline. All final models were selected with consideration of outliers and multicollinearity.

Where possible, missing values were managed according to existing studies for the relevant parts of the questionnaire in this study. For primary outcomes, HOOS questionnaire was reported in managing missing data by scoring of at least 50% of items responded[170]. In psychological factors, missing values of anxiety and depression parts were replaced by average scores of items that were answered using at least four items in each aspect[193]. Missing values of pain catastrophising were replaced by average scores of remaining items where they were not exceed two missing items[194]. Moreover, missing values in self-efficacy of pre-operative symptoms and pain were replaced with the average score of the remaining answers. Only one item was missing from each aspect[195]. Where there were missing data in the parts of the questionnaire that there was no appropriate mechanism to replace the data, these were excluded from the analysis. These were overall QOL, self-efficacy of post-operative symptoms, function, and rehabilitation, and expectations.

In addition, familywise error was possible because the Wilcoxon signed-rank test and Spearman's correlation analysis were performed in multiple testing. False-positive results of a significant difference or correlation may occur. Therefore, this problem was managed by calculation of the adjusted p-value based on the Bonferroni correction method. The formula is a value of type I error (0.05) divided by the number of tests[196]. The significant result may have p-value less than the adjusted p-value. However, the significant results had p-value less than whether 0.05 or adjusted p-value, which should be viewed with a

caution. This was considered in the isolated results and integrated with the qualitative findings.

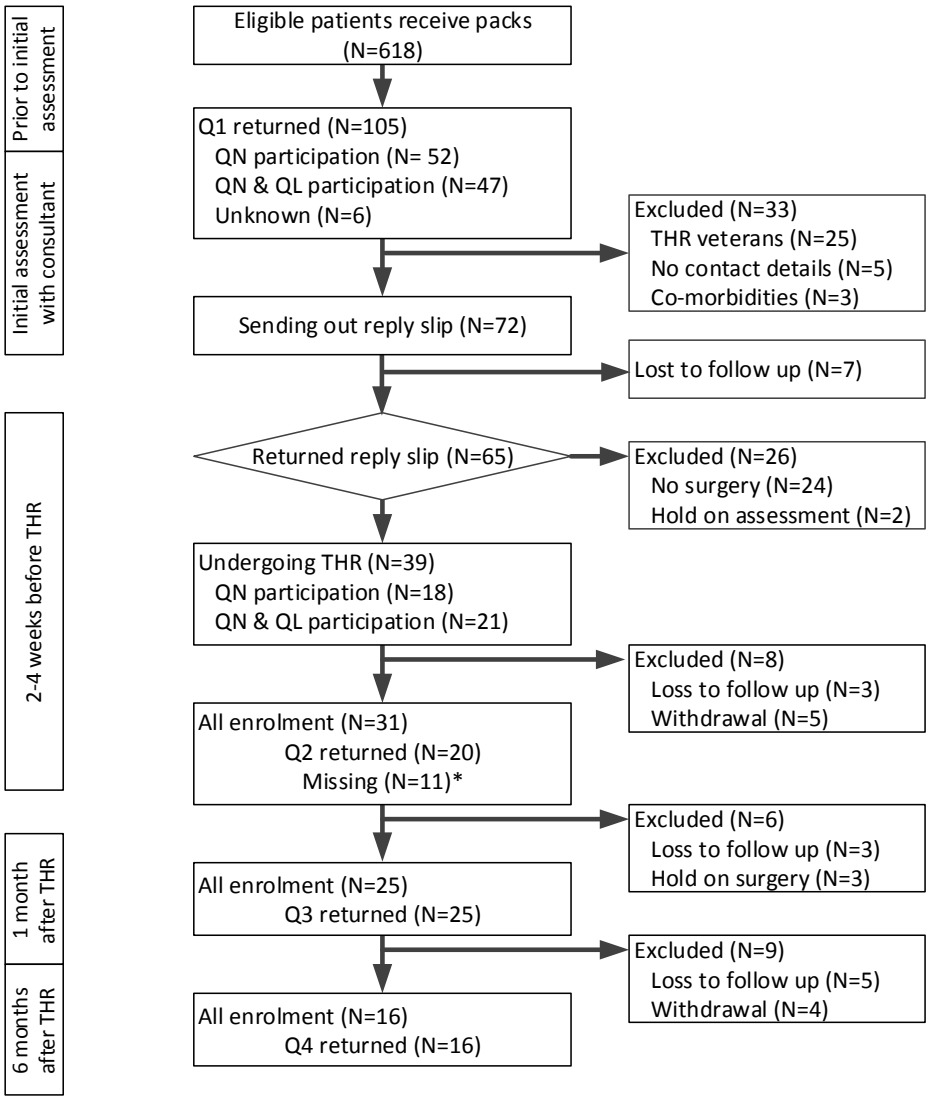
4.4 Results

4.4.1 Recruitment

Details of recruitment are illustrated in Figure 7. In total, 618 eligible patients received the information pack from five centres between March 2013 and January 2015. Overall, 105 patients participated in the study and 33 of them were excluded. Twenty-five of them were experienced in THR, five of them did not give their contact details, and three participants had their co-morbidities related to literacy problems. Consecutively, a reply slip was posted to 72 participants after their first consultation with the surgeon and 65 reply slips were returned. Following this schedule, 39 participants were timetabled to receive further questionnaires at three points of time. 24 participants were excluded due to no schedule for THR at this moment. Finally, there were 20 (51%), 25 (64%) and 16 (41%) of the further questionnaires returned. At around one month pre-operative, 11 participants returned reply slip when their THR was done and 3 participants were postponed their THR due to personal reason and infection.

At baseline, numbers of supporting surgeons were varied in five centres. The highest numbers of surgeons was five in centre A so that numbers of questionnaires administered and response rate were also maximised in this centre. Average response rate was calculated as 17% that was varied in a range of 2-50%.

Figure 7: Summary of quantitative survey recruitment



*11 of participants were not completed the second questionnaires because they returned the reply slip after THR was done. QN = quantitative phase (questionnire), QL = qualitative phase (diary and interview)

4.4.2 Descriptive statistics

At each occasion of measurement, normality assumptions of variables were varied. Almost all variables were non-parametric data.

4.4.2.1 Demographic data

All details of demographics and socio-economic data are represented in Table 10 and Table 11, respectively. The whole group of 105 participants (All) was categorized in three subgroups based on their status about THR. There were recruited participants undergoing their first THR (N=39), THR-experienced participants (N=25) and participants who did not schedule for THR (N=24).

Table 10: Demographic data at baseline between the whole group and three sub-groups

	All[a] (N=105)	**RP[a] (N=39)**	**EP[a] (N=25)**	**NP[a] (N=24)**
Female	66 (63%)	20 (51%)	17 (68%)	18 (75%)
Age at baseline (years)	66.0 (56.3, 76.0)	67.5 (60.0, 76.3)	76.0 (61.0, 79.0)	63.0 (51.3, 71.3)
BMI (kg/m^2)	27.43 (24.39, 31.49)	26.62 (24.60, 30.10)	28.78 (25.08, 31.39)	29.83 (25.77, 32.62)
Smoking	17 (16%)	6 (15%)	3 (12%)	3 (13%)
Having other co-morbidities	68 (64%)	21 (54%)	20 (80%)	17 (71%)
Number of other co-morbidities	1 (0, 2)	1 (0,1)	2(1, 2)*	1 (0, 2)
Effect of co-morbidities on pain and movement	22 (21%)	5 (13%)	6 (24%)	7 (29%)
Number of treatments	1 (1,2)	1 (1,2)	1 (1,1)	1 (1,1)
Numbers of pain medications	2 (1,3)	2 (1,3)	2 (1,3)	2 (1,2)
Recruiting through centre A	72 (69%)	29 (74%)	17 (68%)	13 (54%)

Cells represent median (IQR) for continuous data and N (%) for categorical data.

[a]All is the whole group of participants. RP is recruited participants. EP is THR-experienced participants. NP is participants who did not schedule for THR.

*p-value < 0.05 when EP and NP were compared with RP

Sixty-six participants were female (63%) across 105 participants with variation in proportions across the sub-groups. Median age of recruited participants was 67.5 years that was the middle position between the eldest median age in THR-experienced sub-group and the youngest age in participants who did not schedule for THR. Specifically, recruited participants was lower median of BMI (26.62 kg/m^2), lower proportion of participants who had other co-morbidities (54%), lower median of co-morbidities number (1) and lower co-morbidities affecting pain and movement (13%) than other groups. By contrast, number of smokers and proportion of participants from centre A in recruited sub-group were the highest median and proportion, respectively. THR-experienced sub-group was the highest proportion of participants, who reported having other co-morbidities and median of co-morbidities number. The highest BMI and proportion of participants reporting effect of co-morbidities on pain and movement were found in the participants who did not schedule for THR. Median of treatment and pain medications were similar in all sub-groups. In addition, no significant difference of recruited participants with other

sub-groups was reported except for number of co-morbidities. THR-experienced participants were significantly higher number of co-morbidities than recruited participants.

Table 11: Descriptive statistic of socio-economic data and circumstances between the whole group and three sub-groups

		All[a] (N=105)	RP[a] (N=39)	EP[a] (N=25)	NP[a] (N=24)
Living in own home		86 (82%)	33 (85%)	23 (92%)	19 (79%)
Living with anyone		68 (65%)	28 (72%)	12 (48%)	16 (67%)
Helper during last week		68 (65%)	26 (67%)	16 (64%)	15 (63%)
One-floor home		23 (22%)	10 (26%)	7 (28%)	3 (13%)
Usual transport:	Car	67 (64%)	24 (62%)	19 (76%)	14 (58%)
	Walking	7 (7%)	2 (5%)	0 (0%)	4 (17%)
	Public transport	19 (18.1%)	10 (26%)	5 (20%)	4 (17%)
	Others	10 (10%)	3 (8%)	1 (4%)	1 (4%)
Working status:	Working	22 (21%)	5 (13%)	4 (16%)	7 (29%)
	Retired	64 (61%)	27 (69%)	15 (60%)	14 (58%)
	Not working	19 (18%)	7 (18%)	6 (24%)	3 (12%)
Annual household income (£):					
0-19,999		56 (53%)	23 (59%)	14 (56%)	13 (54%)
20,000-39,999		21 (20%)	9 (23%)	4 (16%)	4 (17%)
40,000-59,999		8 (8%)	3 (8%)	0 (0%)	4 (17%)

Cells represent n (%) for categorical data.

[a]All is the whole group of participants. RP is recruited participants. EP is THR-experienced participants. NP is participants who did not schedule for THR.

The proportion of participants living in their own home across the whole group and three sub-groups was around 80%. The highest proportion of living with someone (72%) and receiving additional help during last week (67%) were found in recruited participants. Although, the lowest proportion of receiving additional help was reported in the sub-group of participants who did not schedule for THR as 63%. Around one fourth of participants in recruited and THR-experienced participants lived in one-floor home. All participants showed the same trend of usual transport and annual household income. Car and income less than £20,000 were the highest proportion in all sub-groups.

Consequently, comparison of demographic data between responders and non-responders was conducted for further analysis in recruited participants. Responders were the participants completing the questionnaires at baseline through to six months post-operative. Non-responders were all participants who postponed their THR, were lost to follow-up, and withdrew from the study. No significant difference was identified between these groups. All details are shown in Appendix 15.

In addition, other demographics data were asked the recruited participants at around one month pre-operative, there were

- Durations between completing questionnaires at baseline with date of surgery: Calculation in average and range reported 13 (1-34) weeks from 31 participants.
- Hip sides for THR: Three participants (15%) would have THR for both hip sides from twenty participants.
- Information sources of THR: All participants got information of THR from healthcare providers and information leaflet. Three of them reported other sources such as book and websites.

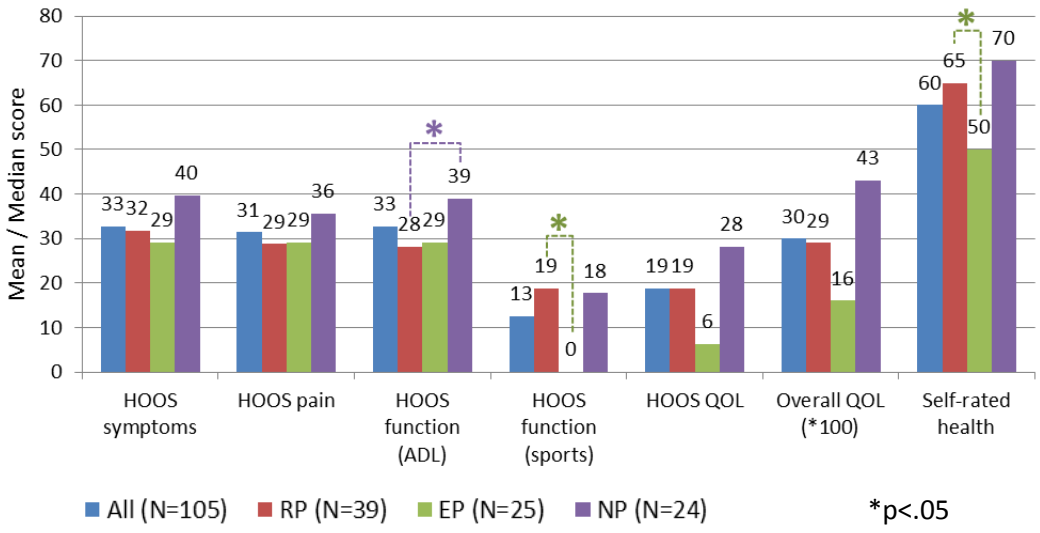
Due to multiple testing, the adjusted p-value was calculated as 0.001 from 48 comparison tests. Only one significant p-value, in the comparison of co-morbidities between recruited and experienced participants, was 0.006. Therefore, other significant results that had a p-value between 0.001 and 0.05 should be viewed in isolation. They should also be compared with the qualitative findings.

4.4.2.2 Personal variables at baseline

Either median or mean of all variables in the whole group and three sub-groups are displayed in Figure 8 - Figure 10. Three sub-groups were recruited participants, experienced participants, and participants who did not schedule for THR. Comparison between recruited participants and two other sub-groups were reported in these figures. Figure 8 reports median or mean scores of all primary outcomes comparison. Figure 9 illustrates the comparison of median or mean scores of psychological factors including anxiety, depression, fear, self-efficacy, emotional states, and pain catastrophising. Figure

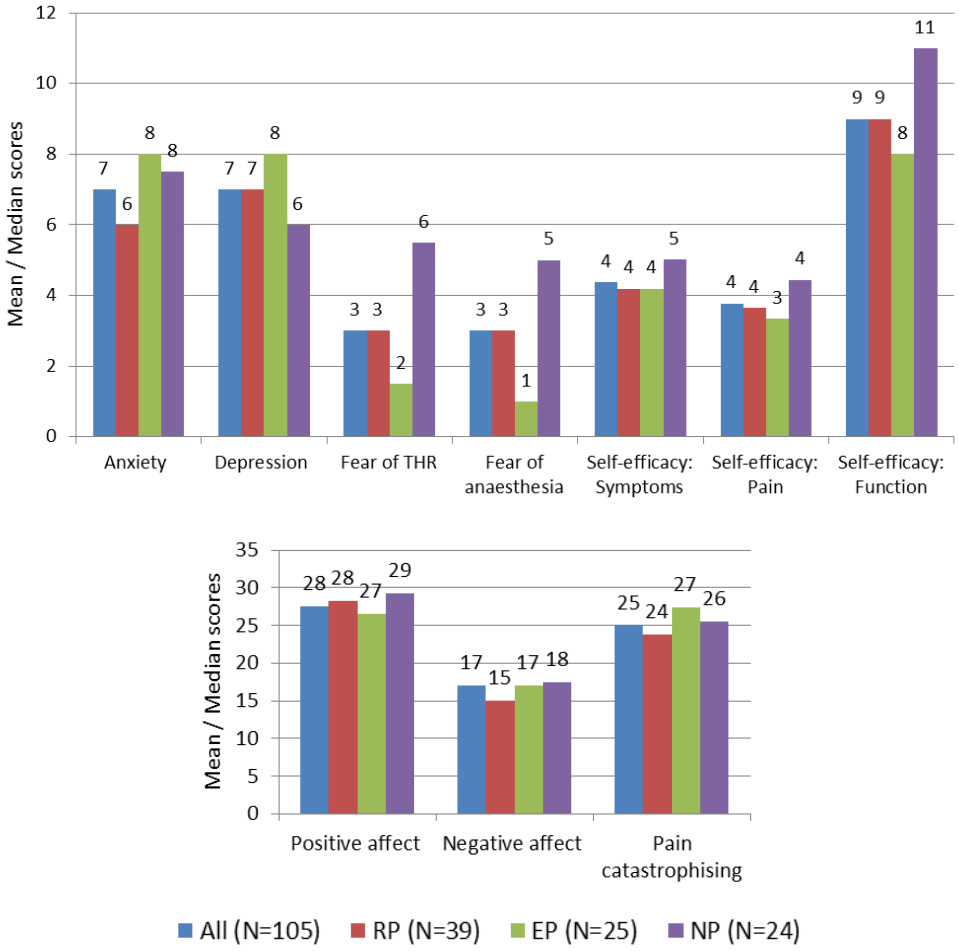
10 shows the median scores of expectations in pain and function. All details of comparison are illustrated in Appendix 18.

Figure 8: Comparison of mean or median of all outcomes between the whole group and three sub-groups at baseline



In the whole group, hip symptoms, pain, and function in ADL were severe problems. Severe-extreme problems of hip function (sport) and hip-related QOL were illustrated. Low overall QOL and moderate self-rated health were reported. In subgroups comparison, all outcomes of recruited participants were very close to the whole group; however, the worst problems were found in THR-experienced participants, while patients who did not scheduled for THR reported better outcomes than two others. Comparison between recruited, and THR-experienced participants was significantly worse sports function (Median = 0.00, U = 264.00, Z = -2.17, p = 0.030, r = -0.29) and SRH (Median = 50.00, U = 287.50, Z = -2.23, p = 0.025, r = -0.29) than recruited participants (Median = 18.75, 65.00 respectively). In addition, participants who did not schedule for THR (Mean = 38.94 ± 4.86) reported their better hip function (ADL) than recruited participants (Mean = 28.18 ± 2.80, t(60) = -2.06, p = 0.043, r = 0.26).

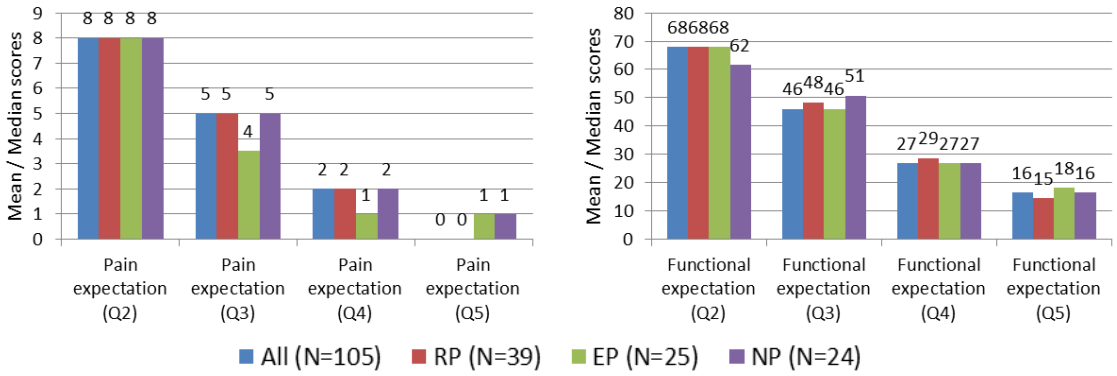
Figure 9: Comparison of mean or median of all psychological factors between the whole group and three sub-groups at baseline



For psychological factors, the whole group reported that anxiety and depression were lower than cut-point of possible clinical condition. Fear of THR and anaesthesia were low level. In self-efficacy, symptoms and pain aspects were under moderate level, while function aspect was moderate-high level. Positive affect score was mild-moderate level; although slightly negative affect was expressed. Mean score of pain catastrophising was represented closely as moderate degree. All psychological factors of recruited participants were close to the whole group. THR-experienced participants reported their higher anxiety and depression than others that were categorised into possible clinical condition. Participants who did not schedule for THR reflected their anxiety around the same level as THR-experienced participants despite the lowest of depression score. On the contrary, the lowest level of fears and all self-efficacy aspects were found in THR-experienced

participants, whereas participants who did not schedule for THR reported the greatest both scores. Moods state and pain catastrophising were quite similar among three sub-groups. Following statistical comparisons of all factors, no significant difference was reported.

Figure 10: Comparison of median of expectations between the whole group and three sub-groups at baseline



Q2 = at two weeks pre-oeprative, Q3 = at one month post-operative,
Q4 = at six months post-operative, Q5 = at one year post-oeprative

In the whole group, pain and functional expectations were the highest level of pre-operatively extreme pain and severe dysfunction. Following THR, they were decreased to moderate pain and dysfunction at one month post-operative and they were continually dropped down to mild pain and dysfunction at six months post-operative. At one year, no pain and very mild dysfunction were reported. All sub-groups reported pain and dysfunctions levels of expectations in quite similar to the whole group along THR. In addition, no significant difference was found in comparison of all expectations.

Patients who scheduled for the first THR were in the middle positions of almost all demographics and variables between two other subgroups. THR veterans reported the highest number of co-morbidities that was significant difference with patients undergoing the first THR. THR veterans also reflected the worst hip outcomes, overall QOL, and SRH. The highest anxiety, depression and pain catastrophising level were measured despite the lowest fears and all self-efficacy aspects. Moreover, patients who did not undergo THR had the highest BMI and proportion of participants who reported effect of co-morbidities on pain and movement. On the contrary, the outcomes were the lowest difficulties except for

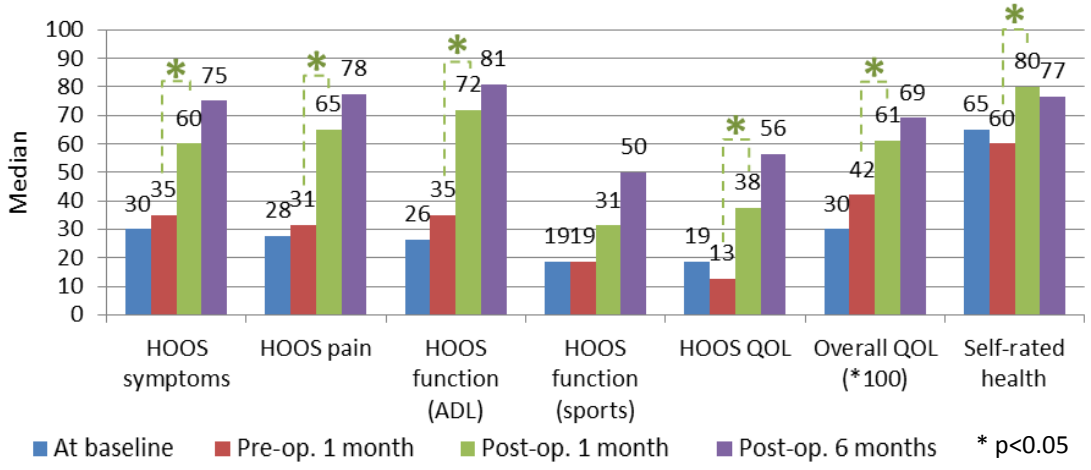
function in sports. Their lowest depression was reported in contrast with the highest scores of positive moods, all self-efficacy aspects and both fears.

In the consideration of familywise error, the adjusted p-value was calculated as 0.001 from 50 comparison tests. Three comparisons tests reported p-values in a range of 0.025-0.043 that were more than the adjusted p-value. Thus, all of them should be viewed with caution in an isolated result and should be corroborated with the qualitative findings.

4.4.3 Changes of outcomes, psychological factors and expectations across total hip replacement

Comparisons of median scores across THR are illustrated in Figure 11 -Figure 16. Changes of the primary outcomes are reported in Figure 11. In psychological factors, changes of anxiety, depression, fear of THR and anaesthesia are showed in Figure 12, whereas trends of all aspects of self-efficacy are reported in Figure 13. Figure 14 shows changes of positive affect, negative affect, and pain catastrophising. In addition, pain and functional expectations at four further occasions are illustrated in Figure 15 and Figure 16, respectively. All details of descriptive statistics and comparison of test statistics are represented in Appendix 19.

Figure 11: Changes of outcomes over time

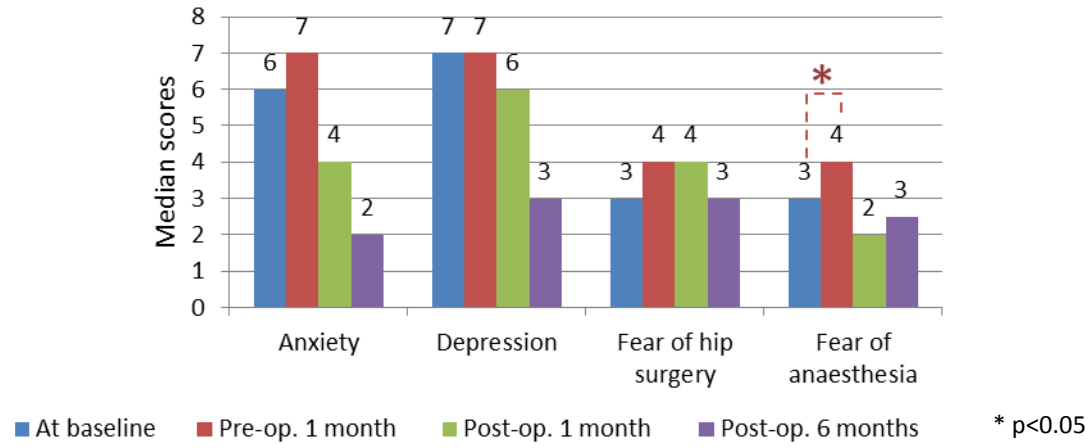


0 = the worst symptoms, pain, function, and QOL, 100 = the best symptoms, pain, function, and QOL

At baseline, moderate-severe problems of all hip outcomes, moderate overall QOL and moderate-high SRH were reported. At around one month pre-operative, hip symptoms,

pain, function (ADL), and overall QOL showed a little improvement in the same level, whilst there was small reduction of hip-related QOL and SRH. The same severity of hip function in sports was reported. Following THR, significant improvements were illustrated in all outcomes except for hip sports (function). Hip symptoms ($Z = -2.59$, $p = 0.007$, $r_s = -0.51$), pain ($Z = -3.23$, $p < 0.001$, $r_s = -0.61$), function (ADL) ($Z = -2.98$, $p = 0.001$, $r_s = -0.56$), overall QOL ($Z = -2.20$, $p = 0.027$, $r_s = -0.42$) and SRH ($Z = -2.60$, $p = 0.008$, $r_s = -0.49$) were increased to moderate-mild severity of hip problems and better health status. Hip sport function and hip-related QOL ($Z = -3.12$, $p < 0.001$, $r_s = -0.59$) were improved to moderate-severe problems. At six months post-operative, all of them were continually increased despite decreasing of self-rated health. Hip sports (function) and hip-related QOL were improved to moderate severity; however others were stayed at the same level. No significant difference at post-operative period was reported.

Figure 12: Changes of anxiety, depression, and fears

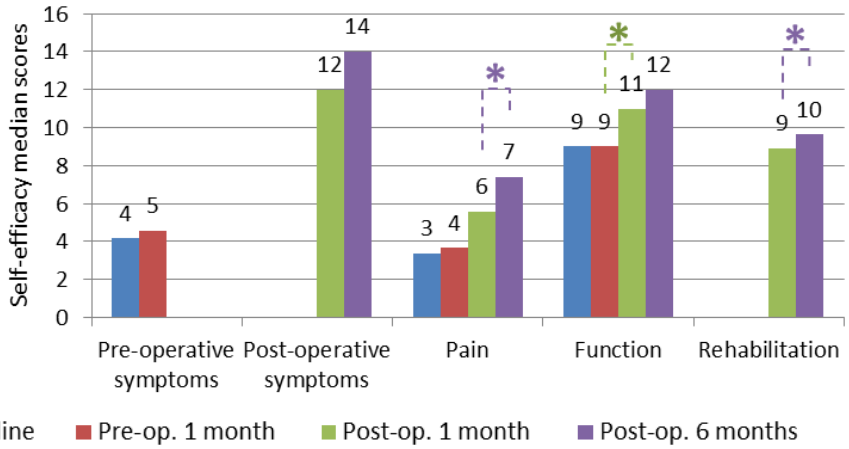


0 = no anxiety, no depression and no fear, 8-10 = possible clinical conditions of either anxiety or depression disorder, 10 = the worst fear

Normal anxiety, normal depression and low both fears were measured at baseline. At around one month pre-operative, whilst anxiety was increased, depression was stable at closely possible clinical conditions without significant difference. Both fears were higher than baseline. Particularly, fear of anaesthesia showed significant increasing ($Z = -2.60$, $p = 0.007$, $r_s = -0.42$) from baseline to pre-operative one month. Post-operatively, anxiety was steadily dropped down but slow decreasing of depression was found until six months. Fear of THR was stable at one month, and was then slightly reduced at follow-up. Fear of

anaesthesia was dramatically dropped down at one month but showed little rising at six months post-operative. All changes after THR were non-significantly different.

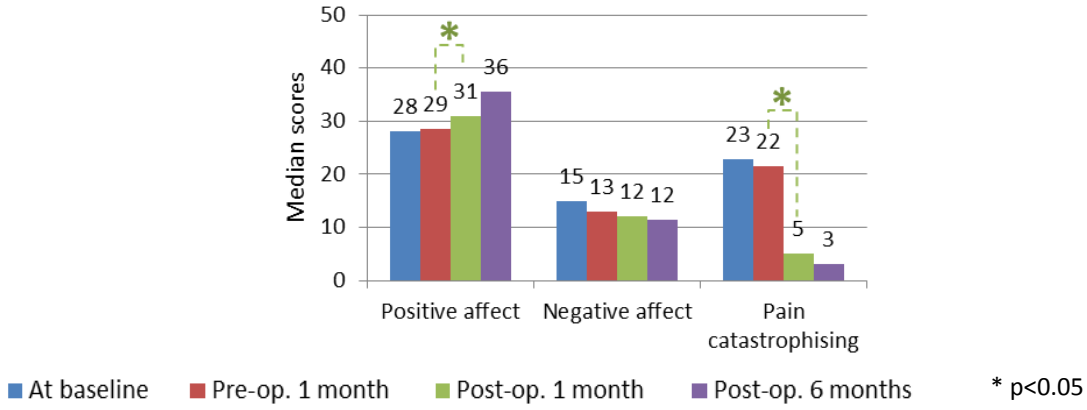
Figure 13: Changes of all aspects of self-efficacy over time



0 = the worst self-efficacy, 10 = the best self-efficacy of pre-operative symptoms, pain and rehabilitation, 16 = the best self-efficacy of post-operative sumptoms, and function

All self-efficacy aspects were improved across the time despite variety of improvement. Pre-operatively, mild-moderate self-efficacy of symptoms and pain were measured at baseline. Self-efficacy of function was moderate level. At around one month pre-operative, self-efficacy of symptoms and pain were slightly increased at the same level but self-efficacy of function was stable. At one month post-operative, self-efficacy of symptoms, pain, and function were enhanced to moderate-high, moderate and moderate-high levels, respectively. Only significant enhancement of functional self-efficacy was reported ($Z = -2.44$, $p = 0.014$, $r_s = -0.46$). Moreover, high self-efficacy in rehabilitation was measured at this time. Following this, enhancing self-efficacy of all aspects was carried on until six-month follow-up. Self-efficacy of pain ($Z = -2.29$, $p = 0.020$, $r_s = -0.45$) and rehabilitation ($Z = -2.16$, $p = 0.029$, $r_s = -0.41$) were significantly increased in recovery period.

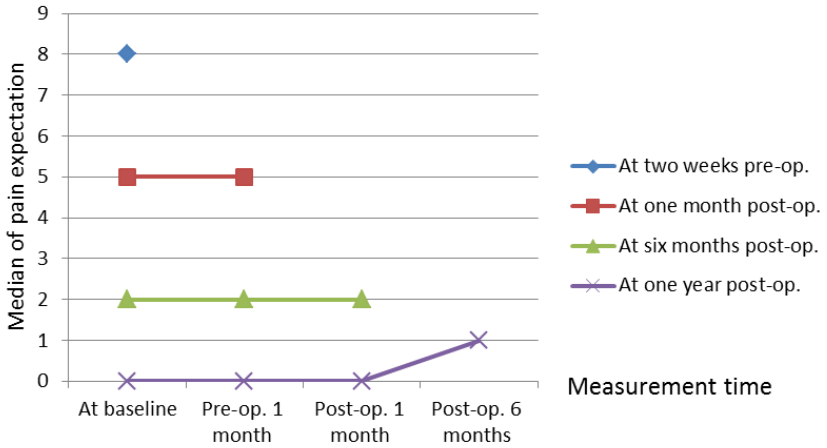
Figure 14: Changes of positive and negative moods state and pain catastrophising over time



0 = no pain catastrophising, 10 = the slightest positive and negative moods state, 50 = the best positive and the worst negative mood state, 52 = the worst pain catastrophising

Moderate positive affect, mild negative affect, and moderate pain catastrophising were measured at baseline. Positive affect was little increased, while negative affect and pain catastrophising was slightly reduced at around one month pre-operative. Post-operatively, the same trends of them were continued. Positive affect at one-month recovery were significantly higher than pre-operative period ($Z = -2.20$, $p = 0.025$, $r_s = -0.42$). There was slightly reducing of negative affect without significant difference, although pain catastrophising at one month post-operative was dramatically lower than median score at around one month pre-operative ($Z = -2.70$, $p = 0.004$, $r_s = -0.51$). Similar changes of them were illustrated until six-month follow-up without significant difference.

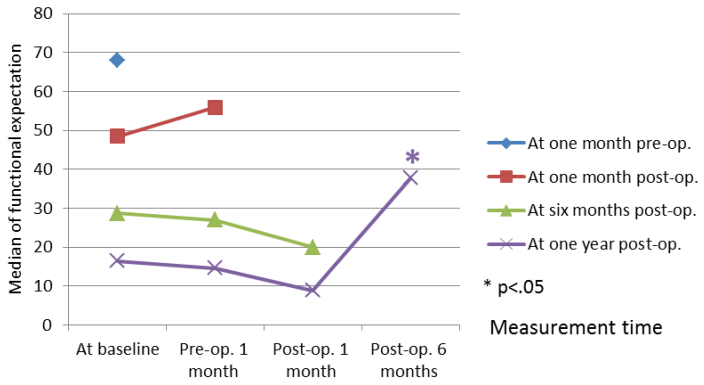
Figure 15: Changes of pain expectations over time



0 = no pain, 10 = the worst pain

At baseline, participants expected to have high-extreme pain at two weeks pre-operative. This was continually reduced to moderate pain at one-month, mild pain at six-month and no pain at one-year follow-up. The same level of pain was also expected by respondents at around one month pre-operative and post-operative. At six-month follow-up, they expected very mild pain at one year post-operative increased from no pain. No significant difference of pain expectations was reported.

Figure 16: Changes of functional expectations over time



0 = the best function, 100 = the worst function

At baseline, participants expected to have high-extreme dysfunction level at two weeks pre-operative. Their expectations of functions were reduced to moderate level at one month, mild-moderate level at six months and mild level at one year post-operative. Similarly, functional expectations measured at around one month pre-operative and post-operative, were illustrated in the same trend of reduction. At six-month follow-up, their expectation of function at one-year follow-up was dramatically increased from very mild severity to mild-moderate severity with significant difference ($Z = -2.20$, $p = 0.031$, $r_s = -0.55$).

Due to multiple testing, the adjusted p-value was calculated as 0.0007 from 63 comparison tests. The p-values of two comparison tests were less than the adjusted p-value; i.e. comparison of hip pain (p-value = 0.0002) and hip-related QOL (p-value = 0.0004) from two weeks pre-operatively until one month post-operatively. Many comparisons tests reported a significant difference of p-value in a range of 0.0002-0.031. Thus, these tests should be taken into consideration when corroborating with the qualitative findings.

4.4.4 Relationships in cross-sectional design

Correlations of psychological factors with the outcomes were reported at each time point. Moreover, demographic data were explored the relationships with outcomes at baseline. Following the results of correlations, regression analysis was also conducted at baseline, and one month post-operatively.

4.4.4.1 At baseline

Significant relationships between the outcomes with psychological factors and demographic data were reported in large and moderate effect sizes. Effect sizes were based on their correlation coefficients. These significant correlations in 39 participants at baseline are summarised in Table 12. All details of correlational matrices are displayed in Appendix 20.

Table 12: Summary of significant correlations of the outcomes with the psychological factors and demographic data at baseline (N=39)

Outcomes	**Psychological factors correlated in (r_s, p-value)**	
	Large effect size (r_s > 0.50)	**Moderate effect size (0.30 < r_s ≤ 0.50)**
Hip symptoms	• Depression (r_s = -0.55, p <0.001) • Positive affect (r_s = 0.51, p = 0.001) • Pain catastrophising (r_s = -0.68, p <0.001) • Self-efficacy of symptoms (r_s = 0.59, p <0.001) • Self-efficacy of pain (r_s = 0.51, p = 0.001) • Self-efficacy of function (r_s= 0.54, p = 0.001) • Pain expectation at two weeks pre-operatively (r_s = -0.65, p <0.001) • Functional expectation at two weeks pre-operatively (r_s = -0.55, p = 0.002)	• Anxiety (r_s = -0.38, p = 0.018) • Negative affect (r_s = -0.35, p = 0.031) • Age (r_s = 0.39, p = 0.016) • Smoking (r_s = -0.34, p = 0.035) • Annual income (r_s = 0.40, p = 0.020)
Hip pain	• Depression (r_s = -0.60, p<0.001) • Pain catastrophising (r_s = -0.71, p<0.001) • Self-efficacy of symptoms (r_s = 0.62, p<0.001) • Self-efficacy of function (r_s = 0.74, p<0.001) • Pain expectation at two weeks pre-operatively (r_s = -0.70, p<0.001) • Functional expectation at two weeks pre-operatively (r_s = -0.73, p<0.001)	• Anxiety (r_s = -0.41, p = 0.011) • Positive affect (r_s = 0.45, p = 0.005) • Self-efficacy of pain (r_s = 0.50, p = 0.001) • Smoking (r_s = -0.39, p = 0.016)
Hip function (ADL)	• Depression (r_s = -0.54, p <0.001) • Pain catastrophising (r_s = -0.67, p<0.001) • Self-efficacy of symptoms (r_s = 0.62, p<0.001)	• Anxiety (r_s = -0.42, p = 0.008) • Positive affect (r_s = 0.42, p = 0.010) • Smoking (r_s =-0.37, p = 0.024)

Outcomes	Psychological factors correlated in (r_s, p-value)	
	Large effect size (r_s > 0.50)	**Moderate effect size (0.30 < r_s ≤ 0.50)**
Hip function (ADL)	• Self-efficacy of pain (r_s = 0.54, p<0.001) • Self-efficacy of function (r_s = 0.69, p<0.001) • Pain expectation at two weeks pre-operatively (r_s = -0.65, p<0.001) • Functional expectation at two weeks pre-operatively (r_s = -0.79, p<0.001)	• Helper during last week (r_s = -0.39, p = 0.016)
Hip function (sports)	• Pain catastrophising (r_s = -0.53, p = 0.001) • Self-efficacy of function (r_s = 0.52, p = 0.002) • Pain expectation at two weeks pre-operatively (r_s = -0.51, p = 0.004) • Functional expectation at two weeks pre-operatively (r_s = -0.67, p <0.001)	• Depression (r_s = -0.37, p = 0.034) • Self-efficacy of symptoms (r_s = 0.36, p = 0.049) • Smoking (r_s =-0.37, p = 0.010) • Living in own home (r_s = 0.44, p = 0.010) • Helper during last week (r_s = -0.35, p =0.042)
Hip-related QOL	• Pain catastrophising (r_s = -0.62, p<0.001) • Self-efficacy of symptoms (r_s = 0.65, p<0.001) • Self-efficacy of pain (r_s = 0.58, p<0.001) • Self-efficacy of function (r_s = 0.68, p<0.001) • Pain expectation at two weeks pre-operatively (r_s = -0.57, p<0.001) • Functional expectation at two weeks pre-operatively (r_s = -0.56, p = 0.001)	• Anxiety (r_s = -0.50, p = 0.001) • Depression (r_s = -0.47, p = 0.002) • Helper during last week (r_s = -0.35, p = 0.031)
Overall QOL	• Depression (r_s = -0.66, p <0.001) • Pain catastrophising (r_s = -0.71, p<0.001) • Self-efficacy of symptoms (r_s = 0.74, p <0.001) • Self-efficacy of pain (r_s = 0.64, p<0.001) • Self-efficacy of function (r_s = 0.79, p<0.001) • Pain expectation at two weeks pre-operatively (r_s = -0.62, p<0.001) • Functional expectation at two weeks pre-operatively (r_s = -0.61, p<0.001)	• Anxiety (r_s = -0.45, p = 0.004) • Positive affect (r_s = 0.37, p = 0.022) • Negative affect (r_s = -0.34, p = 0.034)
SRH	• Depression (r_s = -0.53, p = 0.001) • Self-efficacy of symptoms (r_s = 0.53, p = 0.001) • Self-efficacy of function (r_s = 0.59, p<0.001) • Functional expectation at two weeks pre-operatively (r_s = -0.65, p<0.001)	• Anxiety (r_s = -0.41, p = 0.011) • Pain catastrophising (r_s = -0.42, p = 0.009) • Self-efficacy of pain (r_s = 0.45, p = 0.005) • Pre-operative one-month pain expectation (r_s = -0.48, p = 0.004) • Post-operative one-year pain expectation (r_s = 0.36, p = 0.004) • Smoking (r_s = -0.47, p = 0.003)

All of the outcomes were negatively related to anxiety, depression, negative affect, pain catastrophising, and almost all expectations. Conversely, positive affect, and all self-efficacy aspects showed the positive correlation with the outcomes. These meant that the worse outcomes were reported in the patients who had

- worse anxiety, and depression,
- higher negative affect, pain catastrophising, fear of THR, and fear of anaesthesia,
- expectations of higher pain and dysfunction in the future,
- lower positive affect and all aspects of self-efficacy.

On the contrary, positive coefficient of post-operative one-year expectation of pain correlated with SRH was reported. The patients who expected to have less pain at one year were low health status at baseline.

Following criteria screening (see page 72), eligible variables were included as predictors in the regression analysis. Final models are illustrated in Table 13. They consisted of the standardised regression coefficients (beta), R, R^2 and adjusted R^2 of each model.

Table 13: Final model of multiple regression in recruited participants at baseline

Outcomes / **Predictors**		**Hip symptoms (N=27)**	**Hip pain (N=27)**	**Hip function (ADL) (N=27)**	**Overall QOL (N=27)**
Beta (p-value)	Square root depression	-0.194 (p = 0.318)	-0.324 (p = 0.029)	-0.235 (p = 0.048)	-0.373 (p = 0.002)
	Pain catastrophising	-0.592 (p = 0.005)			
	Self-efficacy of function		0.604 (p<0.001)		0.626 (p<0.001)
	Functional expectation at two weeks pre-operatively			-0.737 (p<0.001)	
R^2		0.549	0.714	0.799	0.822
Adjusted R^2		0.511	0.690	0.782	0.808
R (p-value)		0.741 (p = 0.005)	0.845 (p<0.001)	0.894 (p<0.001)	0.907 (p<0.001)

A model of hip symptoms was created. The regression coefficient was significantly different from zero, ($F(2, 24) = 14.583$, $p<0.001$), with $R^2 = 0.549$), showing that around half of the variance in hip symptoms was predicted by pain catastrophising. Only

regression coefficient of pain catastrophising differed significantly from zero demonstrating that it was a strong predictor. Patients who had high level of pain catastrophisation tended to report severe hip symptoms.

Next, a regression of hip pain was conducted. The final model was created with depression and functional self-efficacy. The regression coefficient was significantly different from zero, ((F(2, 24) = 29.980, p<0.001), with R^2 = 0.714), showing that around 70% of the variance in HOOS pain was predicted by two strong predictors. Low pain level was possibly reported in patients who had high confidence in managing of hip dysfunctions and low depression.

A model of hip function in ADL was created. The regression coefficient was significantly different from zero, ((F(2, 24) = 47.729, p<0.001), with R^2 = 0.799), showing that around 80% of the variance in HOOS ability was predicted by depression and functional expectation at two weeks pre-operatively. Two regression coefficients differed significantly from zero indicating strong predictors. Patients, who expected pre-operative mild dysfunction and reported low depression, possibly reported mild dysfunction.

Overall QOL model was created. The regression coefficient was significantly different from zero, ((F(2, 24) = 55.604, p<0.001), with R^2 = 0.822), showing that around 80% of the variance in overall QOL was predicted by depression and self-efficacy of function. All regression coefficients differed significantly from zero indicating all strong predictors. Patients who had low depression and high confidence in managing hip dysfunction tended to report high overall QOL.

Depression was a significant predictor of hip pain, function, and overall QOL as well as hip pain and overall QOL were significantly predicted by self-efficacy of function. Pain catastrophising was a strong predictor of hip symptoms, whereas functional expectation at two weeks pre-operatively was a strong predictor of hip functions (ADL).

4.4.4.2 At around one month pre-operative

The relationships were reported from Spearman's correlation matrices that are displayed in Appendix 21. All significant relationships are represented in Table 14 separated in large

and moderate effect size. The top three ranking of the high coefficients were depression, self-efficacy of pain, self-efficacy of symptoms, and pain catastrophising.

Table 14: Summary of significant correlations of the outcomes with the psychological factors at around one month pre-operative (N=20)

Outcomes	Psychological factors correlated in (r_s, p-value)	
	Large effect size (r_s > 0.50)	**Moderate effect size (0.30 < r_s ≤ 0.50)**
Hip symptoms	• Anxiety (r_s = -0.60, p = 0.006) • Depression (r_s = -0.67, p = 0.002)* • Positive affect (r_s = 0.51, p = 0.027) • Negative affect (r_s = -0.55, p = 0.015) • Pain catastrophising (r_s = -0.71, p = 0.001)* • Self-efficacy of symptoms (r_s = 0.54, p = 0.018) • Self-efficacy of pain (r_s = 0.79, p<0.001)*	• Self-efficacy of function (r_s = 0.48, p = 0.039)
Hip pain	• Anxiety (r_s = -0.56, p = 0.011)* • Depression (r_s = -0.52, p = 0.018) • Pain catastrophising (r_s = -0.55, p = 0.012) • Self-efficacy of symptoms (r_s = 0.59, p = 0.006)* • Self-efficacy of pain (r_s = 0.70, p = 0.001)*	• Negative affect (r_s = -0.50, p = 0.026)
Hip function (ADL)	• Pain catastrophising (r_s = -0.60, p = 0.006)* • Self-efficacy of symptoms (r_s = 0.57, p = 0.009)* • Self-efficacy of pain (r_s = 0.77, p<0.001)*	• Anxiety (r_s = -0.45, p = 0.048) • Depression (r_s = -0.49, p = 0.028) • Positive affect (r_s = 0.47, p = 0.036)
Hip function (sports)	• Depression (r_s = -0.57, p = 0.018)* • Negative affect (r_s = -0.61, p = 0.010)*	• -
Hip-related QOL	• Depression (r_s = -0.51, p = 0.022)* • Positive affect (r_s = 0.52, p = 0.018)* • Self-efficacy of pain (r_s = 0.66, p = 0.002)*	• Anxiety (r_s = -0.50, p = 0.026) • Negative affect (r_s = -0.49, p = 0.030) • Pain catastrophising (r_s = -0.48, p = 0.031) • Self-efficacy of symptoms (r_s = 0.46, p = 0.042)
Overall QOL	• Depression (r_s = -0.73, p<0.001)* • Negative affect (r_s = -0.52, p = 0.020) • Pain catastrophising (r_s = -0.55, p = 0.012)* • Self-efficacy of symptoms (r_s = 0.52, p = 0.020) • Self-efficacy of pain (r_s = 0.67, p = 0.001)* • Post-operative one-year expectation of pain (r_s = -0.51, p = 0.025) • Post-operative one-month expectation of function (r_s = -0.52, p = 0.040)	• Anxiety (r_s = -0.47, p = 0.038) • Positive affect (r_s = 0.45, p = 0.045)

Outcomes	Psychological factors correlated in (r_s, p-value)	
	Large effect size (r_s > 0.50)	**Moderate effect size (0.30 < r_s ≤ 0.50)**
SRH	• Anxiety (r_s = -0.53, p = 0.020) • Depression (r_s = -0.67, p = 0.002)* • Negative affect (r_s = -0.65, p = 0.002)* • Self-efficacy of symptoms (r_s = 0.64, p = 0.003)*	• Pain catastrophising (r_s = -0.49, p = 0.035)

*Three highest values of correlation coefficients in each outcome.

In the consideration of familywise error, the adjusted p-value was calculated as 0.0001 from 484 correlational tests. The significant correlation coefficients in two tests were less than the adjusted p-value. There were associations of self-efficacy of pain with hip symptoms and hip ADL. Other results that may be considered in triangulation with the qualitative findings should be viewed in isolation with caution.

4.4.4.3 At one month post-operative

All significant relationships in large and moderate effect sizes were summarised from Spearman's correlation matrices. Hip symptoms, pain, and function were highly correlated with anxiety, negative emotions state, and fear of anaesthesia. Hip-related QOL, and overall QOL were mainly related to self-efficacy of pain, whilst SRH was highly related to self-efficacy of rehabilitation. They are shown in Table 15. All details of correlations are displayed in Appendix 22.

Table 15: Summary of significant correlations of the outcomes with the psychological factors at one month post-operative (N=25)

Outcomes	Psychological factors correlated in (r_s, p-value)	
	Large effect size (r_s > 0.50)	**Moderate effect size (0.30 < r_s ≤ 0.50)**
Hip symptoms	• Anxiety (r_s = -0.68, p<0.001) • Depression (r_s = -0.60, p = 0.002) • Pain catastrophising (r_s = -0.60, p = 0.001) • Self-efficacy of symptoms (r_s = 0.51, p =0.011) • Fear of hip surgery (r_s = -0.59, p = 0.004) • Fear of anaesthesia (r_s = -0.62, p = 0.002)	• Negative affect (r_s = -0.48, p = 0.015) • Self-efficacy of pain (r_s = 0.45, p = 0.041)

Outcomes	Psychological factors correlated in (r_s, p-value)	
	Large effect size (r_s > 0.50)	**Moderate effect size (0.30 < r_s ≤ 0.50)**
Hip pain	• Anxiety (r_s = -0.77, p<0.001) • Depression (r_s = -0.52, p = 0.008) • Negative affect (r_s = -0.69, p<0.001) • Pain catastrophising (r_s = -0.54, p = 0.005) • Self-efficacy of pain (r_s = 0.58, p = 0.006)	• Fear of hip surgery (r_s = -0.49, p = 0.020) • Fear of anaesthesia (r_s = -0.50, p = 0.018)
Hip function (ADL)	• Anxiety (r_s = -0.56, p = 0.004) • Negative affect (r_s = -0.58, p = 0.003) • Self-efficacy of pain (r_s = 0.52, p = 0.006) • Fear of anaesthesia (r_s = -0.63, p = 0.002)	• Depression (r_s = -0.46, p =0.021) • Pain catastrophising (r_s = -0.42, p = 0.039) • Self-efficacy of symptoms (r_s = 0.41, p = 0.048) • Fear of hip surgery (r_s = -0.49, p =0.020)
Hip function (sports)	• Anxiety (r_s = -0.76, p = 0.003) • Negative affect (r_s = -0.68, p = 0.011) • Pain catastrophising (r_s = -0.81, p = 0.001) • Fear of hip surgery (r_s = -0.85, p<0.001) • Fear of anaesthesia (r_s = -0.91, p<0.001)	• -
Hip-related QOL	• Anxiety (r_s = -0.57, p = 0.003) • Negative affect (r_s = -0.59, p = 0.002) • Self-efficacy of pain (r_s = 0.58, p = 0.006) • Fear of anaesthesia (r_s = -0.51, p = 0.015)	• Depression (r_s = -0.44, p = 0.028) • Pain catastrophising (r_s = -0.46, p = 0.020)
Overall QOL	• Anxiety (r_s = -0.56, p = 0.005) • Depression (r_s = -0.58, p = 0.003) • Negative affect (r_s = -0.58, p = 0.003) • Self-efficacy of pain (r_s = 0.74, p<0.001) • Fear of anaesthesia (r_s = -0.56, p = 0.008)	• Pain catastrophising (r_s = -0.58, p = 0.044) • Fear of hip surgery (r_s = -0.48, p = 0.027)
SRH	• Self-efficacy of rehabilitation (r_s = 0.65, p = 0.001)	• Depression (r_s = -0.47, p = 0.017) • Self-efficacy of symptoms (r_s = 0.49, p = 0.016) • Self-efficacy of pain (r_s = 0.50, p = 0.021)

Subsequently, simple linear regression was performed. The predictor was anxiety included in the analysis with three outcomes: hip symptoms, hip pain, and hip-related QOL. The standardised regression coefficients (beta), R^2, adjusted R^2 and p-value of each model are displayed in Table 16.

Table 16: Simple linear regression of anxiety with outcomes in recruited participants at one month post-operative

	Hip symptoms (N=25)	Hip pain (N=25)	Hip-related QOL (N=25)
Beta	-0.672	-0.798	-0.626
R^2	0.452	0.637	0.392
Adjusted R^2 (p-value)	0.428 (p<0.001)	0.621 (p<0.001)	0.365 (p = 0.001)

First, a linear model of hip symptoms was created. The regression coefficient was significantly different from zero, ((F(1, 23) = 18.988, p<0.001), with R^2 = 0.452), showing that around half of the variance in HOOS symptoms was predicted by anxiety as a strong predictor. Second, a linear regression of hip pain was performed and showed significant difference from zero of regression coefficient, ((F(1, 23) = 40.314, p<0.001), with R^2 = 0.637). This demonstrated that around two third of the variance in HOOS pain was predicted strongly by anxiety. The last model of hip-related QOL was created. The regression coefficient was significantly different from zero, ((F(1, 23) = 14.818, p<0.001), with R^2 = 0.392), showing that around 40% of the variance in hip-related QOL was predicted by anxiety. Patients who had lower anxiety were more likely to report lower severity of hip symptoms, milder hip pain and better hip-related QOL.

4.4.4.4 At six months post-operative

The top three ranking of the high correlation coefficients were post-operative one-year expectation of function, pain catastrophising, self-efficacy of pain and self-efficacy of function with the outcomes. These relationships are represented in Table 17. Spearman's correlation matrices are displayed in Appendix 23.

Table 17: Summary of significant correlations of the outcomes with the psychological factors at six months post-operative (N=16)

Outcomes	Psychological factors correlated in large effect size (r_s > 0.50) (r_s, p-value)
Hip symptoms	• Anxiety (r_s = -0.68, p = 0.005) • Depression (r_s = -0.60, p = 0.017) • Negative affect (r_s = -0.55, p = 0.034) • Pain catastrophising (r_s = -0.78, p = 0.001)* • Self-efficacy of symptoms (r_s = 0.76, p = 0.002)* • Self-efficacy of pain (r_s = 0.62, p = 0.023) • Self-efficacy of function (r_s = 0.69, p = 0.039)* • Post-operative one-year expectation of function (r_s = -0.66, p = 0.019)

Outcomes	Psychological factors correlated in large effect size (r_s > 0.50) (r_s, p-value)
Hip pain	• Anxiety (r_s = -0.74, p = 0.002) • Negative affect (r_s = -0.57, p = 0.027) • Pain catastrophising (r_s = -0.88, p <0.001)* • Self-efficacy of symptoms (r_s = 0.74, p = 0.003) • Self-efficacy of pain (r_s = 0.85, p<0.001)* • Self-efficacy of function (r_s = 0.69, p<0.001) • Post-operative one-year expectation of function (r_s = -0.85, p = 0.001)*
Hip function (ADL)	• Anxiety (r_s = -0.70, p = 0.004) • Pain catastrophising (r_s = -0.72, p = 0.004)* • Self-efficacy of symptoms (r_s = 0.62, p = 0.017) • Self-efficacy of pain (r_s = 0.77, p = 0.002)* • Self-efficacy of function (r_s = 0.66, p = 0.008) • Post-operative one-year expectation of function (r_s = -0.81, p = 0.002)*
Hip function (sports)	• Negative moods state (r_s = -0.69, p = 0.014)* • Self-efficacy of function (r_s = 0.69, p = 0.014)* • Post-operative one-year expectation of function (r_s = -0.87, p = 0.001)*
Hip-related QOL	• Anxiety (r_s = -0.64, p = 0.008) • Negative affect (r_s = -0.69, p = 0.003) • Pain catastrophising (r_s = -0.85, p<0.001)* • Self-efficacy of symptoms (r_s = 0.83, p<0.001) • Self-efficacy of pain (r_s = 0.84, p<0.001)* • Self-efficacy of function (r_s = 0.84, p<0.001)* • Self-efficacy of rehabilitation (r_s = 0.62, p = 0.018) • Post-operative one-year expectation of function (r_s = -0.87, p<0.001)*
Overall QOL	• Anxiety (r_s = -0.62, p = 0.010) • Negative affect (r_s = -0.65, p = 0.007) • Pain catastrophising (r_s = -0.77, p = 0.001) • Self-efficacy of symptoms (r_s = 0.88, p<0.001)* • Self-efficacy of pain (r_s = 0.86, p<0.001)* • Self-efficacy of function (r_s = 0.84, p<0.001)* • Fear of THR (r_s = -0.58, p = 0.047) • Post-operative one-year expectation of function (r_s = -0.82, p = 0.001)
SRH	• Depression (r_s = -0.58, p = 0.019) • Positive affect (r_s = 0.52, p = 0.038) • Negative affect (r_s = -0.83, p <0.001)* • Self-efficacy of symptoms (r_s = 0.68, p = 0.005) • Self-efficacy of pain (r_s = 0.80, p = 0.001)* • Self-efficacy of function (r_s = 0.80, p<0.001)* • Self-efficacy of rehabilitation (r_s = 0.58, p = 0.029) • Post-operative one-year expectation of function (r_s = -0.87, p <0.001)*

*Three highest values of correlation coefficients in each outcome.

Due to multiple testing, the adjusted p-value was calculated as 0.0001 from 361 correlational tests. The p-values of seven tests were less than the adjusted value. There were significant correlations of (1) hip pain with pain catastrophising, (2) hip-related QOL with pain catastrophising and self-efficacy of function, (3) overall QOL with self-efficacy of post-operative symptoms, pain and function, and (4) SRH with negative emotion state. Therefore, other significant results that had a p-value between 0.0001 and 0.05 should be viewed in isolation. They should also be taken into consideration when corroborating with the qualitative findings.

4.4.5 Relationships in longitudinal design

4.4.5.1 The Outcomes at one month post-operative

There were two sets of pre-operative psychological factors. First, all significant correlations of psychological factors at baseline with post-operative outcomes at one month are displayed in Table 18. All outcomes were significantly correlated with fear except hip symptoms. Hip pain, function, and overall QOL were significantly related to both fears. Hip-related QOL and SRH were reported the significant relationship with only fear of anaesthesia. The worse fear of anaesthesia at baseline was reported in the patients that tended to have worse pain, functions, and QOL at one month post-operative. All correlations are shown in Appendix 24.

Second, two significant relationships between the outcomes at one month post-operative and two factors at one-month pre-operative were reported: hip related QOL with self-efficacy of symptoms (r_s = -0.55, p = 0.042); and hip symptoms with pain expectation at one year post-operative (r_s = -0.68, p = 0.010). A correlation matrix (N=14) is displayed in Appendix 25. Moreover, the adjusted p-value was calculated as 0.0001 from 484 correlational tests. Two p-values of the significant results were more than the adjusted p-value and should be viewed in isolation with caution.

Table 18: Summary of significant correlations of the post-operative one-month outcomes with pre-operative predictors at baseline (N=25)

Outcomes	Psychological factors correlated in (r_s, p-value)	
	Large effect size (r_s > 0.50)	**Moderate effect size (0.30 < r_s ≤ 0.50)**
Hip symptoms	• -	• -
Hip pain	• -	• Fear of THR (r_s = -0.41, p = 0.042) • Fear of anaesthesia (r_s = -0.47, p = 0.017)
Hip function (ADL)	• Fear of anaesthesia (r_s = -0.59, p = 0.002)	• Fear of THR (r_s = -0.45, p = 0.025)
Hip function (sports)	• Fear of THR (r_s = -0.77, p = 0.002) • Fear of anaesthesia (r_s = -0.61, p = 0.027)	• -
Hip-related QOL	• -	• Fear of anaesthesia (r_s = -0.45, p = 0.024)
Overall QOL	• Fear of anaesthesia (r_s = -0.61, p = 0.002)	• Fear of THR (r_s = -0.50, p = 0.013)
SRH	• Fear of anaesthesia (r_s = -0.56, p = 0.004) • Post-operative one-month expectation of function (r_s = -0.64, p = 0.003)	• -

Subsequently, simple linear regression was performed. The predictor was fear of anaesthesia included in the analysis with two outcomes: hip pain; and hip-related QOL. The standardised regression coefficients (beta), R^2, adjusted R^2 and p-value of each linear model are displayed in Table 19.

Table 19: Simple linear regression of fear of anaesthesia measuring at baseline with the post-operative outcomes at one month

	Hip pain (N=25)	**Hip-related QOL (N=25)**
Beta	-0.446	-0.442
R^2	0.199	0.196
Adjusted R^2 (p-value)	0.164 (p = 0.025)	0.181 (p = 0.027)

A model of hip pain was created with fear of anaesthesia. Significant difference from zero of the regression coefficient ((F(1, 23) = 5.719, p = 0.025), with R^2 = 0.199), showed that around 20% of the variance in hip pain was predicted by fear of anaesthesia. Patients, who had pre-operative worse fear of anaesthesia, were more likely to report post-operatively

high pain at the hip. The other linear regression of hip-related QOL with fear of anaesthesia was performed and showed significant difference from zero of regression coefficient ((F(1, 23) = 5.600, p= 0.027), with R^2 = 0.196). This indicated that around 20% of the variance in hip-related QOL was predicted by fear of anaesthesia. Patients who had worse fear of anaesthesia before THR were more likely to report worse post-operative hip-related QOL at one month. Pre-operative fear of anaesthesia at baseline predicted post-operative one-month hip pain and hip-related QOL.

4.4.5.2 The Outcomes at six months post-operative

Significant correlations in large effect size of post-operative outcomes at six months with pre-operative predictors at baseline are displayed in Table 20. The top three ranking of the high coefficients were pain catastrophising, self-efficacy of symptoms, depression, and pre-operative two-week expectation of pain. Full details of correlations are shown in Appendix 26. However, correlations of outcomes at six months post-operative with predictors at one month pre-operative were unable to analyse.

Table 20: Summary of significant correlations in large effect size of the post-operative six-month outcomes with pre-operative predictors at baseline (N=14)

Outcomes	Psychological factors correlated in large effect size (r_s > 0.50) (r, p-value)
Hip symptoms	• Depression (r_s = -0.55, p = 0.035) • Pain catastrophising (r_s = -0.65, p = 0.009)* • Self-efficacy of symptoms (r_s = 0.60, p = 0.025)* • Pre-operative two-week expectation of pain (r_s = -0.56, p = 0.032)* • Post-operative six-month expectation of pain (r_s = -0.55, p = 0.036)
Hip pain	• Depression (r_s = -0.57, p = 0.027) • Pain catastrophising (r_s = -0.67, p = 0.006)* • Self-efficacy of symptoms (r_s = 0.62, p = 0.017)* • Pre-operative two-week expectation of pain (r_s = -0.63, p = 0.012)*
Hip function (ADL)	• Positive affect (r_s = 0.53, p = 0.041)* • Pain catastrophising (r_s = -0.56, p = 0.029)* • Self-efficacy of symptoms (r_s = 0.63, p = 0.017)*
Hip function (sports)	• Depression (r_s = -0.65, p = 0.023)* • Fear of anaesthesia (r_s = -0.59, p = 0.042)*

Outcomes	Psychological factors correlated in large effect size (r_s > 0.50) (r, p-value)
Hip-related QOL	• Depression (r_s = -0.72, p = 0.002)* • Positive affect (r_s = 0.63, p = 0.009) • Pain catastrophising (r_s = -0.85, p<0.001)* • Self-efficacy of symptoms (r_s = 0.70, p = 0.004) • Self-efficacy of function (r_s = 0.53, p = 0.036) • Pre-operative two-week expectation of pain (r_s = -0.72, p = 0.002)* • Pre-operative two-week expectation of function (r_s = -0.59, p = 0.034)
Overall QOL	• Depression (r_s = -0.63, p = 0.009)* • Positive affect (r_s = 0.60, p = 0.014) • Pain catastrophising (r_s = -0.88, p<0.001)* • Self-efficacy of symptoms (r_s = 0.73, p = 0.002)* • Self-efficacy of function (r_s = 0.58, p = 0.019) • Pre-operative two-week expectation of pain (r_s = -0.62, p = 0.011) • Pre-operative two-week expectation of function (r_s = -0.58, p = 0.038)
SRH	• Depression (r_s = -0.84, p<0.001)* • Positive affect (r_s = 0.67, p = 0.004)* • Pain catastrophising (r_s = -0.66, p = 0.006) • Self-efficacy of symptoms (r_s = 0.73, p = 0.002)* • Self-efficacy of pain (r_s = 0.57, p = 0.022) • Self-efficacy of function (r_s = 0.67, p = 0.005)* • Fear of anaesthesia (r_s = -0.54, p = 0.029) • Pre-operative two-week expectation of pain (r_s = -0.65, p = 0.007) • Pre-operative two-week expectation of function (r_s = -0.66, p = 0.013)

*Three highest values of correlation coefficients in each outcome.

The Bonferroni correction was calculated. The number of tests was 576, and the adjusted p-value was then calculated as 0.00008. Correlations remained significant for three of the factors with p-values of less than the adjusted p-value. They consisted of the correlations of hip-related QOL and overall QOL with pain catastrophising, and SRH with depression. Other correlations highlighted above should be viewed in isolation with caution owing to the risk of familywise error.

All significant psychological factors are represented in Table 21 and Table 22. First, cross-sectional relationships and predictors were summarised from correlational and multiple regression analysis. The relationships between self-efficacy and the outcomes were found in all points of time whereas expectations were reported the correlations with the outcomes prior to initial assessment and six months post-operative. Depression was significantly related to the THR outcomes in pre-operative period. At one month post-

operative, emotional aspect was raised their relationships with the outcomes in particular anxiety, negative moods, and fear of anaesthesia. Finally, pain catastrophising was highly related to the outcomes at pre-operative period and six months post-operative.

Table 21: Summary of highly correlated psychological factors with the outcomes in cross-sectional analysis

Prior to initial assessment	One month pre-operative	One month post-operative	Six months post-operative
• Depression* • Pain catastrophising* • Self-efficacy of function* • Pre-operative two-week expectation of function*	• Depression • Self-efficacy of pain • Pain catastrophising • Self-efficacy of symptoms	• Anxiety* • Negative affectivity • Self-efficacy of pain • Fear of anaesthesia	• Post-operative one-year expectation of function • Pain catastrophising • Self-efficacy of pain • Self-efficacy of function

*regression analysis

The longitudinal relationships were concluded from correlational and simple linear regression. The outcomes at one month post-operative were highly related to fear at baseline and self-efficacy and expectation at two weeks pre-operative. The outcomes at six months post-operative were significantly related to depression, pain catastrophising, self-efficacy of symptoms, and pain expectation at two weeks pre-operative.

Table 22: Summary of highly correlated psychological factors with the outcomes in longitudinal analysis

At one month post-operative	At six months post-operative
Factors at baseline • Fear of anaesthesia* • Fear of THR Factors at one month pre-operative • Self-efficacy of symptoms • Post-operative one-year expectation of pain	Factors at baseline • Depression • Pain catastrophising • Self-efficacy of symptoms • Pre-operative one-month expectation of pain

*regression analysis

4.5 Discussion

4.5.1 Key findings

4.5.1.1 Comparison at baseline

Fifty one per cent of participants undergoing THR were female, lower than the 60% stated by the NJR report[197]. The median age of patients in this study (68 years) was similar to the

median age given in the NJR report (69 years) and the BMI of participants (26.62 kg/m^2) was similar to the BMI of the participants reported in NJR report (28.67 kg/m^2)[197]. This may represent the generalisability of participants to national report; however, reflecting a lower proportion of women.

There were comparisons in demographic data, psychological factors and the outcomes between recruited participants with experienced participants and participants who did not schedule for THR. Experienced participants reported the worst hip function (sports), the worst SRH and the highest number of co-morbidities. The worst function (sports) may relate to prohibition of hip positions after THR. The patients have been prohibited to run, twist, and squat their legs to prevent their complications after THR[12]. The lowest health status may be a result from possible clinical conditions of anxiety and depression with low self-efficacy in managing chronic pain and dysfunctions. Experienced participants reported the worst depression, worst anxiety, worst pain catastrophising as well as the lowest self-efficacy in all aspects. Moreover, the worst SRH may be associated with multiple co-morbidities with significantly numbers higher than patients undergoing the first THR.

In addition, participants, who were not scheduled for THR, reported the least problems of hip function in daily activities, the highest self-efficacy of all aspects, and the worst fear of THR and anaesthesia. No schedule for THR at this moment may relate to the lowest dysfunction severity, the highest self-efficacy and fear among three sub-groups. The highest BMI was also shown in this sub-group. They may receive other alternative treatment before undergoing THR. National guidelines for osteoarthritis treatment recommend weight loss as well as use of alternative therapies[1]. A booklet giving guidance to patients also strongly advises weight loss before going through THR. This is to reduce the risks associated with THR and enhance recovery[33].

4.5.1.2 Change of variables

Comparisons reported no significant change of all factors and psychological factors between measuring at baseline and at one month pre-operative. Anxiety at baseline was slightly increased. This was contradicted with the past studies. A systematic review reported a slight reduction of pre-operative anxiety after the pre-operative education

programme compared with the usual care[111]. Moreover, no change of pain expectation and small changes of functional expectation were illustrated. This was opposed in a previous study. Mancuso *et al.* reported little change without significant difference in overall expectations covering pain and function in THR patients measuring at before and after pre-operative education programme[198]. Particularly, fear of anaesthesia was significantly increased from baseline. This has never been carried out elsewhere in this pre-operative change of fear. Perhaps, experience of patients undergoing THR may illustrate individual learning impact on these changes at pre-operative period. Therefore, all of these changes are discussed in the chapter 7 on page 174.

Duration of measuring in this study might be a factor in pre-operative period. Duration between baseline, the second questionnaire and date of surgery were various because of variability of medical fitness of patients affecting the readiness for THR. However, average duration fitted with recommendations of BOA. This guideline states that duration of process from referral to THR taken place is targeted within 18 weeks for patients who will fall in the category of 'medically fit'[30].

At one month post-operative, all hip outcomes were significantly improved to mild-moderate severity of pain and function except for sports function. Moreover, pain catastrophising was significantly reduced, whilst positive moods and self-efficacy of function were significantly increased. At six months after THR, all hip outcomes and almost all psychological factors were well progressed in particular with self-efficacy of pain and rehabilitation. These findings support previous studies for improving pre-operative hip symptoms, pain, function, and QOL[82,97,199], and enhancing post-operative self-efficacy of rehabilitation[70]. In addition, non-significant decreasing anxiety, and depression were reported in this study but the previous studies showed significant reducing anxiety[82,83,96], and depression[81,82,96,200]. This may be a result of small sample size and duration of measurement. This study compared data at each pair to maximise sample size and duration of post-operative measurement. The previous studies compared between pre-operative period and either three[200], six[81–83] or twelve months[82,200] post-operative in larger sample size than this study.

4.5.1.3 Relationships of outcomes with psychological factors

At baseline, regression models at baseline showed four significant predictors on the outcomes. Depression, pain catastrophising, self-efficacy of function, and functional expectation at two weeks pre-operative were the strong predictors. At one month pre-operative, depression, self-efficacy of pain, pain catastrophising, and self-efficacy of symptoms were significantly correlated with almost all outcomes. Similarly, the previous studies reported the potential predictors of hip osteoarthritis outcomes in pain, function and QOL. They comprised depression[201,202], pain catastrophising[202–204], self-efficacy of symptoms[205–207], self-efficacy of function[205–207], self-efficacy of pain[187], and expectations[76]. Particularly, expectations of pain and function at two weeks pre-operative were highly correlated with almost all outcomes at baseline. These were measured as the outcome expectations in the future despite level of expectations. These levels may be varied in individual participants, which are explored in the chapter 7 on page 184.

At one month post-operative, possible models of hip outcomes at one month post-operatively were predicted by anxiety. Two other factors: negative affect; and self-efficacy of pain, were expressed their large effect size in correlation with the outcomes. Fear of anaesthesia was significant correlated with most of the outcomes. These cross-sectional correlations support the previous studies. Pinto *et al.* reported that post-operative pain after THR at 48 hours was significantly related to anxiety[96] as well as a significant correlation of post-operative function with self-efficacy of pain was reported in Moon study[59]. At six-month recovery, functional expectation at one year post-operative, pain catastrophising and self-efficacy of symptoms were highly related to the outcomes.

In longitudinal correlations, at one month post-operatively, all outcomes were significantly related to fear of THR and anaesthesia at baseline for hip symptoms. In simple linear regression model, fear of anaesthesia was significantly predicted hip pain and hip-related QOL. This relationship of post-operative outcomes at one month should explore in triangulation with qualitative findings because almost all previous studies explored the relationships at six months or one year follow-up.

Moreover, at six months post-operatively, almost all hip outcomes were significantly related to depression, pain catastrophising, self-efficacy of symptoms, and pain expectations at baseline. These results may support previous studies that pre-operative depression was a strong predictor for post-operative hip outcomes[82,87,96,200,208] as well as outcomes were significantly correlated with pre-operative expectations of pain and function[73]. Although pre-operative anxiety[81–83,87,96,200,208], and fear of surgery[90] were also influenced with hip outcomes despite no significant correlation of pre-operative anxiety in this study. This might be a result from small sample size; however, these are possibly described in triangulation report.

4.5.2 Potential limitations

Due to the small sample size, it was not possible to undertake a regression analysis to achieve the aim of exploring the predictors of hip pain, function and QOL. However, a number of correlational tests were possible and have been reported. A particular issue arises from familywise error in this analysis owing to multiple testing that leads to and increases risk of false positive errors (type I error)[196,209]. On the basis of family wise error management, two common procedural approaches are considered: adjustment of p-value; and resampling based procedure[209]. Adjustment of p-value consists of several techniques such as the Bonferroni correction and the Holm method. The most common procedure is the Bonferroni correction which calculates the p-value, as described above on page 72. However, this method is recommended only where the number of tests is less than five[209]. As there were many situations where familywise error was a concern in the present study, over five tests were used and another method of correction was chosen, namely resampling. The resampling method used was the bootstrapping function, built into the SPSS programme[196]. However, this was not always possible because of the small sample size. Therefore, the principle of 0.05 probability value was retained, but caution is advised in interpreting the findings in isolation. This is particular true with the correlation matrices where the number of significant tests was more than five per cent of the total number of tests and one in every twenty tests may report the true positive result[196]. In most cases the significant results that returned a p-value more than the adjusted p-values

but less than 0.05 are subsequently supported by the experiences of participants in the qualitative element to enable acceptance of the statistical results.

4.5.3 Implications

From comparison between subgroups at baseline, experienced patients should be screened for depression and anxiety disorder because around half of them reached possible clinical levels. Moreover, they had other co-morbidities that may affect their self-efficacy to cope with their symptoms, pain and dysfunction. This subgroup is seemed to receive more support in a link with other diseases. A previous study reported that hypertension and obesity might have an effect on THR outcome[210].

As reported significant correlations of outcomes with positive moods and self-efficacy, these may be useful for support patients who report extreme difficulty and/or high pain. Appropriate programmes in particular psychological treatment may help them to improve functioning and pain such as enhancing pre-operative self-efficacy of pain during waiting period.

4.5.4 Publication of findings

Some parts of the quantitative element were presented as a preliminary report of psychological factors relationships in pre-operative period. Two posters were presented in 2014 – one at the Health Service Research and Pharmacy Practice and another at the Annual Scientific Meeting of British Pain Society. First, sub-domains of pain catastrophising were reported as predictors of pain and functional expectations. High level of sub-domains in pain catastrophising was able to predict expectations of poor pain and worse function. This finding suggests that healthcare professionals should be concerned about the expectations of patients receiving pain medications or pain management programme. Second, psychological factors were explored in the relationships with pain catastrophising. These were anxiety, depression, positive and negative affect, self-efficacy of pain and symptoms. Results showed that lower anxiety and greater self-efficacy of symptoms were related to lower pain catastrophising. This element provides an indication that health professionals should consider the importance reducing anxiety and increasing self-efficacy

of symptoms prior to THR. Poster presentations are included in Appendix 27 and Appendix 28, respectively.

4.6 Conclusion

The findings presented that the pre-operative outcomes are predicted by depression, pain catastrophising, self-efficacy of symptoms and function including functional expectations before THR, whilst post-operative outcomes are predicted by anxiety. The finding in longitudinal model is that pre-operatively high fear of anaesthesia predicts high pain and low quality of life related to the post-operative outcomes at one month. Correlation coefficients show strong relationships between psychological factors with the outcomes. All of them will be integrated with qualitative findings in chapter 7 of this thesis.

Chapter 5: Diaries and interviews

The previous chapter demonstrated the relationship between various psychological factors and expectations of pain, function, and quality of life. To fully understand the deeper relationship of THR experience of patients, a qualitative longitudinal element was conducted concurrently with the quantitative arm. This chapter starts with the aim and objectives of this part of the element. It then continues with methods and findings of the diary and interview element and finishes up with a discussion and conclusion.

5.1 Aim and objectives

This element aims to explore the subjective experience of pain with psychosocial factors throughout the treatment and recovery journey by using diary and interview method. There are two objectives to this aim:

1. To capture actual experiences of patients from end-stage osteoarthritis to six-month recovery of THR by using diary method;

2. To detail narrative experiences from the diary by using follow-up interview.

5.2 Methods

5.2.1 Procedure

Participants were recruited after they expressed their interest in a contact details form. This form was returned with the first questionnaire provided from the hospital in the quantitative element. After confirming the date of surgery on the reply slip, eighteen participants were interested in taking part. They were then contacted and, ultimately, twelve agreed to participate in the written diary and follow-up interviews. Participants received a participant's information sheet explaining this aspect of the study (Appendix 5), along with a consent-form to sign and return (Appendix 6), and a blank two-week diary with space to write about their experiences/thoughts and some key prompts relating to pain and functioning (Appendix 7). Once participants had completed the diary they returned this, along with the signed Consent Form, to the researcher. After around a week

following the expected return date, if the diary was not returned participants were reminded by telephone.

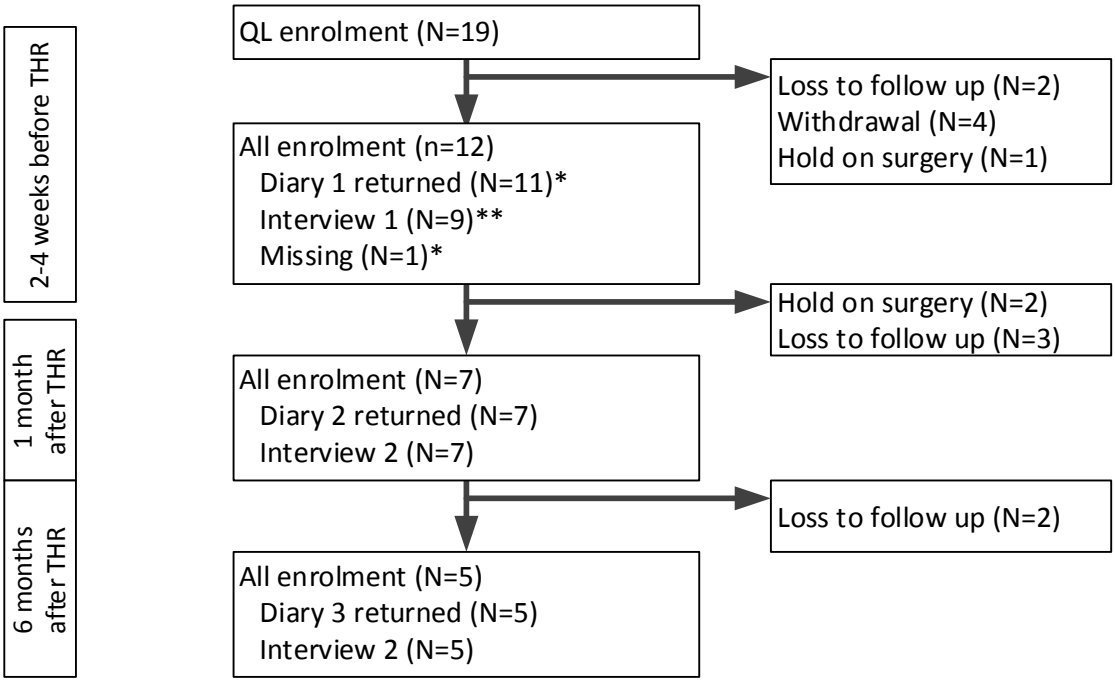
The returned diary was preliminarily analysed in order to explore critical points in preparation for a face-to-face interview. The researcher rehearsed the initial interview with one of research team before interviewing the first participant. A semi-structured interview was then scheduled to explore in depth the incidents recorded in the diary. The interview took place on University premises or at the participants' home and lasted for approximately thirty minutes to two hours. At the beginning of the interview, the participant read through the diary transcription to confirm the accuracy. The interview was then digitally recorded with consent, later transcribed, and content of the transcript confirmed by participants. This process was repeated for two further occasions, distributed along with the questionnaire at post-operatively one month and six months. Reasonable travel expenses were paid to participants attending the University and a £10 shopping voucher (Love2Shop or Tesco) was given in recognition of participants' time on each occasion of interview.

Ethical approval was granted by Liverpool-Central NRES committee (reference number: 12/NW/0850) and all participants provided informed consent to participate in qualitative aspect at the time of returning the first diary.

5.2.2 Recruitment of patients

Inclusion and exclusion criteria are the same as described in chapter 4 (see page 71). On the first occasion, eleven diaries were returned and the twelfth one was not returned due to immediate THR. Nine interviews took place because two participants terminated their involvement in the study. One of them returned the pre-operative diary at two months post-operatively. The other participant, who returned the diary after the recruitment was ended, was still waiting for THR. Following this, two participants were still waited their THR, and three of others were lost during follow-up, therefore seven participants continued to take part at one month post-operative. Finally, five participants completed this study and two others were lost to follow-up at six months post-operative. This recruitment is summarised in Figure 17.

Figure 17: Summary of participants' recruitment for diaries and interviews study



*One participant did not complete the first diary and interview because of undergoing THR before returning replied slip to the researcher.

**Two participants were not interviewed after diary returned because first one was still waiting for THR and the other diary was returned at two months post-operative.

5.2.3 Data analysis

The written diaries and interviews were typed up and anonymised. Anonymisation was used in quote as source of data (D = diary, I = interview), collecting data occasions, and pseudonym, such as *D1 Ms A*. The researcher read through transcripts to confirm accuracy with the audio recordings and then posted transcripts to participants so they could confirm the content of the transcript to ensure accuracy of data. Once returned, the researcher refined the transcripts following participant's comments. NViVo10 was utilised for thematic analysis by a constant comparison approach to identify key emergent themes. This was a technique for 'a rich and detailed, yet complex, account of data'[211]. First, the researcher read through all transcripts in order to be familiar with all data and then generated the code of meaning and interpretation in psychosocial aspects. When completing some transcripts in the pre-operative period, the first round of coding was compared and discussed with two other members of the research team who coded three transcripts concurrently and independently, to refine all codes. This was continued on two

other occasions in the post-operative period to ensure robustness of analysis. Following this, potential sub-themes were clustered from chunks of coding, which then generated a thematic map of analysis. All themes were also defined and named first by the researcher prior to discussion with the research team for refinement of the final thematic map until consensus was achieved. In addition, data from participants, who did not undergo THR, were included in the analysis because of their valuable experiences during the waiting period for THR. This analysis was conducted prior to the quantitative analysis to minimise subjectivity in the analysis seeking to confirm quantitative results. The goal of this aspect of the study was objective exploration of the psychosocial aspects of patients' experience based on inductive analysis rather than researcher bias from quantitative results.

5.3 Findings

Findings consisted of participants' characteristics, thematic map in changes of theme over THR period including details of each theme and sub-themes, and the relationships of sub-themes focusing on pain and function. Twenty-three diaries and twenty-one interviews were thematically analysed from a total of twelve participants. A report was produced in a thematic map, which was categorised into five main themes.

5.3.1 Characteristics of patient

All 12 patients (5 men and 7 women), aged 51-84 years, who had undergone THR were recruited from four of five centres (A=9, B=1, C=1 and D=1). Pain duration was in a range of more than one year up to ten years. Eight participants lived with their family member(s). The five participants in centre A took part on three occasions. None of them had previous experience of THR and a pseudonym is applied to them. Details of participants are described in Table 23.

Table 23: Characteristics of participants

Pseudonym	Age (years)	Gender	Centre	Pain duration (years)	Household members	Occasion numbers of participating
Ms A	61	Female	A	3-4	No	3
Mrs B	76	Female	A	5	No	3
Mrs C[a]	68	Female	A	1.5	Husband	3
Mr D	77	Male	A	5-10	Wife	3
Mr E[a,b]	69	Male	A	>2	Wife	3
Mrs F	78	Female	D	>2	No	2
Ms G[a]	56	Female	A	2	No	1
Mr H	67	Male	A	2	Wife	1
Mr I[c]	51	Male	B	>1	Parents	1
Mr J	84	Male	C	>1	Wife	1
Ms K[a,b,d]	72	Female	A	N/A	Son	1
Mrs L[c]	56	Female	A	N/A	Husband	1

[a] Four diaries were returned to the researcher after THR, therefore interviews took place at post-operatively one month.

[b] Mr E and Ms K were completed the first diary at time of undergoing THR.

[c] Mr I only participated in the second occasion of writing diary and interview.

[d] Ms K and L only participated in the first occasion of writing diary.

5.3.2 Themes and sub-themes

Five emergent themes relating to subjective pain experiences were identified. The themes comprised: physical symptoms; management and awareness; support; well-being; and cognitive aspect of self-regulatory model. Each theme was described to represent experiences of participants. All themes and sub-themes are summarised in Table 24.

Table 24: Themes of subjective pain experience emerged from diaries and interviews

Themes	Sub-themes
1. Physical symptoms	• Pain
	• Disability and post-operative effects
	• Co-morbidities
2. Management and awareness	• Active coping
	• Passive coping
3. Support	• Support from people
	• Support from other things
	• Altruism towards others
4. Well-being	• Experiences
	• Emotions
5. Cognitive aspect of self-regulatory model	• Beliefs
	• Expectations
	• Learning behaviours

5.3.2.1 Physical Symptoms

The Physical Symptoms theme included all relevant symptoms from osteoarthritis, THR and other diseases. After living with degenerative osteoarthritis disease diagnosis for many years, chronic pain and difficult function led participants to undergo THR. Following this, post-operative symptoms from THR and anaesthesia effects were expressed by participants during early recovery but they disappeared by six months post-operative. Co-morbidities influenced the THR process.

5.3.2.1.1 Pain

Pre-operatively, all participants described their kind of pain differently, including sharp pain, dull ache, sore, and nagging pain, in various areas. Effects of pain were felt not only on the hip but also back, groin area, knee and ankle. Pain brought difficulties of mobility in terms of stiffness, limping, tiredness and discomfort. Prior to osteoarthritis diagnosis, some participants believed that pain origins might not come from the hip but from their knee or back, and a few of them thought that sports' injury was the cause of their pain.

> *'Referred pain down my leg to my knee bothered me all afternoon – sometimes that pain is worse than my hip pain.' (D1 Mrs L)*

Around one month post-operative, participants still complained of acute pain in the same areas as pre-operative: hip, knee, back and leg. All participants were relieved from pre-operative pain and had less pain in a different type or dull ache at the hip, whereas knee pain eased eventually. Some participants believed this to be healing pain. All participants suffered from backache due to the necessity of lying on their back until six weeks after the operation, but this improved once they could sleep on their side.

> *'It is now 4 weeks and 3 days since I had my hip replacement. The first week I was very tired and everything was an effort. Since then each day has got easier. The nights are bad because I have to sleep on my back and this puts pressure on the back of my leg, which hurts, so I have to get up and walk about every couple of hours.' (D2 Mrs F)*

Patients complained of pain, swelling, and bruising when they slept on their back, did too much physical activity or undertook new physical activities to try and regain normality. Some participants also complained of stiffness, soreness, and tiredness which eased over time.

At six months after THR, most participants described slight or little pain in their operated hip owing to overdone physical activities or from being in the wrong position.

> *'…the pain I suppose it's not a pain, it's more like an ache. The pain's getting less and less, you know, less and it's only when I have overdone it, that that I do get it … They say what pain from one to ten, it's probably one. My pain is probably one …' (I3 Mrs C)*

5.3.2.1.2 Disability and Post-Operative Effects

This sub-theme looked at the mobility of participants across their THR journey following with post-operative effects. Descriptions of mobility and post-operative effects were illustrated across the time.

A high level of reduced physical functioning due to end stage osteoarthritis was resulted in the hip operation in all participants. In particular participants were restricted in running and from previous hard sports or doing too much activity. Prior to THR, most of them had problems going up and down stairs, getting in and out of the car, kneeling, putting shoes

on and off due to incapacity of bending down. Moreover, for some participants household chores consumed a longer time than the past when they had mild severity of osteoarthritis. A few participants continued to carry out their hobbies normally, for instance, driving, playing bowls, and gardening. In addition, most of them reported tiredness appearing after doing too much activity or having poor sleep the previous night. A few participants reported the effects of dysfunctions with their occupation. These difficult movements were the identification for THR.

> *'Simple tasks are now a challenge – I can kneel on the floor to clear [doing homework] but I cannot get up without a struggle … Writing in this diary when I am off work makes me realise just how hard I struggle to do full time child minding with this osteoarthritis in my hip … Today I am so tired. I just couldn't get comfortable in bed last night and I kept waking up when I fell asleep.' (D1 Mrs L)*

Following THR, there were effects from anaesthesia, wound care and scar, and movement functions. All participants mentioned the type of anaesthesia and effects. Most had an epidural and woke up in few hours later, but a few participants needed general anaesthesia due to their co-morbidities and were unconscious, staying around two days in the hospital. A few participants felt like nerve damage or numbness was caused by anaesthesia.

> *'I was on on the ward the ward and I had the epidural and I was I was I was fine and they all had the gas and they were terrible, so I don't know' (I2 Mr I)*

Once they woke up, the physiotherapist helped and guided participants to move out from the bed and walk with a walking aid. The majority of participants expressed that wound care was undertaken in hospital and in the local health care. Participants reported various feelings in their scar such as tenderness, heaviness, soreness, numbness and pain, but these improved a few weeks later. A few participants tried to fade the visible scar by using pharmaceutical products.

> *'Excellent sleep 12-8.15!! I am stiff and have some soreness by my wound when I first wake but this goes when I start moving.' (D2 Mrs C)*

When they went back home, the district nurse followed-up to maintain good recovery, especially with wound healing.

> *'She [district nurse] came on a Sunday, she came on a Monday, she changed the dressing, erm and she came on the Tuesday, just to check, and then she said 'Oh, you're okay now' she said 'I'll come after two weeks to take...' I had clips, not stitches 'To take the clips out' and she did, she said 'The scar's healing beautifully if you need us, ring us but we don't need to see you again unless there's a problem'…' (I2 Mrs F)*

All participants were limited in physical ability before six weeks post-operative in order to prevent risks and complications, in particular dislocation. Limitations on physical activity included driving, twisting, bending down to pick up things from the floor, and lying on their back. This advice was given by health professionals and information provided in a booklet. For the majority of participants, difficulty sleeping on their back was expressed due to pain and being in an uncomfortable position. As such, participants needed to move every few hours after sleeping and compensated by sleeping during the day. They also looked forward to when they could sleep in any position and drive again.

> *'erm and the last three weeks I've started using the car again finally (laughs). But I don't drive too far. I only drive a few miles. I haven't done any long, longest journey I've done is six miles down to B[place].' (I2 Mr E)*

All participants practiced hip specific exercises as instructed by the physiotherapist in order to recover and become fully functional. Participants expressed difficulty with walking during the early recovery period as well as difficulty with mobility in the affected hip, or where weight was heavily loaded on the operated side. There were difficulties in activities such as bending down their body, changing positions, and sitting on appropriate height of chair.

> *'In the evening, we went to dinner at a restaurant with my brother and family to celebrate his birthday. I sat down and immediately my new hip began to ache and feel tense. The chair had no support, I think it was old and padding/structure had gone. After a few minutes, the discomfort was too much, I couldn't tolerate it.*

Luckily, my partner and brother both lent me their jackets and I put them on my seat and sat on tops of them. I was then in a much better position, with my hips significantly higher than my knees which was much more comfortable.' (I2 Ms A)

Stiffness was apparent in almost all participants when they stayed in one position for a long time, such as waking up in the morning after a night's sleep, and when sitting. Stiffness disappeared after participants had walked or changed their position. Participants also complained of stiffness when they did too much activity or had difficulty sleeping.

'Well, I walk until I get tired, and then I take a break and I walk again if it's stiff.' (I2 Mr D)

At six months post-operative, participants complained of tiredness when they did too much physical activity or had difficulty sleeping, although stiffness was reduced in a few individuals. There were a few positions, such as getting up from the floor, where participants needed assistance.

'Arrived home at approx 4.30 p.m. Leg a little tired but not too bad considering the amount of walking I had done.' (D3 Mr E)

'… Well, recently, I went to my husband's grave the other day erm I knew that there'd be a seat but anyway, I could get myself up from when I'd done a few jobs, but then when I went to get up people that were on the cemetery had taken all the seats to have them re-varnished and there wasn't anywhere that I could get up and I was just literally in the middle of this grave with no and I had to wait for somebody to come and there was somebody walking past and I just said 'Can you give me a hand up?' and they did, but that was how severe it was that really that I hadn't got the strength to get up.' (I3 Mrs B)

5.3.2.1.3 Co-morbidities

The Co-morbidities sub-theme was clustered from chronic and acute diseases. A few participants reported their co-morbidities which had an influence on THR. Participants with diabetes mellitus needed extra care for their feet and numbness in their hands in the recovery period. A few participants mentioned that they had infection. One had a sore

infection before the operation and the other one had a skin infection on the big toe of operated leg after THR. In addition, one individual had a low immune system, low blood pressure, and low blood count owing to blood loss. Participants were driven by these co-morbidities to give more attention for caring their ill.

> *'I've a throat infection which is really pulling me down. Hip OK, that's not brilliant but not terrible.' (D1 Ms A)*

> *'She [wife] puts lotion on my feet every day. I have er I always done that. Maybe in the diabetic that the worst I think forward people keep your feet like, so I so since I've been a diabetic which is about eight years nine, seven eight years.' (I2 Mr D)*

Chronic pre-operative pain commonly occurred, whereas post-operative acute pain was temporary and disappeared over the next few months. Additionally, pain developed during difficult movements and some physical activities could be causes of pain.

In summary, chronic osteoarthritis pain was very common before THR but this disappeared after THR, whilst acute post-operative pain disappeared eventually. In addition, pre-operative disability was very common and then dramatically rose in the early post-operative period as a result of THR; however, this decreased later. Additionally, at a few months after THR, participants got tiredness and stiffness that decreased at around six months post-operative as normality of physical activities regained. Moreover, post-operative effects were common at a few months after the operation whereas chronic co-morbidities were unchangeable.

5.3.2.2 Management and Awareness

The Management and Awareness theme emerged from analysing active coping and passive coping. Whilst active coping strategies involve patients starting to manage and control pain themselves, passive strategies are when a patient relinquishes pain control to accept an adverse reaction of pain[212]. These strategies included management of the effects of pain, such as function, THR preparation, awareness of movement and negative feelings. Each of them was described chronologically.

5.3.2.2.1 Active Coping

Pre-operatively, active coping was aggregated from hip specific exercises, an attempt to keep busy with normal activity, pain distraction, optimism, complementary and alternative medicine therapies, awareness of function and THR preparation. The majority of participants expressed that hip specific exercise gave advantages to the hip function and strengthened muscles around the hip. The exercises were recommended by the physiotherapist and some participants carried out the exercises but a few individuals rejected them due to no improvement being made.

> *'I think I did [physiotherapy exercises] really. I think I did. I think I felt better whether it was actually helping my hip I don't know, but I felt better in myself and I felt better in myself which is a lot of it is in the mind, isn't it? ….' (I1 Mrs C)*

Moreover, all participants generally kept themselves to their normal routine activities, in particular walking. There were other options to support their day-to-day activities, for instance, walking the dog, using a stick, getting a bus or taxi when they were too exhausted to walk. Most participants continued to socialise by attending their normal clubs and outdoor activities in order to keep themselves active and busy. Normal activity not only improved the function of participants but also distracted their attention from pain. For example, swimming, gardening, and walking were carried out by some participants, although the majority of participants read by to take their mind off pain. In addition, there were other hobbies such as doing puzzles such as crosswords, and watching television.

> *'… And sometimes I would find pain relief by erm moving, just keep on moving.' (I1 Ms G)*

> *'Well, other than gardening, it's the dog. It it's convenient having a dog, because a dog won't let you get away with it. A dog insists that she's going to go out. We've been out this morning, she doesn't just want to go sniffing along the road, she wants to go on the field, and she wants to have the ball thrown for her and to chase it and that means that I've got to do quite a bit of running, not running around, but I can't just sort of stand in one position. She won't come, she insists on making sure that*

I'm I'm active with her, which isn't a bad thing, I find I find it's quite useful.' (I1 Mr J)

For the majority of participants, optimism was effective to help the participants cope with pain. When they faced difficult situations such as conversations about their hip problem, pain while walking, and sleep disturbance, they focused on the positive side of things or applied enjoyable techniques. A few participants preferred not to talk about their hip and were optimistic with their friends that were trying to be kind or helpful. A few participants used mind games, for example, thinking of pain jarring up on feet like walking on volcanoes, naming pain as old man or naughty boy and telling them to keep quiet, and recalling their beautiful memory of travelling while waking up during the night.

'I get times of total panic and negative thoughts about my situation, thinking each time I go anywhere whether it is the last time I will be able to do it, then resign myself, I have had a good, happy life, other times I can be more positive, especially with friends, that is why I try to fill each day and keep busy.' (D1 Mrs B)

Additionally, some participants utilised alternative treatments such as herbal supplement, acupuncture, osteopath, and mindfulness. When discussing movement, some participants expressed the need for support from someone or walking aids to prevent falling, and reported not carrying heavy things loaded on their bad hip.

'I have a drink of honey and cinnamon with hot water each day. I find this helps the pain in my knee.' (D1 Mrs F)

'Put improvement down to rest, some walking, the warmer weather, and not carrying shopping/shopping trolley. The latter aid result in some niggly pain lower left back. Back on settee. Didn't feel it after that.' (D1 Ms K)

In relation to THR preparation of participants, all of them obtained information from the hospital about the THR procedure, anaesthesia, things to do and not do, and preparation before admission to the hospital. All support and details of information from hospital are described in the Support sub-theme (see page 127). Some participants reported that they prepared and stocked up sufficient food at home for use in the early recovery period. Some women rearranged their appointments with hairdressers and chiropodists. A few

individuals prepared financial support in case of complications while others expressed the need to stop warfarin before THR. Participants who lived alone discussed how they arranged for friends to support them in the early recovery period.

> *'I intend to cook fresh while able and freeze them for post-operative meals.' (D1 Ms K)*

> *'I feel calm and then panic. – am in the process of putting all my financial affairs in order, in case operation things don't go well.' (D1 Mrs B)*

During the early recovery period, active coping composed of pain and function management, pain distraction technique and awareness of movement. For the majority of participants, they coped with their pain and function by doing exercises from the physiotherapist in hospital. When they went back home, all participants reflected that they kept walking, moving around, and doing exercises every day. Most of them expressed the need for frequency of exercises two to three times a day. As a result of the exercise, there was improvement of physical activity over time, such as doing household chores, hobbies and driving. Additionally, all participants mentioned that walking aids were necessary for assisting movement and most participants mentioned using a grabber. A minority of patients used a local heat or ice pad (thermotherapy) to treat their soreness.

> *'They, the hospital, gave me a sheet. I think it was eight exercises and I had to do them three times a day.' (I2 Ms A)*

> *'…let me see, I had the operation on the Tuesday and then the following Wednesday erm my daughter took me to Sainsbury's and I walked all around Sainsbury's with one stick, and I thought that was a real achievement.' (I1 Ms G)*

In relation to pain distraction, a variety of distraction techniques was utilised. The majority of participants reported watching television and socialisation, whilst reading and keeping busy every day enabled some participants to move their focus from pain to enjoyable activities. In the minority of participants, self-encouraging, acceptance of pain nature and playing games assisted in taking their mind off the pain. Optimism was expressed by some participants. For example, when a few of them woke up during the night, they thanked God or Heaven that they could wake up and were still breathing.

'Rest in chair watching television. Start stiffing up. Get up and move around go to bed about 10 pm take 2 medium painkillers.' (D2 Mr I)

'It's getting old, it's called aging, and you start falling apart. I think it is, you know, your body's obviously got to wear out, hasn't it? But, you know, as long as you wake up and you're breathing you go 'Yeah, I'm good to go for another day' (laughs).'(I2 Mr D)

Most participants were vigilant about falling and protected themselves by using walking aids or staying at home during bad weather. At six weeks post-operatively, patients started driving, swimming, gardening, and bending down but a few individuals expressed the worry of not wanting to overdo exercises and walking. Moreover, consideration of seat height, no heavy weight loaded on operated leg, and awareness of turning over while sleeping were discussed by a few participants.

'I am still being very careful about bending down or getting dressed in the morning and am still using the "Grabber arm" [reaching aid] for these purposes, as I do not want to bend my leg to high in case of problems.' (I2 Mr E)

At six months after THR, active coping techniques included management of physical activities, psychological coping and vigilance about the new hip. All participants expressed that their recovery went well. Moreover, they still kept busy by socialising and doing day-to-day activities and they were optimistic about their new hip, despite partial recovery.

'I know that my operated 'hip' is supporting my 'good' leg much better, and am walking well for longer periods.' (D3 Mrs B)

'Went to village to get some money from bank then did some light housework for my wife to help pass the time in the morning.' (D3 Mr E)

Finally, all individuals reflected on their awareness of the new hip, such as by being careful about twisting, running, wearing wedges with low heel, and using ladders. In addition, most participants still needed a stick to ensure they did not fall and a few participants gave details of other ailments, for instance, skin infection on the foot of the operated side and pain in the other hip.

‘Almost every time, sometimes I feel like I'm going to fall. I'm scared, it’s [stick] like my er security blanket, you know fall back on it like if I go, it will be like I'm falling over anything like that, but it’s there, I know it’s there to help me out that's why I use it. Around the house, I don’t use it inside the house, but er when I go out I use it.’ (I3 Mr D)

The advantage of writing a diary to log pain during the THR and recovery period was raised by some participants. They wrote and spoke of the benefits of discussing their feelings, and evidence of progression. A few of them were able to cope with their feelings about pain, worries, burden and private issues, black side of anything, and surviving through this challenge. In addition, a few others reported that a diary is an interesting instrument to evaluate their personality, function, factors, and results of exercises. All participants recorded their walking ability every day in the diary which indicated their tangible improvement.

5.3.2.2.2 Passive Coping

In the majority of participants, analgesia was taken to relieve pain and help support function. Paracetamol, diclofenac, or codeine with paracetamol were prescribed to all participants. Most of the participants occasionally used this medication when they needed to stand for a long time or felt pain to be unmanageable, whereas a few others needed analgesia routinely.

‘I have erm paracetamol and co-codamol, I've got both I take the paracetamol during the day if I'm in pain and I take the co-codamol of an evening, you know like before I go to bed because it’s stronger.’ (I1 Mr H)

Some participants stopped taking analgesia due to experiencing side effects such as upset stomach and/or constipation. In addition, some participants reported no efficacy of analgesia but a few reported not taking the prescribed dose of analgesia due to high concern about side effects, as described in the leaflet.

‘Erm well, paracetamol, I can’t take anything stronger, because it upsets my stomach, so I do take the full eight a day, two every four hours, which doesn’t take

it away, but does help. It, it means that I can be that little bit more active without a lot of pain.' (I1 Mrs F)

In addition to analgesia, patients expressed other passive techniques in dealing with pain, function, negative feelings and sleep disturbance. All participants reported resting when they were tired after long busy day to balance their physical activities. A few individuals pointed out that they spent quite long time per day resting due to pain while moving.

'I am really ready for a rest. We walked to the park and I find myself having to sit on the bench more and more when we get there.' (D1 Mrs L)

Participants discussed negative feelings after socialising. Some expressed avoidance of talking about their hip because it was a boring topic in conversation and they didn't want to focus on the hip problem. A few participants reported occasionally using sleeping pills to manage anxiety and improve sleep ability.

'Arranged to go out with husband and 2 daughters for a meal mustn't talk about me and operation!!' (D1 Mrs C)

Following THR, the majority of participants used analgesia and resting as their passive coping methods. There were different pain medications taken immediately after operation and for recovery at their home. On the hospital ward, morphine use was reported by almost all participants but some of them stopped taking morphine owing to adverse effects and belief it was masking the pain. Instead of morphine, a few participants used other pain medications as needed. Around one month post-operative, some individuals reported using two tablets of paracetamol as needed and a few participants used four tablets of codeine with paracetamol.

'when I get the nurse came every four hours to know what how you were and everything take your temperatures, she said 'Oh you haven't, you haven't had any morphine' and I said 'Morphine, I don't want morphine' she said 'Well that's what, that is round your wrist, it's a morphine bracelet and you're supposed to' well when you get a bit of pain, you're supposed to press it, so I thought oh that's a good idea, I'll do that, so I pressed it a few times, and then I felt ghastly, … so when she came

round again, I said no not taking it, I don't want it, you know you can have it back if you want it and she took it off me,' (I2 Mrs B)

'… well the one they [health professionals] gave me at the hospital, erm paracetamol, erm when I was in hospital, you have a a morphine…, I didn't like that, because it made me very tired and kept falling asleep, erm I didn't like that and erm dia dia dia-codamene…' (I2 Mrs C)

The other passive coping method was resting. Almost all participants reported sitting with their feet up after feeling tired from doing exercise or too much activity after a long day. Three other techniques were used by a few participants. For example, they ignored pain or THR complications, did not talk about their illness, and used alcohol or marijuana to relieve pain and improve post-operative sleep.

'…erm at half eight in the morning, I used to go down to the newsagent for a paper, used to walk down, walk back, so that was my first my walk in the morning and in the afternoon after lunch, (coughs) I know by about between two and half two, I'd go out for another walk about another mile and come back and rest the leg again,' (I2 Mr E)

At six months post-operative, a few participants discussed passive coping methods such as resting and using pain medication. After long periods of walking or daily activities, a few participants reported that they had to rest before they could continue walking or doing activities again.

'I do two [hours of gardening], well I do have, I do, I do have rests in-between, you know what I mean? I do have rests, because I mean I do it's a lovely day to be out, isn't it? so you go out in the garden and you do a bit, and then you have a rest,' (I3 Mrs C)

Coping techniques were largely mentioned before THR and were still expanded upon at a few months after the operation and then dramatically decreased at six months. Alternative treatments and mental coping were reduced post-operatively. By contrast, awareness was highly expressed from the pre-operative period to a few months post-operative and still gradually increased at the end of study.

5.3.2.3 Support

The support theme included: receiving support from people; receiving support from objects; and altruism towards others. Participants obtained support from their family members, friends, health professionals, and equipment, in particular during the post-operative period. When they regained their physical abilities, participants contributed to their experience, supporting charities and their friends.

5.3.2.3.1 Receiving support from people

5.3.2.3.1.1 Support from family

Pre-operatively, all participants received support from their family. Most of them reported receiving help doing daily activities, preparation for THR and in movement. Family members observed participants and suggested other positions to improve function. Some of them also shifted the participants' focus from pain and THR to other topics, such as travelling and playing board games.

> *'It is fair to emphasise the support of my wife in all these activities and that she "keeps an eye" on how I cope.' (D1 Mr J)*

In the early recovery period, the majority of participants reported that family members supported them in personal care, movement, and helped with some day-to-day activities. A minority of participants were encouraged by family members to do hip specific exercises and keep walking and their focus on pain was shifted to conversation or family activities. Importantly, a few participants often received warnings from family not to overdo exercises after they felt better and were able to live independently.

> *'My my mum and dad, my mum and dad, I went back to live with my mum and dad. I had the flat so I went back to live with my parents, so they were making me tea and stuff, I was like the king (laughs).' (I2 Mr I)*

At six months post-operative, almost all participants reported that family members often visited them. A few of them described how they were using items to support movement.

> *'Erm I've even done a bit of gardening, you know, and erm now I've got my son bought me some gardening tools, which are not long ones, not short ones, they're*

in the middle, and then I've got the national health walking stick, which the one that I've got it to the length that's about that high now, the shortest it can be and I can, I can use that to get [up], when I'm gardening,…' (I3 Mrs B)

5.3.2.3.1.2 Support from friends

Before THR, most individuals reported that they kept busy with their friends to distract them from their hip problems. During conversation, they avoided talking about their hip with friends who did not have experience in hip surgery; however, some of them received information about THR from friends who had experienced THR. These discussions were not only about the pre-operative period but also about things in the post-operative period such as preparation for recovery, type of anaesthesia, results of surgery, and management of post-operative effects. Participants expressed their desire to follow the path of THR veterans who showed good recovery. Additionally, some participants reflected upon the assistance of friends to help when they had negative feelings.

'The lady next door erm she she's eighty odd. […] and she was talking about going in for the operation, and she said 'Just treat it as an adventure' she said 'Just treat it as an adventure, you're going in for something, you've never had before and it's a bit of an adventure, isn't it?' so you know I started to think it about it like that. It's going got be a little bit of an adventure…' (I1 Mrs C)

At one month after surgery, some participants reported that their THR experience was distracted by socialisation with friends. In addition, friends supported them in daily activities and encouraged discussion about their worries, as well as encouraging participants to do their exercises. Moreover, they compared their own recovery with that of their friends undergoing THR ahead or behind them. A few participants mentioned that people around them offered support in relation to the difficulty of certain positions.

'I know there was a friend of mine who had his hip hip done two days before me in X [hospital], and he's been going up to Y [NHS centre] for physio, and he's he has now been given different exercises to do now. This is where I feel, perhaps I would benefit, I don't know, (laughs)…' (I2 Mrs F)

Most of the participants reflected that they felt more confident with friends than other times when they were alone. They received positive feedback as their movement progressed. A few participants reported other people helping them to stand up from the floor.

> *'Yes. I still have I still have a bit of a limp, erm but that's getting better erm. I was out last Friday with some friends and they said 'Oh, you don't seem to be limping very much now' so they notice that it is getting better and my limp is not as pronounced as it was, so yes, it's, I'm happy if people are noticing now that I'm not limping very much, it means I am making progress, so I'm very happy about that.' (I3 Mr E)*

5.3.2.3.1.3 Support from health professionals

Health professionals provided preparation before THR for the majority of participants, in particular, by offering a pre-operative education programme. (Pre-operative education programmes are discussed in more depth in chapter 6 and 7) Health professionals gave participants documents providing information on the prevention of risks and complications, information was given by the OT about home circumstances, diet during early recovery period was discussed, as well as recommendations to keep active. Some participants reflected upon advice given about movement as well as things they could and could not do after the operation. A few participants discussed advice given to stop taking warfarin.

> *'… that [pre-operative education] was very informative, that (laughter) very good very good, she's [wife] my buddy you see, she came with me that's what they [health professionals] said bring your buddy with you, yes that was very informative, they showed you what they was going to do, you know they showed you the parts they were going to replace, and all the things that you can and cannot do yeah, that was very good.' (I1 Mr H)*

Post-operatively, almost all participants received support from physiotherapists about movement and the importance of exercises on ward. When they went back home, they received information from the district nurse about normal wound healing and health

condition. In addition, the majority of patients were reassured by the consultant that they could resume normal activity at six weeks post-surgery. For the minority of participants, information provided in a hip booklet received from the pre-operative education programme was useful during this period.

> *'…I'd come back from the theatre at five. At nine o'clock, she [physiotherapist] was coming round and she said 'Can you move your leg? Can you do this?' and she had this pain 'Can you do that? Can you move your leg that far? Can you move it that far?' and I'm thinking I've just had an operation here, you know (laughs) and er and she she sort of said 'Oh, you can do it fine' … erm so yes that was it, but it was very very nice fellow' (I2 Mrs B)*

> *'Left for the hospital at 2.15 pm. Had my x-ray and then saw the consultant. He showed me the x-ray of my hip and said how pleased he was. It has settled in place and I can now drive, wonderful.' (D2 Mrs F)*

At six months after surgery, most participants met with health professionals who provided reassurance about recovery. Some participants were given confirmation that they could travel, to fly on an aeroplane and walk up and down a hill. However, almost all participants felt that their recovery did not match up to their expectations in terms of time of recovery. Therefore, they expressed that this expectation should be adjusted by the consultant to be more realistic.

> *'I would, you know the pain in my right's one is alright now. It's still it's as they [health professionals] said 'You've got to take your time with it, not rush it, not rush it'' (I3 Mr D)*

5.3.2.3.2 Support from other things

Before the operation, some participants reported using walking aids to help their movement. Some of them mentioned that they borrowed equipment from hospital to support their physical activities during the early post-operative period.

'Walked (with X [walker with wheels]) to local shops. Needed some shopping and my son comes with me. He helps me up the kerbs with the X, which is ideal for outdoors.' (D1 Ms K)

All participants spoke about using walking aids in the early recovery period. Reduction in number of sticks or crutches was implied to be their indicator of recovery. Most of them expressed that equipment offered by hospital and used during the early recovery period was the special chair and grabber arm. A few participants mentioned they used pillows in order to improve their sleep ability.

'… I walk with one stick. I've been walking without a stick now for three three weeks erm in the house. I try not to use it too often, but if I go outside, I use it all the time.' (I2 Mr E)

Six months into recovery, some participants reflected on the fact that they were using their walking aids as needed and using aids to help them get up from the floor to prevent falling.

'I am OK on even ground and downhill but use my collapsible walking stick uphill.' (D3 Mrs C)

5.3.2.3.3 Altruism towards others

Altruistic action was demonstrated in the majority of participants by expression of their willingness to support research and contribute feedback so as to be beneficial for other osteoarthritis patients going through the THR process. Pre-operatively, a few expressed their responsibility in the family as role of carer and helping their wife to do chores.

'… erm when I when I first got your letter to hip surgeon, that letter first of all saying that he gave us it's an option, it's quite optional, isn't it? if if (laughter) if you know if you want to, we can we can say no, thank you, I and he his letter emphasises that it's it's not for it's not for our. I mean it's whatever you produce from your your topic isn't going to be any help to me in my, but it may it may be of help to to some people who are having the same thing in the future and that so I thought that's fine...' (I1 Mr J)

At one month post-operative, a few participants reported that they behaved altruistically to help other people undergoing THR and other people in society by volunteer work with a charity. Altruism for other people continued until six months post-operative. Moreover, they also generated some ideas for further research, such as a group of THR veterans, a volunteer to provide THR experiences for others having THR and promotion of important exercise in the pre-operative period.

> *'If people could be sort of before a replacement, if people perhaps could hear about other people's experience, and what to expect, and what to do for the best would help a lot, wouldn't it? Yes, I think so. I wish I'd been able to speak to people before erm to sort of erm find out really like if anybody told me that first week home, I was going to feel so tired, I wouldn't have been so worried.' (I2 Mrs F)*

In term of writing a diary, some participants gave feedback of a negative nature about recording their experiences. This was due to the fact that the diary focused their mind on the hip and pain issue and the fact they were uncomfortable.

> *'I still find it uncomfortable to be having to focus much more on my hip that I would do naturally. I'll be very glad when this diary exercise is completed. I can just get on well myself without needing to think about & record my feelings towards my hip.' (D1 Ms A)*

Both the support sub-themes illustrated the same trends. Participants needed support for their disability before the operation but this need was not as great as during the early post-operative period, and declined steadily to be at the lowest point six months after THR. Moreover, altruism during early post-operative time was higher than at other time points.

5.3.2.4 Well-being

Well-being is defined as the subjective evaluation of people's happiness and satisfaction with their lives. Wellbeing is made up of genetics, emotion and experiences[213]. In this sub-theme, experiences and emotions were looked at from end-stage osteoarthritis to six-month recovery.

5.3.2.4.1 Experiences

Pre-operatively, participants became experienced in controlling their pain and dysfunction. Active coping techniques to move their focus from pain to other things, in particular their leisure, socialisation, and exercises were able to support participants before the operation. Moreover, experience of passive coping was also expressed. A few individuals reported they were trying to be independent from analgesia and using it as needed due to either awareness or experience of the side effects shown in the medication leaflet.

> *'Right, I read a lot. I do read a lot. I mean obviously I have to do housework and that sort of thing, (laughs) but I read a lot. I'm quite involved. I'm the treasurer at my club, so have quite a lot to do with that. I'm the treasurer for my local talking newspaper, erm so I am involved with that. I have to sort of keep the books up to date, and all the rest of it, erm I start, oh I love my Sudoku, my daily paper and I started to do jigsaws.' (I1 Mrs F)*

All the participants reported that pain had an effect on their day-to-day activities and the ability to sleep. Participants woke up during the night and then applied a variety of coping techniques to return to sleep. In cases of waking up close to early morning, some decided to get up and carry on their normal activities but others continued to try and sleep. When they felt tired and wanted to sleep during the day, they were able to doze off because most of them were retired.

> *'Woke in the night several times. First about 12.30. Decided to make a drink and read a book. Hip is painful, particularly when I turn over but lower left back and abdomen feel achy and sore. Couldn't get back to sleep until 5.30. Woke at 9.00.' (D1 Ms G)*

Moreover, participants hoped to get a date of surgery either from the consultant or by reference to the national guidelines. Some people felt a sense of success when they got a letter giving the surgery date. On the contrary, most of participants expressed a negative experience of inappropriate time, such as a long-waiting time for the surgery date and

postponement of THR. This meant participants had to rearrange support from family or friends for the early recovery period.

> *'Saturday, I got a letter from the hospital re-arranging my operation 6 days later (from Nov 29th to Dec 5th). This left me feeling low, so it was good to be busy. I live on my own, I have no family less than 200 miles away. They had booked leave between them to cover my stay in hospital and a week after I get home. I just hope they can re-arrange leave and children.' (D1 Mrs F)*

Participants expressed feelings of great achievement in their capabilities of carrying out some physical activities without chronic osteoarthritis pain after THR surgery. In hospital, the physiotherapist encouraged participants to walk within a few hours after the operation and use of morphine for a while to deal with acute pain. At home, participants mentioned the progression of wound healing, movement, and independence from analgesia. Wound care was undertaken by a district nurse on a few home visits. On the contrary, some difficulty of movement and sleeping were reported, mainly due to restrictions in using the new hip. Participants needed to wear support stockings, use walking aids, take appropriate exercise and movement, including sleeping on their back. Wearing stockings and sleeping on their back resulted in pain and discomfort. This was managed by taking off stockings, using pillows, getting up and moving around, or taking analgesia before going to bed.

> *'I did not sleep well at all, very restless. No pain but sleeping straight not comfortable at all.' (D2 Mr I)*

> *'I noticed that after a week, or so my left leg, which was the operated leg was really really painful, and I found that the stockings, which were the high ones would roll down and almost cut off your circulation and make your legs really really painful and at one point, my leg was really really swollen,' (I1 Ms G)*

Friends and family members boosted confidence by giving positive feedback and encouragement to keep doing exercises as well as try new things. In addition, health professionals confirmed good evidence of walking posture and function recovery when participants met them for a health assessment around six weeks post-operative.

'he [consultant] says when we can start driving that's what the Friday after, when I had to have could start driving he says 'Do you feel like you could drive?' I said 'Yes, feel alright' so that weekend I can start driving…,' (I2 Mr D)

Some participants reported tenderness in their scar tissue. Health professionals explained that this was the normal healing process. This reassured participants' confidence that recovery was progressing well. The tenderness gradually disappeared a few weeks later and participants put more faith in the health professionals due to the good recovery.

'…I think it [meeting doctor] was last week, because I was a bit worried that it [scar] was still swollen and it it was swollen and little bit sore and erm I can feel it like a big lump in the side, and I went to see the doctor and he was very good and he explained everything and he said it was scar tissue, so he said he said when they went in erm too much, scar tissue grows, it grows quickly and it's grown and it's it's got to be dispersed and the more exercise you do and some days I don't feel it at all, and then some days I do I still do feel it a little bit…' (I2 Mrs C)

Additionally, some restrictions were allowed by the consultant. Advice was significantly changed for participants to regain their normal activities, in particular driving, enjoying some safe hobbies and starting to sleep on their side. These resulted in little or no pain and discomfort resulting from not only positions of sleeping, and discarding support stockings, but also increasing strength of muscle around their hip. Apparent evidence was recorded in the diary, such as reducing the number of walking aids, increasing long distance walking, trying to do household chores, and enjoying some safe hobbies.

'… I walk with one stick. I've been walking without a stick now for three three weeks erm in the house. I try not to use it too often, but if I go outside, I use it all the time.' (I2 Mr E)

After six months post-operative, all participants expressed that they had a good recovery. Their normal life had returned during the healing process. Participants continued the exercises from the physiotherapists, and these were blended into normal activities such as walking and swimming. Some could discard walking aids but all still carried sticks when walking long distance due to fear of falling. They were also able to control their function

with less pain and no stiffness. An aid was still used in order to get up from the floor, which was perceived as partial recovery, but participants were satisfied with this. They were told to wait until twelve months for full recovery of function.

'I am OK on even ground and downhill but use my collapsible walking stick uphill.' (D3 Mrs C)

'So everything's as far as the hospital and the specialists are concerned everything's okay. It's just a waiting game now of building up the muscle strength and nothing else.' (I3 Mr E)

Participants could partake in all hobbies that they used to enjoy. They were able to treat their new hip in the same way as the normal hip; however, they were still concerned about posture of movement after getting pain and discomfort. All were able to sleep without any pain or discomfort.

'Slept well, hip feeling a lot better. Improving all the time.' (D3 Mr D)

5.3.2.4.2 Emotions

Anxiety and fear were the main emotions during the pre-operative period. This was due to hip pain and its effects. Participants reported hip dysfunction, tiredness, sleep disturbance and limping during the waiting period before having THR. In addition to these, there were all the effects of hip pain associated with annoyance, disappointment, and frustration.

'…now I can only paint where I can read from a chair. I can't climb ladders or keep getting up and down from the floor. I felt frustrated and useless.' (D1 Mrs L)

'…we had we're disappointed in a way, that we're not able to continue as in as active a role as we as we were…' (I1 Mr J)

Some individuals reported that they were annoyed or disappointed with having to take analgesia due to ineffectiveness and side effects. Their frustrations also related to limitations on their physical abilities. Therefore, they tried to use alternative pain medications, or use it as needed.

'Erm well, paracetamol, I can't take anything stronger, because it upsets my stomach, so I do take the full eight a day, two every four hours, which doesn't take it away, but does help. It, it means that I can be that little bit more active without a lot of pain.' (I1 Mrs F)

After they met their consultant and confirmed the need for THR, participants waited until receiving an answer from the consultant or in accordance with the time set out in the national guidelines, around 10-18 weeks. Some waiting times were shorter, some were longer than the target set out in the national guidelines. Those with shorter waiting times were happy but also felt shocked and frustrated because that left a short period for preparation for surgery.

'I am quite shocked because it is short notice but at least I won't have too much time to worry about it.' (D1 Ms G)

Conversely, other participants were left waiting for a date of surgery and tried to chase it up, sometimes getting postponement of their surgery date. Feelings of disappointment and frustration in chasing the right department for their surgery date and having to deal with disability in the waiting period were common. Participants also reported how this had an effect on support lined up from family or friends in the early recovery period. However, participants used optimism to help them deal with the nature and priority of surgery. Some participants were anxious in terms of risks and complications, as well as anxious about their occupation and return to work. Experience of pain in the other hip or leg and fear of falling was also expressed during this time by a few participants.

'I had a shock as rang hospital to find out likely timing of hip op. … Now told, he got it wrong & wait time was 18 weeks!! My op likely to be Nov/Dec. I feel unsettled as had been gearing up for an early Sept op. Have now accepted it'll be much later. On positive side, it means I have ever more time to get back hip really strong & flexible. The exercises have made a HUGE difference – much more mobility & less pain. My hip has never felt so good!' (D1 Ms A)

'Worry that post-op, I will not be able to get up, go downstairs and distract myself for a while. I know this will only be temporary and as long as I have one leg walking I can manage stairs eventually.' (D1 Ms K)

Participants detailed all of these negative feelings, secrecy and burden in the diary. Some participants expanded further in the interview due to living alone and inconvenience of talking with close friend or spouse. Most participants enjoyed their hobbies and used them to distract from their pain and hip issues. This kept them happy which helped to take their mind of pain.

'it [diary] did help me writing it down, and I've been honest with you, where I perhaps haven't been honest with other people, you know I kept it lighter 'How are you?' 'I'm fine, I'm fine' whereas I'm not really, I've got a pain here, and I can't do this, and I'm worried to death'. There's a lot of people, I can't, so that to some people I could, whereas I could say that you know to the diary. ' (I1 Mrs C)

After the operation, participants expressed positive feelings because THR had been done. Following on from this, increased regaining of physical activities at home, reduced THR effects, no pain, and freedom from restrictions were reported. Additionally, when they socialised their friends noticed their improvement of function across the time and participants felt increasingly positive about their progression.

'Everyone is amazed how well I look and how well I'm doing, given it only 6 weeks since the day of the operation.' (D2 Ms A)

However, various issues worried participants during early recovery. Participants mainly reported their anxiety about functional recovery. They attempted to exercise and used walking aids to support their movement, as well as to measure their progress by looking at walking distance, speed and numbers of walking aids used.

'… I stick stuck with the two crutches outside, and one crutch in the house until I saw him [consultant] after six weeks, and I asked him he said 'You walk with whatever you feel comfortable with' so I I just I, around the house now I don't use anything, but I limp a bit and that bothers me, because limping can put pressure on other

joints, so I don't know whether I'm doing the right thing, but outside I use one crutch.' (I2 Mrs F)

In particular, effects, risks and complications of THR, including progression of recovery, were wound healing, scar, knee pain for a short period, later independence from walking aids and all supports including stockings. Participants felt annoyance and frustration dealing with some difficulties when sleeping on their back and wearing stockings that hurt them. A few of participants were frustrated with the error of the NHS system.

'erm I noticed that after a week, or so my left leg, which was the operated leg was really really painful, and I found that the stockings, which were the high ones would roll down and almost cut off your circulation and make your legs really really painful and at one point, my leg was really really swollen,'(I1 Ms K)

At six months post-operative, all participants reflected upon their happiness and took comfort from their progression across the time, despite only a partial recovery. They were able to partake in their hobbies; however, they still needed some support to get up from the floor. Moreover, the fact that they had no hip pain made them feel good about the on-going recovery and their good movement ability was noticed and commented on by friends and family members.

'A good day today. Walked around lake in B'head park. Felt really good, pain just a little hope it stays that way.' (D3 Mr D)

On the contrary, negative feelings about THR and hip pain were discussed by almost all participants. They expressed little anxiety about their future in terms of their improved physical function and duration of full recovery. Other issues were concern, in particular, about their co-morbidities resulting in pain.

'Very little pain to worry about from hip now. More concerned that once I stop using my stick, I will have problems with my right knee again. I have problems with knee for many years due to a skiing accident.' (D2 Mr E)

Change of this theme beyond THR was clearly illustrated in positive experiences and emotions. Positive experience gradually inclined since the pre-operative occasion in

contrast with negative feelings about mistakes by other people, including an inappropriate NHS system. This moderately declined until six months after operation. Positive emotion was the highest expression at early post-operative period and then gradually reduced at the end of study but it was still higher than pre-operative period.

5.3.2.5 Cognitive aspect of self-regulatory model

Cognitive aspect of the model theme was emerged from beliefs, expectations and learning behaviours sub-themes. Details of three emerging sub-themes of cognitive aspects in this model are described below.

5.3.2.5.1 Beliefs

Participants' beliefs were represented in three areas, comprising active coping techniques, nature of osteoarthritis and THR, including medical professionals. They were described from the pre-operative period to recovery at six months.

First, all participants expressed their belief in active and passive coping and a balance between exercise and rest. Almost all participants believed in active coping techniques, in particular, exercises and maintenance of day-to-day physical activities. Following exercises and keeping active, participants suffered from tiredness and stiffness but they felt that their hip benefited from the movement and exercises.

> *'… so now all I have to do is push on these and get up things to help me out. I mean I don't believe in sitting down, doing nothing, because I'm er bored out of my mind and I've put on weight,…' (I1 Mr D)*

However, some individuals expressed their belief in passive coping, in particular, using pain medications when they needed. They tried to be independent from pain medications but a few of them believed in using analgesia to enhance their movement function.

> *'I am taking painkillers, they don't take the pain away, but they help me to keep mobile.' (D1 Mrs F)*

When participants got their exact date for surgery, some reflected that the good experiences of their friends gave them confidence in the THR process. In a few remaining participants, lack of confidence regarding THR was raised because they had pain in other

areas compared with their friends or other co-morbidities which generated similar symptoms to hip osteoarthritis.

> *'My main worry is that although I was told I needed a 'full hip replacement' I don't get the pains in my groin as severe as other people; however, my most severe pains occur in my legs.' (D1 Mrs B)*

Moreover, some participants expressed their trust in health professionals. They received useful information in terms of keeping active, exercises, and anaesthesia. A few of them mentioned the benefit of the exercise recommended by the physiotherapist.

> *'Must concentrate on instructions from physio and orthopaedics and work hard towards walking properly again. Seem to be in "no man's land" but must remember how good it will be to go walking with the family again and visit my son in X [place].' (D1 Mrs C)*

Some patients expressed that, shortly after the operation, analgesia was recommended by the health care team in order to recover movement. A few wanted to listen to the pain in their body and a few of them were not able to tolerate the side effects of pain medication.

> *'The reason I have stopped taking it [analgesia] is the only way I'm going to find out if the pain has gone, or is subsiding, is by not taking the pills, because the pills are hiding the pain.' (I2 Mr E)*

During the early recovery period, almost all individuals who lived alone reported that they needed someone to support them. They received supported from their friends and/or family members whom lived in other premises. A few individuals reflected that they believed their body to be a machine. A new hip joint was replaced but the muscle around the joint was cut and this was the essential part for participants to recover and increase strength. Their concerns pushed them to assist their desire of good recovery by adding more repetitions of hip exercises when they felt no effect of the recommended repetitions.

'I'm still doing my hip exercises 3 times a day but an increasing the number of repetitions so that they continue to be challenging and increase my strength and flexibility.' (D2 Ms A)

The majority of participants believed in health professionals after the operation. They were restricted in their physical activities in order to prevent risks and complications. At an appointment with the consultant at around six weeks after THR, patients were given their surgery outcomes from x-ray evidence as well as an explanation about scar tissue and allowed to resume their physical activities such as driving.

'Left for the hospital at 2.15 pm. Had my x-ray and then saw the consultant. He showed me the x-ray of my hip and said how pleased he was. It has settled in place and I can now drive, wonderful.' (D2 Mr D)

All participants reflected their confidence in movement recovery because their friends gave positive feedback and health professionals reassured them that their mobility had recovered well at six weeks after THR. Moreover, they got more confidence from their own recuperation of physical function by feeling strength in their hip as well as being liberated from wearing the stockings. For the minority of participants, there were doubts in the duration of recovery owing to feeling no benefit from the exercises; however, a few tried to increase the number of exercises or sought out recommendations from physiotherapists.

'Erm I'm going to see a specialist in four weeks' time for an x-ray and a chat with the specialist again, and until then I don't know how good or how bad the operation has been until I've had an x-ray to see how it is, and whether it's healing properly or not.' (I2 Mr E)

Participants mainly expressed their achievement after doing exercises and obeying the restrictions of THR. When participants woke up on wards after the THR, they were supported by physiotherapists for their mobility, for example, when getting out of bed and walking, as well as starting to walk with walking aids. During the two weeks of writing their diary participants recorded their walking distance and number of walking aids that they used. As time passed, walking capacity increased while number of walking aids decreased.

Following interviews, most of them tried to discard their walking aids in their house but brought one walking aid with them when they went out. Participants believed that regained physical activities were caused by self-disciplined exercises around two to three times per day.

At six months post-operative, the majority of participants believed that maintenance of specific exercise should continue as they had not reached their target of recovery. Moreover, most participants expressed that their age was a factor for partial recovery and some restricted movements were because they were old.

> *'Erm if I'm sitting for any length of time, when I get up erm my leg's a bit bit stiff until I've walked two or three yards until the stiffness starts to disappear, but I don't know whether that's, because of the operation or just normal old age. (laughs) It could be just old age, erm because I've stiffness in my other leg as well,' (I3 Mr E)*

Most of them expressed confidence about their recovery due to the progression of day-to-day activities without any pain or walking aid, including adaptation of movements in some positions. The strength of hip muscles returned at various times. A few participants tried to do some restricted movements, such as kneeling down to do their gardening by support of a kneeling pad or starting a little bit on the bed, moving to a chair and then a short period of kneeling down on the floor and standing up after. However, some expressed that the particular movement of getting up from the floor required some aid.

Most participants achieved their goal of recovery at this time. They reflected their satisfaction with their movement, with less or no difficulties in terms of limping, tenderness, stiffness and pain. Their friends and family members encouraged them by saying they could see good improvement with their walking. Moreover, they could return to doing almost any physical activities, such as gardening, swimming, and travelling.

> *'The guest at supper, two hadn't seen me since we trekked for 5 weeks in W [place] in Oct 2012, were amazed that I now walk without any limp at all. I can't see it myself, but everyone says my walk is great and you'd never know I once had a bad hip and limped very badly.' (D3 Ms A)*

5.3.2.5.2 Expectations

Pre-operatively, all participants reported that they expected to undergo THR, recover well and return to their normal life that they had had prior to diagnosis as hip osteoarthritis. The main reason for undergoing surgery was uncontrollable pain and disability that impacted on their physical ability and occupations or roles in society. A few participants experienced delayed THR. This resulted in the need to rearrange their appointments and family or friends' support a few weeks after their operation.

> *'I'm looking forward to it [THR], because er I hope something can be done, and I could stop being in this pain and er I can stop moaning about the pain (laughter) and be better for my health and my wife's and everybody's everybody everybody be sad, because I know she'll be happy if I especially what I have to do, you know don't know what I'm going to do. I hope I I can go out there, and play golf again, hope I can get out there, and dance, you know it's the things that I we last year past two years New Year's eve, we went out past three years, we went out and er I couldn't dance. I I got up to dance and start trying to turn, couldn't turn the pain was so bad.' (I1 Mr D)*

After hip surgery, participants expressed their expectation of good recovery and return to normal life. Due to restrictions six weeks post-operative, they wore support stockings, needed to sleep on their back, did not overdo some movements, and could not drive. In following these restrictions, they hoped to recover without complication or problem. They looked forward to discarding their stockings, sleeping on their side, doing their physical activities and the follow up appointment with the consultant. The appointment was arranged to follow-up their progression and confirm their physical abilitiy around six-to-eight weeks after THR, looking at capability for driving and recommencing their hobbies. Participants eagerly anticipated the return to normal life and kept doing their exercises.. Most of them aimed to walk without aid, travel and recommence hobbies, although, hesitation about the length of time for good recovery was apparent in some participants. Moreover, a few of them expected that their experiences would be useful to support research study and make contributions for future patients.

'6 weeks have passed. I hope I am at the correct state that I should be at. I hope so. I can get on and off buses, go upstairs and downstairs comfortably and can do lots of jobs around my flat plus I am walking further distances each day. So I am looking forward to when I see my consultant and have X-rays to confirm everything is OK.' (D2 Mrs B)

The majority of individuals had an expectation that they would have good recovery by six months post-operative. Recovery of function partially achieved their expectations because they still had some stiffness, uncomfortable feeling, and tenderness in their hips. This affected their hopes to accelerate their recovery but health professionals suggested they should wait and there was no rush for full recovery until twelve months post-operative.. This was also advised for the minority of participants that were satisfied with their recovery.

'… he [consultant] said I'm as I should be for this length of the time. I mean just said 'Don't rush it, just take it as as', you know, and he said in twelve months he thinks I'll be walking perfectly he said 'You'll have forgotten all about ever having had the operation' and I think it is getting there, because we're only in June and we've got like five, it's five months so yeah.' (I3 Mrs B)

5.3.2.5.3 Learning behaviours

Before the operation, most participants reported on their analysis of their experiences in coping with pain and movement function. Active coping with pain and daily activities were analysed. Some exercises or hobbies were stopped or adjusted to do in small doses, and alternative choices of coping techniques were selected after trials, such as alternative treatments, and using the bus instead of walking. A few participants played mind games to solve their problems and that worked in keeping up optimism. A few others were concerned about their reduced capability to work.

'I went for a swim and worked really hard in the garden today & I've overdone it! My hip is really stiff which means I'm hobbling this evening. I suppose it's to be expected after quite a few days of it feeling really good. I accept the situation, after

all I've actually in cartilage between my hips & thigh bone, so it's seemed to give me problem.' (D1 Ms A)

Most of the participants accepted limitations on physical activities resulting from hip osteoarthritis. Some of them accepted pain from exercises that would support their strong hip and a more rapid recovery. A few of them expressed that they could accept painful movement during this waiting period due to hope of getting THR.

'I've made an effort to avoid stretching and bending and twisting my body, what have you if if you do those sort of things, er then then as I say by getting into the car and passively doing all those sort of things, er they are the things that er they're going to cause you trouble,…' (I1 Mr J)

Some participants reported vicarious learning by observing other's experiences through socialisation, internet, or friends on the pre-operative education programme. They selected good experiences to guide them and compared themselves with different lifestyles so that they could make some adaptions to prepare themselves for THR, including good recovery. In addition, most participants also reflected upon encouragement to undergo surgery from THR veterans, family members, and health professionals. Some of them were discouraged in a previous appointment with health professionals as they were rejected for a referral to the specialist or to undergo THR due to the severity and their age.

'I met a lady a couple of days ago, and she had an operation, erm no, she went out a month ago, and she's still on two sticks. Well, this girl I'm talking about yesterday, she was on sticks for a fortnight two of them, and then she went on to one, and you know she said so well, I'm taking, I'm going by what she's done and er I'm very impressed. … she came in and told me what to do in the kitchen, but then the lady that came to offer me help in getting a different chair, and things like that she told me, but it was very helpful to get advice from somebody that's just going through it. Well, gone through it, now she's, she's out the other end now. She's planning a holiday, yes, so it it can be done, can't it? But I suppose it still depends on you and how severe your operation is, isn't it?' (I2 Mrs B)

Adverse effects of analgesia were reported by most of the participants. They tried many pain medications to alleviate pain and then decided to use medication as needed when pain became uncontrollable. In addition, a few participants reported that they worried about the side effects of analgesia and limited their dosage after reading information from the medication leaflet. They applied other coping techniques to ease the pain; however, they were advised by their doctors and gained more confidence to take analgesia.

> *'I'm not a tablet person and I'm always worried about the side effects if you read the erm the leaflet. You wouldn't never take any tablets, the leaflet would put you off you know the leaflet it just all the warnings and all the side effects' (I1 Mrs C)*

From their belief in active coping and the nature of THR, efforts of trying active coping techniques were reported in the majority of participants. They preferred to exercise as much as they could do before the operation in order to receive the optimum effect in the recovery period. This was also confirmed by the health care team when they went to hospital for a pre-operative assessment and education programme.

> *'I'm a firm believer in it, I think exercise if you even, if you have to force yourself, it's worth doing. Sometimes even the pain is worth putting up with to keep the legs active (laughter), yes, very much so yes.' (I1 Mrs F)*

After THR on the ward, some participants spoke that they stopped taking morphine in hospital because they would not tolerate side effects of feeling faint, nausea and constipation. Around a month after discharge, the majority of participants reported their own experiences of progress function. This was measured from distance, speed, time of walking, number of walking aids used to support, and new positions gained such as sleeping on the side, kneeling down, and gardening without hip pain. The more distance and speed of walking they reported, the better progression they felt. Most participants tried to start walking without aids in their house in order to gain confidence before trying this task outside. In the minority of them, repetitions of hip specific exercises were added when they felt no improved function.

'… I walk with one stick. I've been walking without a stick now for three three weeks erm in the house. I try not to use it too often, but if I go outside, I use it all the time.' (I2 Mr E)

Additionally, most participants reported that progression resulted from balance of coping techniques between exercises and resting, including function augmentation from analgesia. They also received positive feedback from friends, family members and health professionals to keep exercises that would assist the success of THR. Once they were satisfied with bodily strength, some of them rewarded themselves by buying new things and making future plans to travel. Moreover, some individuals reflected upon a vicarious experience that guided them to good recovery.

Most of the participants accepted their physical abilities were restricted as a result of THR, doing hip exercises in the early recovery period. They used walking aids, supportive equipment in their homes, slept on their back, and restricted difficult movements. In particular, sleeping on their back gave pain at the back or legs and they solved this issue by the support of pillows, or walking around the room until pain eased. However, most of them were retired and were able to compensate by sleeping during the day. In addition, a few participants wanted to discard their support stockings and they waited for confirmation of this from health professionals as they were aware there could be complications.

Participants expressed the importance of exercise in order to enhance their movement recovery. A while after waking up on the ward, the physiotherapist supported participants in their movements by using walking aids. When they tried and were able to do these exercises in their home, participants gained confidence in their movement and their progression to their target of regained physical function. Both confidence and target also enhanced their power to keep doing the exercises. However, a few participants were frustrated with their recovery and commented that they expected to get full recovery and return to do physical activities as well as they could do before having hip pain.

'… you know even though I've had my hip done now. I'm still a bit nervous about falling over and and doing any damage, but you know I know that I need to walk

and I need to strengthen those muscles, you know, to to get the optimum effect.' (I1 Ms G)

At six months post-operative, the majority of participants reflected that they were learning from their own experiences. They compared their physical abilities between the present and the past six months since undergoing THR. They felt they had regained physical abilities slowly but accepted this. Two reasons for this were the length of recovery period and their age. However, their consultant advised the point of time for full recovery as being twelve months after the operation, therefore participants still kept doing exercises but did not overdo them. They also tried to do some new exercises although this might cause pain. After that, they recognised the importance of waiting for full recovery. In addition, almost all participants discarded equipment supporting their early recovery, excluding walking aids. They were kept to essential use only.

'Erm I have got a helping aid but I've never used that now for two months 'coz I've I'm trying not to use it, so that I can feel that I'm able to bend the joints more and more without the help of the aid, because only by doing that that I can help to give the strength back into the muscles and the tissues. As long as I'm using an aid, I'm defeating the object of trying to do things on my own.' (I3 Mr E)

For the minority of participants, vicarious experience was reported. They observed and talked with their friends or family members about periods of full recovery and effectiveness of the new hip over a long period. Moreover, a few others explained that they slowed down their physical activities, comparing with their lifestyle before getting hip pain, especially when working before retiring. Limitations of mobility were also expressed, in particular getting off the floor without support and going for long walks; however, they accepted this dependence and took a rest before continuing their walking.

Beliefs sub-theme was generated highly by confidence at the pre-operative period and belief in active coping at one month post-operative, which was maintained until post-operative six months. For expectation sub-theme, it was stable from pre-operative to early post-operative period, even though this was reduced at six months post-operative. In learning behaviours sub-theme, vicarious learning was highly raised before THR but this

was reduced after THR and disappeared at post-operatively six months. On the contrary, learning from their experiences was inclined from pre-operative period to post-operative period.

5.3.3 Relationships of sub-themes focusing on pain and THR

The relationships between all five themes and thirteen sub-themes are explained separately in each sub-theme. This illustrates all relationships at each point of time. This started with chronic osteoarthritis pain that led participants to undergo THR, and followed with agreement for hip surgery, and THR preparation. Later, the relationships during early and late recovery period were described. All relationships at each point of time across THR are summarised in Table 25.

Table 25: Summary of relationships between dominant sub-themes and other sub-themes at each point of time through THR journey

Time across THR	Dominant sub-themes	Relationship with
End-stage osteoarthritis	• Pain (chronic) • Disability	• Active coping • Emotions (Negative feelings) • Experiences (Sleep ability) • Support
Agreement for THR	• Expectations	• Active coping • Passive coping • Learning behaviours • Beliefs • Support • Emotions (Anxiety) • Co-morbidities
One-month recovery	• Pain • Disability • Post-operative effects	• Learning behaviours • Beliefs • Support • Emotions • Experiences
Six-month recovery	• Experiences (normal life)	• Expectation • Learning behaviours • Beliefs • Altruism

First of all, there were relationships starting from chronic osteoarthritis pain and disability through to coping technique, emotions, sleep ability in experience sub-theme, and support

theme. For end-stage osteoarthritis, participants expressed a variety of active coping techniques blended into their lifestyles. Dysfunction negatively impacted on feelings and sleep ability and participants managed chronic pain by exercise, analgesia, mind games and optimism. Support was given from family, friends, and health professionals. Chronic pain and severity of disability led participants to undergo THR with the agreement of the consultant.

Following agreement to undergo THR, patients had expectations with regard to coping techniques, learning behaviours, beliefs, support and emotions, in particular, anxiety. When they expected to eliminate chronic pain and its effects with regard to their beliefs in health professionals, two targets of undergoing THR and good recovery were established. They prepared themselves such as by gaining information from THR veterans in order to get optimal recovery, as well as other sources such as family members, friends, relations, acquaintances, and the internet. In addition, participants relied upon information provided by health professionals to prepare themselves for THR. Participants attempted to increase benefits and lower risks of THR via vicarious learning and the recommendations of health professionals. Additionally, other ailments were concerns before the operation, in particular, acute infection and tooth problems due to infection control. This might result in cancellation of THR.

After THR, post-operative effects impacted on learning behaviours, beliefs, support, emotions, and experiences. Acute post-operative pain and post-operative effects occurred instead of chronic pain, thus, active coping was carried out through various techniques to pain and physical function management including awareness of safe movement. In addition to these, post-operative care ensured patients could manage the effects of THR and that they were supported by health professionals, family members, and friends. Participants also believed in the exercises recommended by the physiotherapist and obeyed advice given relating to taking pre-cautions when making risky movements. Participants wanted to reach their targets following their expectations of good recovery and return to normal life. Physical function was improved by active coping methods and taking pre-cautions with certain positions. Their confidence in the exercises was increased by self-learning, which could support their effort to continue these coping techniques for

the long term. During early recovery period, participants were also encouraged in their progress by people around them, including health professionals at a check-up appointment. Participants expressed their happiness about undergoing THR and confirmation of good recovery, as well as their regained physical function and improved sleep ability at six weeks post-operative. They also told of their altruistic actions in sharing their THR experiences with other people.

At six months post-operative, participants gained partial recovery without hip pain. Their normal life returned and helped by expectation, adaptation from learning behaviours within their lifestyle, and beliefs. Moreover, they expressed their willingness to support other people. They partly achieved their goal of full recovery and mobility, except for a few positions where they still needed support from other people or equipment. Their expectations were then adjusted by health professionals to wait until twelve to eighteen months after THR and they tried to accept this adaptation of partial recovery. Therefore, they confidently believed in health professionals for active coping methods and continued doing exercises until they had made a full recovery. Participants gained happiness and were altruistic. They were satisfied with their recovery and regained their physical activities, and they offered their voluntarily service in some charities, including support in this research study.

5.4 Discussion

This longitudinal element was concurrently conducted in participants representing their experiences in questionnaire surveys, diary then interview in order to explore in-depth details of their experiences through the THR journey. The transition state of participants undergoing THR was illustrated in findings of five themes across THR and relationships of dominant sub-themes. The results illustrated the process of pain impact on psychosocial aspects and behaviour to confront pain, dysfunction and negative feelings as well as maintain daily activities with subjective well-being. Patients got support from people around them as well as specialist equipment. From these influences, a group of some themes were discussed below.

5.4.1 Key findings

5.4.1.1 Physical symptoms, management and well-being

Before the operation, various durations of the waiting period were reported. Some participants got the date of surgery earlier than they expected. Then, they felt shocked and used optimism to prepare themselves for operation. Conversely, a few participants waited for a longer period than suggested and required support of pain management. This was also suggested in previous study by McHugh for appropriate alternative treatment at this time[98]. This might be ambiguous support from either GP service or surgical team and it should be specific support for patients in the waiting period.

Additionally, a few of them postponed their surgery. They tried to keep active and did exercises, gaining confidence in the result of exercises to support their mobility. Difficult movement issues were also raised in previous interview research during the waiting period[100] and two randomised control trials explored the effectiveness of pre-operative exercise in THR patients. An intervention group improved their pre-operative physical function[214,215] and reduced the rate of using a rehabilitation facility after THR[215] but there were no effects on post-operative function[215]. Thus, exercises should be an alternative therapy for participants to improve their physical function in the waiting period.

This study reported on the pattern of using pain medications in participants since end-stage osteoarthritis pain. Pre-operatively, some participants used pain medications routinely to help with movement but others preferred to use it when needed. After the operation, medication was taken by most participants to relieve acute pain. Most participants reported their analgesic independence at six months. This was different to the previous study by Johnson[109]. At the pre-operative period and recovery, most participants reported that they rarely used analgesia, although post-operative pain management was similar to analgesia patterns in hospital. Attitude towards pain medications in this element saw a dynamic change. When they were home, participants took pain medications as needed because of their belief in independence, and concern about side effects. By contrast, their attitude was changed for a short period by health professionals in the hospital who suggested the use of analgesia for recovery. Participants then returned to

taking pain medications as needed, again because of similar reasons before the operation[109]. Likewise, these reasons were the same as in this element through THR journey.

Post-operative pain management medication taken by all participants was morphine. They could not tolerate side effects and decided to stop taking the analgesia; however, they received support from physiotherapists to enhance their function recovery by observing their use of walking aids until confirming their good function in hospital. Previous studies reported that post-operative exercises improved early recovery of physical function[214] meaning there was an increase in reduced length of hospital stay without complications[216]. On discharge from hospital, alternative pain medications prescribed were codeine and paracetamol. This pattern of pain medications use was in line with PROSPECT study[217] referred to British Orthopaedic Association guideline[30].

5.4.1.2 Physical symptoms, expectations in cognitive aspect and support

Cognitive aspect of self-regulatory model was emerged from three sub-themes. Beliefs, expectations, and learning behaviours were involved with the cognitive illness representation according to self-regulatory model of illness behaviour. A dual processing model was proposed and developed in emotion and cognition paths. Stimuli of health threat impacted on both ways, which resulted in coping techniques of health issue and subsequent assessment of the coping in success or failure as known as appraisal[218–220]. Beliefs and expectations of participants were the process prior to coping with the health issue as well as coping and appraisal parts were similar to learning behaviours.

Post-operative care by health professionals was via a district nurse and a few participants were recommended extra physiotherapy sessions by their consultant. However, three participants got extra support from private physiotherapists for their recovery of physical function. This was reported in a previous study in Manchester. The minority of participants received confidence to walk due to the extra physiotherapy service[106]. In the other study of a common rehabilitation programme, no physiotherapy service was provided following THR but it was dependent on clinical needs and recommendation of the consultant[221].

Moreover, some participants expressed their desire for full recovery around a few months post-operatively and three participants adjusted their expectations to twelve-to-eighteen months for full recovery after discussion with the consultant. A different result was described in a previous Manchester study which came to the conclusion that there was an unrealistic expectation of recovery and minimal support by health professionals[106]. Some quantitative studies explored the time of recovery and functional improvement. The maximum improvement of function was at six months post-operative and this was maintained until follow-up at twelve months by SF-36 questionnaire as well as reaching the plateau of Harris Hip Score at eighteen months[222]. The other review showed eighty per cent of physical function improvement around six to eight months post-operative compared with healthy controls[223]. This information should be provided to participants by health professionals as participants have strong faith in them, and expect reasonable outcomes dependent upon many factors, especially age[106].

The companionship of friends and family members supported participants in their recovery. The majority of participants placed an emphasis on veterans of THR in providing a good recovery model. They planned their management by following the positive outcomes experienced by those with previous THR experience, obtaining the information from friends and electronic sources. This result was supported by recommendations of the previous qualitative studies. Positive experiences of THR veterans were recommended as being useful for new patients for reassurance and advice[107,108]. A report giving advice about good recovery from other THR veterans would be beneficial for new patients and could be supplied in paper and electronic copy, so that the unrealistic expectation of functional recovery might be less likely.

5.4.1.3 Management, awareness and cognitive aspect

A variety of coping techniques was described in learning behaviours, active and passive coping sub-themes. To manage their chronic pain and dysfunction, many participants continued with exercises and had an awareness of their movement until six months recovery. In addition to physical management, participants carried out other various techniques to cope psychologically. This was similar to a previous study which looked at how participants distract from focusing on pain and dysfunction[105]. In particular, most

participants expressed sleep disturbance prior to surgery which was caused by pain and anxiety. Distraction by reading, walking, and mind games, as well as taking analgesia, were used to help go back to sleep again. This was also explored in the other focus-group study which reported similar techniques being carried out to deal with pain at night[224].

5.4.2 Limitations

The qualitative element of the study is limited in generalisability by the small number of individuals included in the sample and the fact that the participants who completed all three aspects of the qualitative work were recruited from only one centre. However, there were a greater number of individuals represented in the data during the pre-operative period and ultimately twelve participants from four hospitals took part in the first round of qualitative data. The participants provided rich in-depth information through diaries and interviews that helped to add meaning to the findings from the other elements of the study, but generalisation of the qualitative findings in isolation should be done with caution.

5.4.3 Clinical implications

There are many clinical implications that will improve future care for patients undergoing primary THR. Four important topics were concerned. They were composed of addition of pre-operative care for patients waiting for THR, adjustment of unrealistic expectation in recovery period, group session of THR veterans for new patients and new veterans in community setting, and therapeutic tool of diary to support patients during a traumatic event.

Pre-operative pain management for patients awaiting the date of surgery should be improved. A person in the GP service or surgical team could operate a service of assessment of needs and pain management for patients. Patients with postponed THR should be included in this service in order to improve their post-operative care. Someone who lives alone may also need post-operative care from the social service.

Functional recovery was expected by participants so their expectations should be adjusted by health professionals around a few months after the operation. This appointment might be via a home visit by the physiotherapist in order to adjust unrealistic expectation and

give reassurance of functional recovery. It was also reported that the cost of home visit was less than going to hospital[225]. Patients might still have difficulties of physical function. However, availability of physiotherapists in the hospital should be considered.

Moreover, a THR support group by those with previous THR experience should be established for new patients. Sharing their direct experience might contribute benefits and guide new patients for preparation of good recovery. A group might be set up in a community for the convenience of patients to arrange meetings and also give a chance to co-ordinate the physiotherapist or other health professionals from hospital. The group can help to adjust patient's expectations and improve their function at a few months post-operative. In addition, the good recovery experiences of some THR veterans could be compiled in a booklet or electronic copy and supplied for new patients early enough that they have enough free time to read and follow the instructions before the operation.

Writing a reflective diary may be a therapeutic tool for patients who get anxious before an operation. This might release their stress, help them to prioritise and set their goals in the near future. Following THR, this diary might also be developed in order to measure progress of physical function. Despite the focus on pain and the need to be able to write down feelings and emotions, this alternative tool might be useful to assist patients going through THR.

5.4.4 Further study

Future research triangulating with previous longitudinal quantitative survey could explore the congruence or lack thereof in the relationship between psychological factors and expectations with pain, function and QOL. Interesting points in this narrative story would reflect on the statistical relationship with expectations in pain and function, behaviours with self-efficacy, and QOL. Moreover, participants' comments of pre-operative education programme would be collected for suggestions of improved service. This would also be fed back to the surgical team so as to reorganise the programme in the most appropriate way for patients.

5.5 Conclusion

The focus of participants is on the dynamic change that they experience before, during and after THR. Participants place an emphasis on their pre-operative pain, difficultly of function, and coping techniques, including THR, thus their focus was shifted to get the THR over with and a good recovery made once they got the surgical date. After THR, many patients put their focus on coping and doing all things to return to normal life. This transitional state from chronic osteoarthritis pain to acute pain and difficulties of movement is influenced with psychosocial factors, expectations, belief, behaviours, and the support of people. To survive through this challenge, emotional management may also be important by writing a diary, post-operative support provided by health professionals, and vicarious learning, in particular, from THR veterans. An understanding of the THR journey and an impact of psychosocial factors could be helped by establishing a therapeutic diary tool, extra physiotherapy session at a few months post-operative and a group with THR veterans giving advice to new patients undergoing THR.

Chapter 6: Evaluation of pre-operative patient education

This chapter begins with the aim and objectives of the programme evaluation. It continues with methods and an evaluation of the services, ending with a conclusion.

The present element complements the previous qualitative work by using an observational approach to directly evaluate pre-operative education programmes. This technique explores the content of the programme, analysed by qualitative content analysis from narrative field notes, and allows a comparison of delivery methods to give a more comprehensive overview of the programmes under evaluation.

6.1 Aim and objectives

The aim of this element is to evaluate, from the perspective of a participant observer, the pre-operative programmes that are operated in the participating centres for patients receiving total hip replacement. To achieve this aim there are three objectives, described below.

1. To explore the nature of pre-operative programme regarding information content and delivery method
2. To descriptively compare the information content and delivery method of pre-operative education programme
3. To assess the programme content compared to aims set out in practice guidelines in the UK

6.2 Methods

6.2.1 Procedure

The observations took place between August 2013 and July 2014 at the same five centres as were involved in recruitment in the other aspects of this work. The researcher contacted the lead clinician or manager of the pre-operative programme at each centre and gained permission to attend the relevant programme. Following permission being granted, the researcher was an observer-as-participant as part of the group to minimise bias arising from the researcher's status. In group sessions, other participants were not told about the

research in order to not affect the flow of the session. In two centres, where the intervention was delivered in a one-to-one format, the clinician delivering the intervention informed the patient that the research was taking place in order to gain permission for observing the intervention. Details of the programme content and structure were recorded in field notes during programme delivery. Field notes were typed up as soon as possible after the session and additional aspects were also added at this point.

Field notes were analysed by qualitative analysis of content and descriptively comparing differences in terms of delivery methods, content of the programme and circumstances. Only field notes from observation were analysed in this element, however, an information booklet electronically provided on the websites of centre A, B, and E were also considered in the discussion part. Moreover, practice guidelines available in the UK were identified and used to evaluate the services against standard quality markers. Content of the programmes were assessed in line with the aims of education programmes according to the guidelines. Since the subject of the observations was the education programme, rather than any of the staff delivering it or the patients receiving it, this approach did not require approval by a research ethics committee[147]. However, full permission was sought for attending the sessions as described above.

6.2.2 Data analysis

There were two parts of analysis. The first part was summary and descriptive comparison of programme characteristics. Secondly, qualitative content analysis was begun by reading all field notes following with paper-based coding of the educational programme from each centre. Initial codes were then pooled together for refinement and arrangement. All refined codes were imported to Microsoft Excel®. Clustered codes were identified as sub-themes that were also re-read and designated as core themes. Themes and sub-themes were illustrated as a table comparing similarities and differences within five hospitals. Content of the programme was therefore assessed in accordance with practical guidelines by three related organisations in the UK: Royal College of Anaesthetists (RCoA)[113]; the British Orthopaedic Association (BOA) blue book[30]; and College of Occupational Therapists (COT)[7]. All these aims of assessment are described in chapter 1.

6.3 Findings and discussion

6.3.1 Programme delivery/structure characteristics

Characteristics of pre-operative education were described and compared in terms of duration, frequency, number of participants, delivery methods, provider, materials and room plan operating the programme observed. Summary of characteristics from field notes and education programme in each centre is described in Table 26 below. Following this, teaching strategies, providers and characteristics of learning process were discussed.

Table 26: Summary of pre-operative programme characteristics from observation

Centre	Duration (hours: minutes)	Frequency of session running (per week)	Number of patients observed	Delivery method (providers)	Use of teaching materials while observing
A	3:00	2	9	3 one-on-one sessions (1 nurse session, 1 pre-operative nurse session and 1 OT session*) and 1 group session (DVD)	- DVD (THR overview) - Helping aids - Patient information leaflet
B	1:00	1	1	2 one-on-one sessions (1 OT and 1 PT session)	- Walking aids - Helping aids
C	1:00	1	7	3 group sessions (1 hip surgeon session, 1 nurse session, and 1 PT and OT session)	- Presentation - Cup and stem - Anaesthesia leaflet
D	2:00	N/A	10	1 group session (1 PT session)	- Hip anatomy model - Cup and stem - Helping aids
E	1:40	1	7	1 group session (1 OT session*)	- Presentation - Hip anatomy model - Cup and stem - Helping aids
Remarks: OT = occupational therapist, PT = physiotherapist, NA = not available *2 OTs provided information in the session.					

Centre A established the programme at the preoperative assessment clinic twice a week for three hours – Wednesday morning for mixed patients undergoing THR and total knee replacement, and Thursday afternoon for only THR patients. When the researcher was observing, nine patients attended the programme on Wednesday in the afternoon at the

pre-operative assessment department. Five rooms were arranged: one large room big enough for twenty four people and used as a waiting room; one room for a small group observing a DVD presentation of surgery overview; and three other rooms for individual discussion with health professionals (Appendix 29). Patients confirmed their details and received information leaflets in the large room prior to the programme starting. There were four sessions which comprised of a group session of twenty-minute DVD media in THR procedure shown to patients and three one-on-one sessions to discuss their health issues and THR preparation with the chief nurse, pre-operative nurse and OTs. The participants received advice of daily activity, personal care and home environment by OTs including how to use helping aids after THR. In addition, a pre-operative nurse assessed patients by conducting a physical examination, looking at the medical history and medication. The other session was set up to describe details of the surgery such as implant used in THR and answer any questions that the patients might have. The patients were freely to attend each session depending on the availability of providers. Time taken in each session ranged from fifteen to thirty minutes depending on the contents of each section.

At centre B, individual sessions were organised by the OT in the pre-operative assessment clinic every Wednesday between nine to twelve o'clock. Patients were scheduled in time slots for one-hour sessions. When they came to the clinic, each patient, and a carer were invited by the OT to the private area partitioned by a curtain and sat facing each other next to a bed (Appendix 30). The OT assessed the patient's movement function and pain around the hip following the checklist and discussed home environment, movement and personal care. Helping aids for post-operative use in daily activities were also demonstrated. Finally, the physiotherapist asked the patient to walk with two crutches on a flat surface, upstairs and downstairs in the assessment gym.

At the occupational therapy department of centre C, patients were scheduled for one-hour group sessions of the education programme every Tuesday lunch time. Seven patients attended this class while the researcher observed. This took place in a hall comprising of two rows of chairs for the patient and their carer to sit side-by-side and listen to the lecture given at the front of the hall by health professionals from the surgical team (Appendix 31). There were three parts of the programme, starting with a presentation (Microsoft

PowerPoint®) of THR overview and procedure by a hip consultant. The ward manager then educated participants about the post-operative process and provided anaesthesia information leaflets. Finally, the physiotherapist and OT gave advice and illustrated post-operative movement to patients. At the end of each session, patients had an opportunity to ask the lecturer any questions. Each session lasted around fifteen to twenty minutes.

In centre D, a two-hour education programme took place on Wednesday morning at the physiotherapy department in a room large enough to hold 30 people. When the researcher observed, ten patients attended the programme with their carers, and were invited to sit side-by-side on chairs arranged in a U-shape (Appendix 32). The physiotherapist began by confirming patients' names and gave a lecture in relation to THR information in front of the room without a media presentation. During this session, hip models, cup and stem were demonstrated for THR process to enhance the understanding of patients. In addition, the post-operative effects of surgery and helping aids for use in daily living were described. At the end of session, the physiotherapist answered patient's questions.

In the occupational therapy department of centre E, a one-hour education programme took place every Wednesday by two OTs. Seven patients and their carers sat side-by-side, as displayed in Appendix 33. Prior to the group session the patients met the staff for a health check-up. This programme utilised media presentation (Microsoft PowerPoint®), hip model, cup and stem, and the demonstration of helping aids. After the presentation, patients met with the physiotherapist or OT to discuss their home circumstances and individual problems or worries they might have.

Mixed teaching strategies were used to educate patients in all facilitating hospitals. They combined several teaching methods as well as group sessions and individual discussion. There were several materials combined in the programmes, such as verbal instruction, DVD, visual aids materials (including presentation), demonstrations, written materials, and sample of artificial cup and stem. Previous report reviewed teaching strategies and delivery methods, and recommended that multiple strategies of teaching were used to educate patients due to effective results of such programmes[226]. Additionally, the survey examined current practices in the pre-operative programme before THR by 57 OTs in the

US. This also suggested that a variety of teaching methods should be included in the programme, such as video tape, individual discussion and group session for demonstration of exercises or how to use helping aids[227]. Moreover, a Finnish quantitative study comparing oral with written information via leaflets reported that giving information by two methods resulted in better knowledge and related care than by only giving written information[228]. This was also qualitatively reported in a Swedish study, that is, the combination of written and verbal information showed good effects for patients along their THR journey[229]. Therefore, a mix of strategies to provide information for patients should be utilised to enhance patients' understanding about THR and its relevant effects. All centres observed are using appropriate methods to educate patients.

All centres consisted of at least one physiotherapist or one OT within the team of providers. Three UK guidelines recommend a physiotherapist or OT to deliver education for this session[7,30,113]. Therefore, health professionals giving a lecture and demonstrating walking aids in five centres were compatible with practical guidelines in the UK.

The education programme in all centres was accompanied with written materials; a hip booklet. It may affect in the long term period after THR, whilst the education programme and care by the health care team probably have an effect in the early post-operative period. Previous research studied the effects of active and passive learning. Active learning was defined as playing a game without verbal instruction but participants in passive learning obtained the verbal guide in the training session. This study compared participants at four times, whilst playing games: baseline; training; immediate test (after training); and delayed test (one week after training). The active group showed better performance in the delayed test than passive group. On the contrary, the active group performance was worse than the passive group in the immediate test. It was concluded that active training benefited the long term learning process but passive learning positively affected the short term outcome[230]. Combination of both methods should be recommended for educating patients.

In summary, programme delivery methods, materials, and structure characteristics were various in all centres. These were supported by the existing research in the effective ways

to enhance the understanding of patients for THR process. In addition to the characteristics of the programme, content of the programme in all centres were investigated in next section.

6.3.2 Programme content and evaluation regarding quality standards

Five core themes comprising sixteen sub-themes emerged from the analysis of narrative field notes. The presence of each of these themes within the pre-operative programme content varied across the facilitating centres, with the five main themes being: THR background; pre-operative process; pain and movement; THR effects and post-operative process; and other information. Consequently, programme content was evaluated with eight aims according to three practice guidelines on page 30. First, (1) explaining THR procedure and effects on patients to understand their THR journey is recommended by RCoA. Secondly, the aim of (2) reducing anxiety is stated by three organisations involved. Six other aims from COT are (3) maximising independence of function, (4) resumption of occupational roles, (5) low readmissions rate, (6) decreasing length of hospital stay, (7) reduction of demand on support services, and (8) reintegration into the community. The framework of core themes and topics in educational programme is presented in Table 27.

Table 27: Coding frameworks of programme contents from observations in 5 centres and evaluation according to aims of three practical guidelines

Core themes	Topics in education programme	Centre					Aims*
		A	B	C	D	E	
THR background	• Programme introduction	✓		✓	✓	✓	1,2
	• Hip introduction	✓			✓		1,2
	• THR procedure	✓		✓	✓	✓	1,2
Pre-operative process	• Patients' preparation for surgery	✓	✓	✓	✓	✓	1,2
	• Process at the hospital	✓	✓	✓	✓	✓	1,2
Pain and movement	• Pain management	✓	✓	✓	✓	✓	1,2
	• Movement function management	✓	✓	✓	✓	✓	1,2,3
THR effects and post-operative process	• Nature of patient	✓	✓	✓	✓	✓	1,2
	• Post-operative managements	✓	✓	✓	✓	✓	1,2,5
	• Hip precautions	✓	✓	✓	✓	✓	1,2,3,5
	• Infection and blood clotting prevention	✓		✓	✓	✓	1,2,5
	• Wound care	✓	✓	✓	✓	✓	1,2,5
	• Discharge process	✓	✓	✓		✓	1,2
Other information	• Reference to booklet	✓	✓			✓	3
	• Positive thinking	✓			✓	✓	2
	• Questions and answers	✓	✓	✓	✓	✓	2,4

✓ This symbol is defined that the content of each topic was provided in the centre while observing.

*According to three UK guidelines (1) explaining THR procedure and effects on patients to understand THR journey (2) reducing anxiety (3) maximising independence of function (4) resumption of occupational roles (5) low re-admissions rate (6) decreasing length of hospital stay (7) reduction of demand on support services (8) reintegration into the community

6.3.2.1 THR background

THR background theme addressed three topics - programme introduction, hip introduction, and THR procedure. At the beginning, the providers introduced educational sessions with their aims and outlines. There was also an opportunity to recruit patients for national research (PROMs). Hip anatomy was described to support understanding of osteoarthritis, symptoms and treatment. This topic was presented by animation of DVD media in centre A, and hip model in centre D and E. Importantly, THR procedure was described that the acetabular cup and femoral stem of the thigh bone were prepared to fit an artificial cup and stem in the hip. Duration of THR was also explained. The lecturer in

four centres described this topic by various techniques: animation in centre A; Powerpoint presentation in centre C and E; oral explanation with artificial cup and stem in centre D.

However, some topics in THR background were not identified in three centres. In centre B this core theme was absent in the pre-admission therapy clinic that the researcher observed. Therefore, this sub-theme might be included within the hip surgeon assessment clinic. Centres C and E had an emphasis on the THR procedure but there was lack of support for pain management caused by osteoarthritis. A limitation of time in Centre C that is within one hour that possibly associated with more focus on THR than pre-operative pain. This topic might be included in other visits or in the centre's hip booklet despite no electronic documents on the website. In centre E, alternative osteoarthritis treatments was provided in patient information leaflet on the website and stated that patients can discuss treatment options with health professionals[31].

For evaluation with practical guidelines, there were two aims covered this core theme. Explaining THR procedure and reducing anxiety of patients were reflected from the content in this theme. THR procedure was explained in four centres but this was absent in centre B. The researcher observed the pre-admission therapy clinic provided by OTs and physiotherapist; however, this was explained in the booklet[231]. Therefore, all patients undergoing THR were received the information of THR procedure; however, their anxiety level may be reduced that should be investigated in other themes.

6.3.2.2 Pre-operative process

Core theme of pre-operative process was grouped from preparation of patients and process at the hospital. There were four main areas of patient preparation relating to their health: dental examination; medications; physical well-being; and personal care. Dental examination was required to confirm the patient had neither infective gum nor tooth in order to prevent the major complication of infection. This was mentioned in centre A only. Medication was discussed in all centres, and discussion covered updated medication use and anaesthesia information. For instance, patients needed to stop warfarin seven days before THR and bring all medications with packaging to hospital on the admission day. Suggestions were made for the best health outcomes of patients after the operation to

prevent of risks and complications occurring. These included stopping smoking, reducing alcohol intake, weight loss, exercise, and relevant issues related to infection control. Personal care topic included clothing and toiletries, looking at home and furniture height. The patients were recommended to bring suitable clothes such as warm night clothing, supportive low heels slippers and shoes. Moreover, house adaptations were individually discussed in detail with the OT after the session or on home visits.

Clinical examinations were made in hospital before the surgery, and patients met with the surgical team on admission day. Prior to admission, patients went through a physical examination, including an assessment of their physical ability by the OT or physiotherapist. The physiotherapist in centre D stated that on admission day the nurse of the surgical team checked up with and confirmed surgery with the patient on the ward. Then, patients were moved to theatre, checked up again against the checklist and met the anaesthetist and the hip surgeon prior to the THR.

This core theme reflected two aims in the standard guidelines. The patients understood THR process and were reduced their anxiety. Explanation of the THR procedure focused on the preparation of patients and the process in hospital. Equipping patients with knowledge before THR reduced patient anxiety.

6.3.2.3 Pain and movement

Pain and movement theme was created from pain and movement function management. Pre-operatively, the staff provided treatment to cope with chronic osteoarthritis pain and recommended to keep active. Following THR in the early post-operative period, pain management was emphasised. A health professional in the pain management team gave options of painkillers for patients and advised that the rehabilitation was usually started as soon as possible once the pain was relieved. For example, in centre E patients could take analgesia to relieve pain and maintain their mobility before THR. Post-operative pain was also eased by three options of pain medications under the assistance of ward nurses and the pain team. When the patients were relieved from pain, they were allowed to start their movement under supervision of the physiotherapist.

The other topic is function management after THR. Staff of all centres explained management of function to prepare patients in particular shortly after THR. In centre B, the OT measured the angle of the hip and knee on the operated side, and a test of thigh strength of patients to assess their movement function. Then they practised walking with two crutches up and down stairs and hip specific exercises under guidance of the physiotherapist. Almost all centres reported that once they were moved back on the ward after THR around 4 hours or more, the physiotherapist and nurse assisted patients to mobilise. This was also benefited in reducing stiffness and swelling on the operated leg. All patients practised walking under supervision of the physiotherapist until they were reassured to walk independently.

Regarding aims of standard guidelines, this theme was evaluated and fitted into three aims: explaining the THR effects; reducing anxiety levels; and maximising functional independence. Post-operative management of pain and function were described in the programme that was identified in enhancing the understanding of patients about the effects of THR. Following this, anxiety might be reduced because of understanding in coping with their pain and function and receiving support from health professionals. Particularly, movement support on wards associated with maximising functional independence with respect to the physiotherapist who reassured walking independence of patients.

6.3.2.4 THR effects and post-operative process

This core theme emerged from six initial topics: nature of patient; post-operative managements; hip precautions; infection and blood clotting prevention; wound care; and discharge process. First, health care staff described patient's characteristics in the recovery room after the operation. Patients received analgesia and had oxygen via a face mask or nasal spec. A drip was put in the patient's hand for hydration as well as a wound drain and pillow/wedge were given. The surgical team visited patients to check up on their clinical status. Once good clinical status was confirmed, they were then moved to the ward.

A topic of post-operative managements included management on ward; follow-up process; information of daily activities, home circumstances and helper. On the ward, the

nurse was described in checking up on vital signs and feelings unwell of patients while the physiotherapist was in charge with mobility of patients as noted above in the previous theme. Variety of follow-up process was described. Whilst, a patient in centre B was informed for an appointment with the physiotherapist within 3 weeks post-operatively, centre E described an appointment with hip consultant from six weeks after THR. Moreover, the OT explained how to use helping aids in daily activity for patients, and discussed their home environment such as furniture height. Contact details of staff were also provided for further questions of patients.

Three topics were separated from risks and complications. There were hip dislocation, infection and blood clotting prevention, and wound care. To prevent hip dislocation, limitation on use of hip after THR was explained in the programme. For example, driving was stopped in a range of six to twelve weeks post-operatively. Patients were advised to use walking aids for at least 3 weeks, to avoid bending down, crossing their legs and twisting. They were recommended to sleep on their back for 6 weeks post-operatively.

Two other major risks and complications were infection and blood clotting. Infection control was explained since pre-operative period. The staff in centre A mentioned that a document of confirming oral hygiene of patients was needed to report the surgical team prior to THR. In addition, rivaroxaban was selected to prevent possible blood clotting leading to life threatening complications such as deep vein thrombosis or ischemic stroke.

Furthermore, wound care was also concerned. Instructions were given to patients in order to prevent skin or wound infection that might lead to deep infection. The health care team described the process of wound dressing at hospital and the district nurse was responsible for follow-up at home. Additionally, when the patients had improved their health status, they were discharged with the permission of the surgeon. Other healthcare staff gave advice on safe discharge, and other things causing concern to patients such as identifying a helper, organising transport home, and stocking food after THR.

However, two centres were found lacking in giving patient information. Centre B was found lacking in giving information about infection control and blood clotting prevention. This was noted during observation carried out in the pre-assessment therapy clinic. These

complications were described in the patient information booklet and might be included in another visit with the surgeon or other health professionals. In centre D, the discharge process was omitted, although this might be included in the booklet or another meeting with the health care team.

Content of this theme expressed the relation to four aims of standard guidelines. They consisted of explaining THR effects, reducing anxiety, maximising independence of function and low readmissions rate. Explaining THR effects and reducing anxiety of patients were reflected from all topics because post-operative process and management were provided to patients that might reduce anxiety level in preparation for their recovery. In addition, increasing functional independence was reported in only topic of hip-pre-cautions, while low readmission rate was expressed in post-operative managements, hip pre-cautions, prevention of infection and blood clotting, and wound care.

6.3.2.5 Other information

Other information comprised the booklet, positive thinking, and questions and answers topics. First of all, the booklet was provided as the other source of information. During the programme in centre A, B and E, patients were emphasised on the importance of the booklet. Secondly, the staff in centre A, D and E attempted to encourage patients by use of positive words during the sessions. In centre D, the provider suggested positive words twice during the session which were

> *'…tell yourself it's not too bad / just get a bit sore'*
>
> *'Patients' hip will be better after their operation in the theatre. Please remember you are not ill you just can't capacitate to move by pain. Don't let it beat you'.*

On the contrary, no use of positive words was reported in centre B and C whereas neither centre C nor D emphasised on the booklet from observational result. These might probably provide in another visit with the health care team.

At the end of the education programme, the patients raised their issues with the staff. A variety of questions were asked in centre A and B, such as medications and co-morbidities that patients have and management during surgery period. In centre C patients asked

about putting the stockings on and off. In centre D, healthcare professionals described the difference between osteoarthritis and rheumatoid arthritis raised from the audience whereas the OT in centre E answered the period of returning to work.

Three topics of this theme were assessed with aims of guidelines. It was seen that positive thinking was an instrumental in reduction of anxiety. Similarly, health professionals gave a positive side of THR. It was also noted that questions and answer session reduced anxiety and increased resumption of occupational roles. The latter one occurred in centre E only.

6.4 Conclusion

Appropriate characteristics of the pre-operative education programme to educate patients about THR and effects were widely different. Commonalities of the programmes were found in three themes, that is, THR process, pain and movement, and THR effects and post-operative process. This followed standard guidelines in the UK.

On the contrary, two lesser common themes comprised THR background and other information. The content of the programme in five centres was appropriate to educate patients in relation to the five aims set out in the practice guidelines. For three other aims recommended in COT guidelines, there were decreasing length of stay, reduction of demand of support services and reintegration into the community. They were not evaluated from the contents of pre-operative educational programme because COT guideline covers interventions of THR journey by multidisciplinary health care staff. Therefore, this result should be integrated with questionnaire results and qualitative findings. This triangulation is described in chapter 7.

Chapter 7: Triangulation of data

Mixed method research produces three sets of triangulation in this study. The quantitative data exploring relationships and changes in the cross-sectional and longitudinal elements are looked at from the perspective of patients. Evaluation of the pre-operative education programme is then described in concert with the quantitative comparison from baseline to one month pre-operative and also with the qualitative findings. Next, a series of case studies are described for the five participants where all of the data from the questionnaires, diaries, interviews and corresponding educational programme observation were available. Finally, the relationships between psychological factors and expectations with pain, function, and QOL are drawn together from all sources and summarised at the end of this chapter.

7.1 Aim and objectives

This chapter aims to describe the impact of congruence, or lack thereof, between psychological factors and expectations with outcomes on pain, function and quality of life in patient's journey. There are two objectives to achieve this aim.

1. To triangulate qualitative and quantitative findings from all phases
2. To describe effects of the pre-operative programme on the patients by quantitative and qualitative findings
3. To describe details of psychological dimensions involved in patients' experience from quantitative surveys and qualitative findings focusing on five case series.

7.2 Triangulation of findings

This triangulation integrated the quantitative results of hip symptoms, pain, function in ADL, and QOL. Hip function in sports was excluded from triangulation because three positions in the questionnaire were prohibited to prevent risks and complications of the new hip.

7.2.1 Change of all variables

A comparison of variables was conducted to explore the effects of the pre-operative education programme and THR results. These variables were described as improving, worsening, and no change, which is illustrated in Table 28.

Table 28: Summary of variables change across THR

Change of variables from the effect of	Pre-operative programme[a]	THR at one-month recovery[b]	THR at six-month recovery[c]
Hip symptoms	↑	↑*	↑
Hip pain	↑	↑*	↑
Hip function (ADL)	↑	↑*	↑
Hip function (sports)	↔	↑	↑
Hip-related QOL	↓	↑*	↑
Overall QOL	↑	↑*	↑
SRH	↓	↑*	↓
Anxiety	↓	↑	↑
Depression	↔	↑	↑
Positive affect	↑	↑*	↑
Negative affect	↑	↑	↑
Pain catastrophising	↑	↑*	↑
Self-efficacy of symptoms (pre-operative)	↑	NA	NA
Self-efficacy of symptoms (post-operative)	NA	NA	↑
Self-efficacy of pain	↑	↑	↑*
Self-efficacy of function	↑	↑*	↑
Self-efficacy of rehabilitation	NA	NA	↑*
Fear of hip surgery	↓	↔	↑
Fear of anaesthesia	↓*	↑	↓
Pain expectation at one month post-operative	↔	NA	NA
Pain expectation at six months post-operative	↔	↔	NA
Pain expectation at one year post-operative	↔	↔	↑
Functional expectation at one month post-operative	↓	NA	NA
Functional expectation at six months post-operative	↑	↑	NA
Functional expectation at one year post-operative	↑	↑	↓*

[a]Comparison of variables between measuring at baseline and around one month pre-operative, [b]Comparison of variables between measuring at around one month pre-operative and one month post-operative, [c]Comparison of variables between measuring at one month and six months post-operative,
NA = no assessment, ↑ improving, ↓ worsening, ↔ no change, *p-value < 0.05

7.2.1.1 Impact of the pre-operative programme

Looking from the perspective of patients, improvement was reflected in no significant difference of: higher self-efficacy of symptoms and pain; higher positive affect; less negative affect and pain catastrophising. These changes are supported by perspective of participants. Patients expressed their achievements in undergoing THR and followed THR information received from the pre-operative programme, in particular, keeping active and trying to do hip specific exercises. Only one participant stated that the benefit of hip exercises during the pre-operative period resulted in higher strength of muscles around the hip.

However, anxiety, fears, hip-related QOL and SRH worsened, possibly due to worry about risks and complications of anaesthesia and THR, and advice which was provided in the pre-operative programme and/or in the hip booklet. This is supported by the baseline differences between those who did not have previous experience of THR reported having higher fear levels than THR veterans, although this finding was not found to be significant. Moreover, fear of anaesthesia was significantly worse than baseline but there was no significant difference in the fear of THR. This may be due to the fact that patients had belief in the surgeon and in the process of THR despite fears caused by uncertainty in anaesthesia selection. Patients sought reassurance of what anaesthesia was most appropriate for them by asking many people for advice.

Patients reported no change of expectations and feelings of depression. The expectations are contradicted with the perspective of participants. Patients were adjusted their expectation of post-operative physical function and pain level, which was emphasised during the pre-operative programme. There must be no high impact of activities to the hip joint. Although the questionnaire was designed to measure patient's outcome expectations, in the future this should be conducted to explore change of expectations and evaluate patient's knowledge after the pre- operative programme.

7.2.1.2 Impact of THR at one-month recovery

Patients had significantly greater hip symptoms, pain, function, and QOL than they had expected prior to their first appointment, and significantly showed signs of higher self-

efficacy in functioning and a more positive affect. Qualitative findings support the fact that participants felt much better without chronic pain despite experiencing the acute healing pains. Increasing self-efficacy of function is supported by participants' reflection of their hip specific exercises and their reporting of progression in the diary. This may be due to freedom from restrictions around six weeks post-operative, regaining physical function, and evidenced by reflection from friends and family members. These resulted in a more positive mood. Confirmation from the consultant about the successful outcomes from the THR may also be related to better pain, physical function, QOL, and positive affect of participants.

There was significant reduction of pain catastrophising compared to the pre-operative period. No significant difference was found in higher self-efficacy of symptoms and pain, as well as lower anxiety, depression, fear of anaesthesia, and negative affect. They may associate with good recovery and less expression of these negative emotions in the qualitative findings comparing with pre-operative period. Fear of THR, pain and functional expectations did not change from the pre-operative period.

7.2.1.3 Impact of THR at six-month recovery

Some variables improved further. Hip symptoms, pain, function, QOL, positive affect, and all aspects of self-efficacy at six-month recovery were better than one-month recovery despite lower SRH. Moreover, anxiety, depression, fear of THR, negative emotions state, and pain catastrophising were slightly reduced to very mild level. Qualitative findings indicate similar results. Participants regained their normal physical functions when they compared to their past function at one month post-operative. Some participants were satisfied with the outcome of THR. They described that their daily activities were close to their normal life prior to having hip pain.

On the contrary, fear of anaesthesia, pain and functional expectation at one year post-operative were enhanced. This is corroborated with the experience of some participants. They were worried about their recovery that showed a sign of slower progression than the expectation. Duration of stiffness after daily activities was quite stable around a few weeks that possibly affected their expectations of worse pain and function. However, the

participants received a sense of optimism from their friends when they told the good progression of walking. Therefore, this might be helpful for the participants in this vulnerable period of recovery to receive support of confirming their progression by health professionals.

7.2.2 Relationship of the outcomes

Correlation analysis reported positive and negative relationships with the outcomes of THR in terms of hip symptoms, pain, function and QOL. Negative correlations reported were anxiety, depression, negative affect, pain catastrophising, fear of THR, fear of anaesthesia, and expectation of pain and function. Patients with worse anxiety, depression, negative moods, higher pain catastrophising, fears, expectation of worse pain and dysfunction (higher scores), were more likely to show worse hip symptoms, pain, function, and QOL (lower scores). Positive relationships were reflected in positive moods and all aspects of self-efficacy. Patients with greater positive affect, and self-efficacy (higher scores), were more likely to report better hip outcomes (higher scores).

7.2.2.1 Cross-sectional relationships

At baseline, depression, self-efficacy of function, pain catastrophising, and pre-operative two-week expectation of function were reported as the significant predictors for hip symptoms, pain, function and hip-related QOL. Some of them are supported in qualitative findings. Sub-themes of active coping, negative emotions, experience and receiving support concur with these quantitative relationships. Prior to the initial assessment, chronic osteoarthritis pain, dysfunction, negative feelings and sleep problems were managed by either coping techniques or receiving support from other people. The participants reflected their confidence in coping techniques and perceived themselves to receive support from other people. Following these, they usually used the successful coping techniques to manage their pain and dysfunction. These may be assumed as a process in self-efficacy theory to achieve their expectation to control their chronic disease[154]. This belief in management of pain and dysfunction may represent as self-efficacy in the quantitative results. Moreover, a goal of undergoing THR and making a good recovery were reported from most patients. Vicarious learning was highly expressed by

the participants to prepare themselves for THR and recovery. This learning may corroborate with a factor associated with self-efficacy in cognitive processing for the specific behaviour[232]. No expression of depression and pain catastrophising was reported in qualitative findings.

At one month pre-operative, quantitative results showed high correlations of the outcomes with self-efficacy of pain, depression, pain catastrophising, and self-efficacy of symptoms. Qualitative findings support these relationships. Expectations were to get through the THR and make a good recovery in order to eliminate chronic pain and dysfunction. Participants also expressed negative emotions and experiences resulting from unsuccessfully coping with their pain and dysfunctions, side effects or ineffectiveness of analgesia, and whilst waiting their date of surgery. They used active coping techniques such as pain distraction and optimism. Following the scheduled date for surgery, all participants reflected on their preparations in terms of learning from their own experiences and vicarious learning. In addition, passive coping was also raised to use pain medications resulting from adjustment pain belief of participants by health professionals. All pre-operative triangulations are summarised in Table 29.

Table 29: Summary of pre-operative quantitative and qualitative findings in the relationships of psychological and psychosocial factors with the outcomes

Quantitative relationships	Qualitative findings
At baseline • Self-efficacy of function • Functional expectation at two weeks pre-operative	Narrative data prior to initial assessment • Coping (active) • Support • Negative emotions and experiences
At one month pre-operative • Self-efficacy of pain • Depression • Pain catastrophising • Self-efficacy of symptoms	Around one month pre-operative • Expectation • Active and passive coping • Learning behaviours • Belief • Support • Negative emotion and experiences

At one month post-operative, three significant factors were identified in the quantitative results: anxiety; negative affect and self-efficacy of pain in the association with hip

symptoms, pain, function, and QOL. Anxiety and negative affect are also indicated in the qualitative findings. All participants reflected their worries about functional recovery and post-operative effects such as wound healing, scar, and knee pain. This was reflected during the period patient's carried out post-operative exercises in order to regain physical function and modified their learning behaviours in order to cope with the acute effects of THR. Patients followed the recommendations of health professionals to do hip specific exercises and not take unnecessary risks which would put their hip under strain. In addition, patients received support from other people and assistance aids.

At six months post-operative, functional expectation at one year post-operative, pain catastrophising, and self-efficacy of symptoms were reported. Expectation and self-efficacy of symptoms are in alignment with findings from diaries and interviews. Almost all participants reflected upon the fact that recovery of physical function was only partial. Analysis of their own experience during the past six months resulted in the feeling that they had slowly progressed. The consultant adjusted patient's expectations and advised that they wait twelve to eighteen months for a full recovery. Patients carried out routine exercises as advised by the medical team until full recovery. During the first six-months after the operation patients used coping techniques such as exercises and taking pain medication. All post-operative triangulations are summarised in Table 30.

Table 30: Summary of post-operative quantitative and qualitative findings in the relationships of psychological and psychosocial factors with the outcomes

Quantitative relationships	Qualitative findings
At one month post-operative • Anxiety • Negative affect • Self-efficacy of pain	During one-three months post-operative • Emotions (positive and negative) • Learning behaviours • Beliefs • Support • Experiences
At six months post-operative • Functional expectation at one year post-operative • Self-efficacy of symptoms	During six-seven months post-operative • Expectation • Learning behaviours • Beliefs

7.2.2.2 Longitudinal relationships

At one month post-operative, patients reported fear of THR and fear of anaesthesia. The diary-interview element reported other types of fear in a few participants prior to THR, for example, fear of falling. Moreover, self-efficacy of symptoms and post-operative one-year expectation of pain were reported in quantitative findings. It is corroborated with qualitative findings. Participants reported the various ways they had of coping with pain, including support from friends and family members, expectation of undergoing THR and good recovery after THR, advice from THR veterans and a strong belief in the health professionals.

At six months post-operative, five factors affected recovery: depression; positive mood; pain catastrophising; self-efficacy of symptoms; and pre-operative two-week expectation of pain. Positive affect, self-efficacy of symptoms and expectation of pain concur with the qualitative findings. Optimism is best described as the positive way that patients dealt with their negative emotions in the pre-operative period. Patients reported that support from other people and helping aids assisted with good recovery. The pre-operative education programme provided information to assist patients in changing their behaviours. In addition, they learnt some coping techniques from their own experiences and from the experiences of other people. Patients had strong a belief in successful coping techniques and in health professionals. All summary relationships are displayed in Table 31.

Table 31: Summary of quantitative and qualitative findings in the relationships of post-operatively one-month and six-month outcomes with pre-operative psychological factors

Quantitative relationships	Qualitative findings
At post-operatively one month	
Measurement at baseline • Fear of THR • Fear of anaesthesia	Relevant sub-themes • Negative emotions (fear of falling) • Experience • Support • Expectation • Active and passive copings • Learning behaviours • Belief
Measurement at pre-operatively one month • Self-efficacy of symptoms • Pain expectation at one year post-operative	
At post-operatively six months	
Measurement at baseline • Positive affect • Self-efficacy of symptoms • Pain expectation at two weeks pre-operatively	Relevant sub-themes • Experience • Support • Expectation • Active and passive copings • Learning behaviours • Belief

7.3 Evaluation of THR process regarding quality standards

Centre A was selected to integrate the evaluation of the pre-operative education programme with two longitudinal elements. Five participants completed the diary-interview element.

All eight aims were established to evaluate the THR process from the time that patients decided to undergo THR. Evaluation of each aim was also reported and a summary of this assessment is presented in Table 32.

Table 32: Summary of evaluation regarding quality standards

Aims according to three standard guidelines	Quantitative results	Qualitative findings	Programme evaluation
1. Explaining THR procedure and effects on patients to understand THR journey	NA	✓	✓
2. Reducing anxiety	✓	NA	✓
3. Maximising independence of function	✓	✓	✓
4. Resumption of occupational roles	NA	✓	NA
5. Low readmissions rate	NA	NA	✓
6. Decreasing length of hospital stay	NA	NA	NA
7. Reduction of demand on support services	NA	✓	NA
8. Reintegration into the community	NA	✓	NA

✓ This symbol is defined that each aim is described by the findings.*NA = not assessed in this study

The first aim, to explain the THR procedure and its effects on patients' understanding of the THR journey, was investigated in chapter 6. Participants also spoke about the pre-operative education programme in the interview. They reported that information about the THR process, preparation for the operation, advice about mobility and limitations on using the hip were given. No assessment of this topic was conducted in the quantitative element.

The next aim, reduction of anxiety, was described in the COT guideline as being able to decrease anxiety in the pre-operative period[7]. A one-on-one discussion with the OT was held during the pre-operative programme. The quantitative result partially demonstrates success with respect to this aim due to non-significant reduction of anxiety between baseline and pre-operative period at one month ($Z = -1.10$, $p = 0.286$, $r_s = -0.20$). Participants expressed their pre-operative worries about coping with pain and dysfunctions, and worries about the date of surgery. No anxious feelings about preparation for THR and recovery were reported; this may be due to support given to reduce pre-operative anxiety in aspect of THR and recovery.

In the evaluation of the programme, the patients were shown how to use helping and walking aids during the early recovery period. This is supported by quantitative and qualitative findings. First, there was significant improvements of hip function (ADL) between one month pre-operative and post-operative ($Z = -2.60$, $p = 0.006$, $r_s = -0.58$). Hip

function continually improved until six months post-operative. Moreover, self-efficacy of function ($Z = -2.17$, $p = 0.029$, $r_s = -0.48$) was significantly improved at one month post-operative. Qualitative findings showed good progression of movement in all participants at one month post-operative. At six months post-operative, almost all participants reported they were able to carry out their normal daily activities again.

Four other aims were unable to be evaluated from the observation. These were as follows: resumption of occupational roles; decreasing length of stay; reduction on demand of support services; and reintegration into the community. However, some of these have been described by the patients during interview and in the diary.

Resumption of occupational roles was not expressed by patients during the observations carried out at this centre. This is reported in the qualitative findings, as well as the other aim of reintegration into the community. At one month post-operatively, the majority of participants started socialising and doing some light activities. They also practised some difficult positions such as kneeling. At six months post-operatively, patients reflected their experiences of resuming normal activities and returning to normal life similar to pre-operative lifestyles.

Reduction of demand on support services is reported in the qualitative findings. Participants stated that it was recommended they attend the pre-operative programme with a carer or buddy. It was suggested in the audit form of COT guidelines that patients should identify an informal carer who may help them to enhance independence. The carer can decrease their stress by having the opportunity to discuss their concerns with health professionals and receive knowledge of caring THR patient. This was reported in the case series (Harold case), whereby some health issues were raised during the interview and the patient's wife suggested asking the consultant. After one month post-operative, all participants began to reduce their reliance on helping aids, in particular walking aids, which was seen as a good measure of their progress of physical function. Moreover, some participants expressed that they no longer relied upon some of the aids (i.e. supported seat in the toilet) but that other aids were still in use at six months post-operative (i.e. a

folding walking stick to use as needed). Almost all participants reflected that they were able to discard most of the aids at six months post-operative.

7.4 THR case series in centre A

Five patients completed all questionnaires, diaries and interviews from baseline to six months post-operative. All of them are individually described below, giving in-depth details and linking quantitative and qualitative findings. This section describes triangulation of quantitative and qualitative findings.

7.4.1 Beryl

Beryl was aged 60 years when she enrolled in the study, seven months before her THR. Her baseline characteristics and duration of pre-operative measurement are summarised in Table 33. Trends of hip outcomes, psychological factors and expectations are represented in Appendix 34.

Table 33: Summary baseline demographic of Beryl

Gender:	Female	Age:	60 years
BMI :	21.40 kg/m^2	Living:	Alone in two-floor home
Duration of hip osteoarthritis pain:	4 years	Osteoarthritis treatment:	swim, sport massage, physiotherapy, analgesia
Smoking:	No	Analgesia:	naproxen 500 mg
Other co-morbidities:	no report	THR information:	health care providers, leaflets, websites, THR veterans
Pain distraction:	socialisation, swim, mindfulness, mind games	Hobbies:	gardening, swimming, walking, and adventure travelling & trekking
Hip needed THR:	One side		
Duration between baseline and the 2nd questionnaire:	3 months	Duration between the 2nd questionnaire and date of surgery:	4 months

Beryl reported quite extreme symptoms of pain and poor function, low QOL related to her hip and a moderate to high level of overall QOL and SRH. This gradually improved at four months before THR but hip symptoms became steadily worse. Similarly, self-efficacy was also inclined. These are corroboration with her experiences about self-efficacy and the outcomes improvement. She had been diagnosed with hip osteoarthritis for four years. She coped with pain and dysfunction by exercising and expressed a strong self-belief in her

ability to cope. Analgesia had been prescribed by the GP to relieve pain. She reported having side effects from taking analgesia therefore she only took it when needed, for example, if standing or walking for a long period in a day. She consulted a physiotherapist who prescribed hip specific exercises to improve her function. This was reflected on her ability to strengthen her muscles by swimming and gardening, resulting in less pain and stiffness since starting the exercise. Her beliefs in and understanding of the mechanics of the body are no doubt influenced from her physiotherapist mother and participating in triathletes. In addition, two other successful coping techniques were mindfulness and using mind games to manage pain and hip symptoms (i.e. naming and talking with pain).

The quantitative report showed stable level of high positive affect in this case. Ms Beryl talked about her feelings when her date of surgery was postponed for three months. She was shocked and but her mood changed to optimism a few hours later, reflecting on the extra chance to increase fitness of her body in preparation for THR and recovery. She disliked seeing the reactions of family members and friends when they saw her limping. She tried to think that they were just being sympathetic with her limping.

In addition, Beryl aimed for a full recovery with no pain. She sought out THR information and successful recovery from various sources, such as the internet and friends who had undergone THR. This ability to explore and analyse information in order to prepare for THR and full recovery was possibly related to her background of market researcher.

Beryl reported that post-operative hip pain, symptoms, functions and hip-related QOL improved to a mild level and self-efficacy increased to the maximum points. This is in congruence with her experience. She carried out routine hip specific exercises and regained her daily activities. She expressed her ability to carry out daily activities such as swimming, light gardening, and having intercourse. Prior to writing the diary, the patient mentioned receiving support from her partner and her need of care after discharge from hospital. She had a low immune system due to blood loss. She thought that three key things to improve health status consisted of good diet, self-disciplined exercises and a positive mind set. At six months post-operative, she continued with hip specific exercises and searched for advance exercises with the recommendation of the physiotherapist. She

reflected on having no pain and on regaining her normal function, so much. Thus, her friends had forgotten to mention her THR when they met and emailed to apologise to her for not showing concern. She was very happy with the feedback from her friends and strongly felt she had achieved a full recovery.

Beryl reported no change of pain expectation after THR. This is congruent with the qualitative report. She expressed her expectation of being able to return to normal life without pain, such as rejoining the walking group.

7.4.2 Gladys

Gladys aged seventy-five years who took part in the study at three months pre-operative. Her baseline characteristics and duration of pre-operative measurement are summarised in Table 34. Trends of hip outcomes, psychological factors and expectations are represented in Appendix 35.

Table 34: Summary baseline demographic of Gladys

Gender:	Female	Age:	75 years
BMI :	25.96 kg/m^2	Living:	Alone in flat (ground floor)
Duration of hip osteoarthritis pain:	5 years	Osteoarthritis treatment:	Analgesia, osteopathy, dietary sypplement (MSM*)
Smoking:	No	Analgesia:	paracetamol with codeine
Other co-morbidities:	No report	THR information:	Health professionals, leaflets, THR veterans
Pain distraction:	Socialisation, hobbies	Hobbies:	Swimming, reading books, writing letter to friends, sewing, volunteer for charities
Hip needed THR:	One side		
Duration between baseline and the 2nd questionnaire:	2 months	Duration between the 2nd questionnaire and date of surgery:	1 month
*MSM is methylsulfonylmethane that was proposed for anti-inflammatory and analgesic action in osteoarthritis[233].			

At baseline, Gladys reported moderate-severe hip pain, hip function (ADL) and hip-related QOL, moderate hip symptoms, moderate-high level of overall QOL and SRH. Moderate self-efficacy of symptoms, low self-efficacy of pain and high self-efficacy of function were also reported. All of them showed little change or were stable at one month pre-operative. Little change of all outcomes and self-efficacy are supported by her experience. Gladys's

coping techniques were use of analgesia, osteopathy, and MSM. She took analgesia as needed but she felt nervous with it because of side effects detailed in the leaflet. She was advised by her GP to take increased amounts of analgesia and to see an osteopath. She stated that she had fallen around two years ago but had been helped by osteopath treatment and had largely returned to normal capability. This resulted in her belief in osteopathy, although this effectiveness gave a result of pain relief for a few hours. An osteopath also suggested she used MSM powder and she felt positive with the result of MSM. She distracted herself from the pain by meeting her friends, and keeping herself busy with her hobbies. Most of the coping techniques that she carried out are passive coping techniques but she tried to manage her pain and dysfunction by using active coping methods such as swimming. However, she stopped swimming due to difficulties in changing her clothing. She took advice from listening to the experiences of friends undergoing THR that enhanced her post-operative independence by not telling many friends about her surgery date.

Gladys reported low anxiety and depression, no fear, low negative affect and low pain catastrophising at baseline. Most of these factors were quite stable at one month pre-operative. However, fear increased to mild level but depression was dramatically decreased to very mild level at one month pre-operative. This may be corroborate with her experience. She received a date for surgery in a shorter time period than her expectation. She expected to receive the date of surgery around ten to eighteen weeks but she received the letter around eight weeks after initial assessment. As such, this may have affected her fear and anxiety levels. Moreover, information about THR and anaesthesia provided in the pre-operative programme was possibly associated with inclination of fears.

Gladys reported that her post-operative symptoms, pain, function and QOL were significantly improved to mild symptoms, pain, function, and good QOL. Psychological factors were varied. At one-month recovery, self-efficacy of pain was not reported but self-efficacy of function was increased a little in high level. At six-month recovery, both of them were increased to the maximum level. Moreover, expectations were reported in no pain

and dysfunction at six-month and one-year recovery. These may be described on corroboration with her recovery experience.

Following THR, Gladys reported a complication of haematoma which occurred a few days after discharge. She received support from health professionals and friends stayed with her around three weeks. She was also unable to do hip specific exercises. After she was allowed to, she exercised as much as she could manage. During some night times, this lady reported that she had severe pain and her friend gave a sense of calm by saying that it was post-operative healing pain. One night at six weeks post-operative, she called the hospital thinking she had deep vein thrombosis but she was told she was overdoing the exercises and a doctor recommended doing them three times a day only. However, a sense of calm was restored when her consultant explained that the duration for making full recovery was twelve months after surgery and her progress was satisfactory. She reported that she was satisfied with the result of THR.

7.4.3 Janet

Janet aged sixty-seven years who participated in the study around three months before her THR. Her baseline characteristics and duration of pre-operative measurement are displayed in Table 35. Trends of hip outcomes, psychological factors and expectations are illustrated in Appendix 36.

Table 35: Summary baseline demographic of Janet

Gender:	Female	Age:	67 years
BMI :	34.66 kg/m^2	Living:	Husband in two-floor home
Duration of hip osteoarthritis pain:	2 years	Osteoarthritis treatment:	Physiotherapy, analgesia, walking stick
Smoking:	No	Analgesia:	pregabalin 25 mg paracetamol with codeine
Other co-morbidities:	No report	THR information:	Health professionals, leaflet, THR veterans and her husband
Pain distraction:	Socialisation, hobbies, doing chores	Hobbies:	Swimming, aqua aerobics, reading, gardening
Hip needed THR:	One side		
Duration between baseline and the 2nd questionnaire:	2 months	Duration between the 2nd questionnaire and date of surgery:	2 weeks

Janet reported moderate level of hip symptoms, pain, function, overall QOL and SRH, and severe problems of sport function and hip-related QOL at baseline. At two weeks pre-operative, all aspects were worse than when previous measurements were taken, except for maintaining of sports function. In addition, moderate positive affect at baseline reduced to mild positive emotions at two weeks pre-operative. Moreover, moderate self-efficacy of symptoms, and high self-efficacy of function at baseline were slightly declined to the same level at two weeks pre-operative. Moderate self-efficacy of pain at baseline was slightly increased at two weeks before THR. The outcomes are supported but positive affect and self-efficacy are contradicted in her experience.

Janet reported her way of coping with pain and dysfunction was by physiotherapy exercises, analgesia, pain distraction techniques and mind games. Exercises were provided by her physiotherapist daughter. She was reluctant to take analgesia due to being highly concerned about the side effects listed in the leaflet. Her GP recommended she take enough analgesia to manage pain but she used using it as needed. This patient distracted herself from the pain by involving herself with hobbies and she dealt with her sleep problems by playing mind games, such as thinking of places that she used to travel. At two weeks prior to THR, she prepared for the operation by carrying out hip exercises, keeping active and losing weight. All of these were recommended by her physiotherapist daughter. She was able to lose one and a half stone. In addition to the pre-operative programme, she also received useful information about the experience of THR from her husband and friends in her reading club. She was advised to select epidural anaesthesia. This coping ability may have increased her positive affect and her belief in coping with these problems but it was maintained at the same level. However, this may be described by her anxiety, depression and fears level.

At baseline, mild anxiety, high fears, and a mild negative emotional state were reported. This increased to a possible clinical condition of anxiety, higher fear, and moderate negative affect. This is supported from her experience about anxiety and fear of treatment.

Janet reported anxiety and needed support from health professionals to reassure her about THR and prepare herself for a good recovery. She coped with her fear by avoiding

information about the THR process and gave an example of having a filling when she told the dentist to treat her without any explanation of the process and knew the result only. Similarly, she wanted to do this for the THR; however, she did need to know THR process and accepted possibility of risks and complications.

After the operation, self-efficacy of rehabilitation, self-efficacy of function and expectations were integrated. All outcomes showed a similar trend of improvement since early recovery. Moderate problems of hip symptoms, pain, function, overall QOL and SRH improved to mild severity, whereas moderate to severe problem of hip-related QOL was improved to moderate severity. All aspects of self-efficacy were improved to a high level.

Self-efficacy of rehabilitation was reported in high level and slightly increased at six-month recovery. This is congruent with Janet's experience. At one-month recovery, she discussed the importance of the support received from her physiotherapist daughter and advice given such as starting swimming with walking around the pool, and kneeling on the cushion before starting kneeling on the ground. Hip specific exercises were carried out three times a day. When she felt her muscle strength was not improving, she asked her daughter to advise her on new exercises. This possibly reflected on her high confidence in managing all post-operative hip problems.

Self-efficacy of function improved along Janet's recovery. Travelling and learning of the THR experience from her husband support this improvement. At six months post-operative, she reported her experiences of travelling in Spain with her husband as a challenge to test her physical function. She was able to walk for long distances and use her walking stick when she needed to. Her husband also encouraged her in regaining normal movement. However, she was unable to get up from the floor without a helping aid or helper. When she came back from traveling, she reported her progression by the discarding of her folded stick on some occasions.

Information about longevity of the new hip was provided from her husband's experiences. She adapted some movements to maintain long tern effectiveness of the new hip, such as not bending the operated leg whilst putting her trousers on or taking them off. She was

satisfied with result of the THR and reported having a full recovery because she was able to do most of all movements.

7.4.4 Harold

Harold aged seventy-seven years participated in the study at five months before THR. His baseline characteristics and duration of pre-operative measurement are displayed in Table 36. Trends of the outcomes, psychological factors and expectations are illustrated in Appendix 37.

Table 36: Summary baseline demographic of Harold

Gender:	Male	Age:	77 years
BMI :	31.36 kg/m^2	Living:	Wife in retired flat
Duration of hip osteoarthritis pain:	5-10 years	Osteoarthritis treatment:	Analgesia
Smoking:	Yes (3 cigarettes/day)	Analgesia:	paracetamol with codeine
Other co-morbidities:	Hypertension Atrial fibrillation Diabetes mellitus	THR information:	Health professionals, leaflet
Pain distraction:	Socialising	Hobbies:	Playing golf (stop for 2 years)
Hip needed THR:	Both		
Duration between baseline and the 2nd questionnaire:	2 months	Duration between the 2nd questionnaire and date of surgery:	3 months

At baseline, Harold reported his severe problems of hip symptoms, pain, function and QOL but self-rated health was moderate level. At three months pre-operative, little changes of them were reported in the same level of severity except SRH. It was increased to moderate-high health status. Moderate self-efficacy of function at baseline was slightly increased at around one month pre-operative, while low self-efficacy of pain at baseline was slightly declined. These outcomes and self-efficacy changes are supported in the qualitative findings.

Harold managed his pain and function by using analgesia and going walking using walking aids to assist him. He took around four to six tablets a day of paracetamol with codeine which helped pain relief. He tried to walk around a quarter to half a mile every day, as reported in the diary. He also attempted physiotherapy exercises but was unable to do

them due to being diagnosed with atrial fibrillation. In addition, he had been diagnosed with hypertension and diabetes mellitus which resulted in him taking several medications. His wife was present during the interview and assisted with some questions where he was unsure of the answers.

At one month post-operative, hip symptoms, pain, function and QOL had significantly improved to mild-moderate problems. Self-efficacy had also increased. This is congruently described in his experience. Harold reported his good recovery at one month post-operative. His progress had improved in that he had less pain, could walk further, had reduced use of his walking stick, resumed driving, and gained independence from using equipment such as a toilet seat.

At six-month recovery, hip pain, function in daily activity, hip-related QOL and overall QOL were declined from one-month recovery. Similarly, self-efficacy of pain and function were also showed the same reduction. In addition, post-operative one-year expectations were increased from no pain and no dysfunction to mild and moderate problems, respectively. Change of expectations post-operative one-year and reduction of hip pain and function at post-operative six months possibly related to his need for THR in both hips. This is corroborated with the participant's experience.

Harold described pain at the hip, lower back, and hands. This was managed by using analgesia; around three - four tablets per day. He tried to walk every day to keep active and prepare for the other THR. In addition he accepted his partial recovery, partly due to the recommendation from his consultant to wait for full recovery at around twelve months and partly due to hip osteoarthritis in the other side. He still kept some aids to assist him and received support from his wife, such as putting lotion on his feet for diabetes care. For other co-morbidities this case may require special care, particularly exercise for functional recovery with heart disease.

7.4.5 Peter

Peter aged sixty-nine years and took part in the study at three months before his operation. His baseline characteristics and duration of pre-operative measurement are

displayed in Table 37. Trends of hip outcomes, psychological factors and expectations are illustrated in Appendix 38.

Table 37: Summary baseline demographic of Peter

Gender:	Male	Age:	69 years
BMI :	28.57 kg/m^2	Living:	Spouse in two-floor home
Duration of hip osteoarthritis pain:	> 2 years	Osteoarthritis treatment:	Analgesia
Smoking:	No	Analgesia:	paracetamol with codeine
Other co-morbidities:	No report	THR information:	Health professionals
Pain distraction:	Hobbies, housework	Hobbies:	Gardening, reading, watching television, playing scrabble
Hip needed THR:	One side		
Duration between baseline and the 2nd questionnaire:	3 months	Duration between the 2nd questionnaire and date of surgery:	1 week

At baseline measurement, hip symptoms, pain, function, overall QOL and SRH showed moderate problems, while sport function and hip-related QOL showed severe difficulties. All of them either slightly increased or remained stable at around one month pre-operative. Self-efficacy of pain, and hip symptoms showed moderate level at baseline. They slightly increased at one week pre-operative. These changes are congruent with the qualitative report.

Peter kept active by carrying out his normal daily activities. He worked on his allotment for long hours per day and walked to the allotment. He exercised the hip and legs to retain muscle strength as recommended by the consultant. Any stiffness and pain caused by gardening disappeared the next day. In addition, pain was managed by taking four tablets of paracetamol with codeine per day. He believed in observing himself reacting with pain due to no more effectiveness of taking eight tablets. He described how analgesia masked pain but it was still there. Thus, he tried to maximising his independence from analgesia by reducing the tablets taken.

After hip surgery, hip symptoms, pain, function, and QOL improved and they showed little change at six months post-operative. Moderate self-efficacy of pain and high self-efficacy of function at one month post-operative were increased to high level at six months post-

operative. High self-efficacy of symptoms and rehabilitation were stable. Post-operatively, one-year expectation of pain and function were slightly increased to a mild level of difficulty. All of them are corroborated in qualitative findings.

Peter demonstrated his good progression and recovered well. His pain improved from acute pain, which he had tried to alleviate by use of pain medications as needed. In addition, he reported walking further each week, increasing the number of positions whilst doing hip specific exercises and discarding walking aids. Further walking was recorded in the diary, showing his tangible progression. Some exercises were hard for this patient at a few weeks post-operative. To begin with he was capable of doing five exercises out of the eight but he managed to do all of them around two weeks later. Moreover, he used two sticks shortly after discharge and discarded one of them at one month into the recovery period.

At six months post-operative, Peter reported in his diary that there was no progress of pain and function. This may relate to his expectation of mild pain and dysfunction at one year post-operative. During the interview, he reflected on the positive feedback and support he had received from his consultant and his friend. The consultant had advised him that it would take time to see improvement and his friend had appreciated his increased ability to walk. In addition, he expressed satisfaction that the tenderness he had experienced had disappeared quicker than expected. His slow progression of recovery was reported in relation to self-efficacy and change of expectations.

7.4.6 Potential elements from five case series

Almost all triangulation reported the congruence of some potential psychological factors with outcomes after THR. Self-efficacy, positive affect, and expectations are linked with improvement of outcomes. However, these factors are expressed in conjunction with the experience of patients. Four potential elements from the case series were summarised comprising links with physiotherapy, anticipation of positive events, role model of THR, and co-morbidities.

First, two cases reflected a **'Links with physiotherapy'**: Beryl with her mother; and Janet with her daughter. These patients wrote about their physical function and movement in

depth in the diary and discussed them during interviews. They also started hip specific exercises before the operation but Beryl had three months to prepare due to postponing of THR, whereas Janet reported around two months preparation time. Post-operative physiotherapy sessions were similar in all cases but extra appointments were given depending on the needs of the patient. Gladys was prescribed a physiotherapy session, whilst Beryl wanted to engage a private service and Janet received support from her physiotherapist daughter. Gladys reported worse hip symptoms and functions, possibly caused by her complication of haematoma at shortly after discharge. This associated with her delayed hip specific exercises for three weeks.

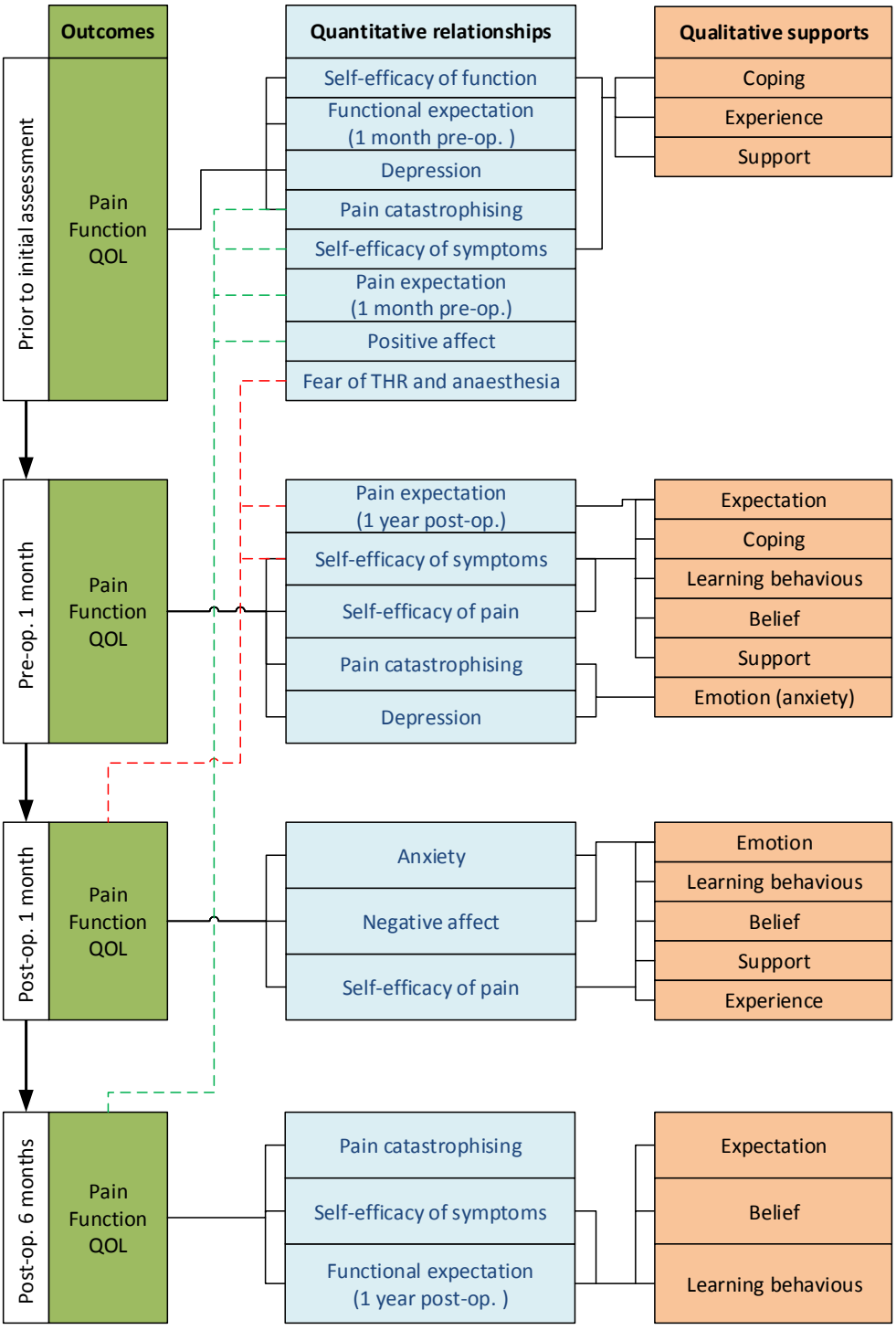
Two cases reported an **'Anticipation of positive events'** in travelling for pleasure and needed a high function of walking. This possibly drove them to keep doing hip exercises to increase their strength of muscle as much as possible. Beryl, Gladys, and Janet reported vicarious learning from **'Role models of THR'** resulting in good recovery. Beryl received information from friends and from surfing the internet, whilst Gladys received support from her friends. Janet had her husband as her role model, in particular in relation to longevity of the new hip. When comparing all cases during the pre-operative period, Beryl, Janet and Peter were stronger than the others because of their hobbies and normal activities such as swimming and gardening, whereas Gladys and Harold only did walking. This may have been due to their **'Co-morbidities'**. Gladys had been diagnosed with haematoma after the THR and her rehabilitation exercises were not prescribed until three weeks later. Harold reported three co-existing diseases, particularly atrial fibrillation. It has been associated with his normal daily activities and there was no chance to use physiotherapy treatment prior to THR. Moreover, hip osteoarthritis in the other site possibly relate to his report of pain and dysfunction. Therefore, Beryl, Janet, and Peter tended to have full recovery within eighteen months after THR, whilst Gladys and Harold may take longer time than normal to get to full recovery.

All in all, five cases reported four potential elements possibly related to good recovery. All of them may be considered in clinical studies to design individual treatment.

7.5 Overview of relationships

Throughout THR journey, self-efficacy is the most important factor for good recovery. In addition, self-efficacy is congruent with coping, experience, support, learning behaviours, belief, and experience regarding qualitative findings. For the majority of relationships, depression, and anxiety are reported at the pre-operative period and one month post-operative. Moreover, pain catastrophising is associated with the outcomes at the pre-operative period and six-month post-operative. Expectations correlate with the outcomes at baseline and six-month recovery. This supports the experience of participants as they express their expectations from having THR to making a good recovery. All triangulation findings are summarised in Figure 18. Self-efficacy and expectations should be concerned and focused in pragmatic way to improve the outcome of THR.

Figure 18: Overview of triangulation findings



Dash line indicates longitudinal relationships with post-operative outcomes. (Red line for one month and green line for six months)

Chapter 8: General discussion and conclusion

As described in chapter 1, there is the strong relationship between anxiety and depression and pre-operative expectations with pain, function and QOL in THR patients[81,83]. However, other factors which influenced pre-operative expectations were also raised by patients undergoing THR and knee replacement[88] thus they were included in this study. In addition, interviews conducted during the post-operative period revealed qualitative findings about the experience of patients undergoing THR[103,105,107]. No previous research into THR caused by osteoarthritis had been conducted using the diary method. Several methods were used in order to understand the process of THR from the perspective of patients, from prior to having the initial assessment for THR through to six months post-operative. Observation of the pre-operative education programme was made in order to evaluate the programme against the standard guidelines and explore the effects of the programme against two previous inquiries. All of these mixed methods were designed and conducted in facilitating hospitals to explore the relationship of psychological factors and expectations on pain, function and QOL in patients undergoing THR. The aim was to understand how psychological factors affect patients' recovery so as an appropriate programme could be designed in the future.

8.1 General discussion

8.1.1 Methodological appropriateness

This research was conducted by use of three methods: questionnaire; diary; and interview schedule. The questionnaire comprised parts taken from other validated questionnaires and some instruction parts were amended to ensure the whole questionnaire made sense. Reliability of the questionnaire was based on previous studies, whilst content validity was assessed by cognitive interview-think aloud techniques. This was developed in the original area of psychology and has been applied in many areas[132–135]. This technique was conducted in two rounds in order to confirm the results and amend prior to using in the main element. A diary was developed so as to capture patient's daily experience. This was based on reflective techniques[122] and was used in a previous study in hip fracture

patients[110]. Another person outside the research team reviewed the diary and some instructions were amended to broaden the definition of instruction and open-ended questions. This study shows that the think-aloud technique of a cognitive interview is potentially beneficial as it can identify any ambiguous content in the questionnaires.

As described in chapter 2, the sample size was estimated in a range of 77 – 157. According to NJR in 2011, questionnaire response rate was around 80% in England[234]. Anecdotal estimates from hip surgeons suggested that approximately half of patients who had an appointment with hip consultant, tended to undergo THR. To estimate the sample size, 60% response rate was established due to length of the questionnaire and 50% of patients undergoing THR so 240-670 questionnaires were estimated to administer from four centres within one year. After ethical approval, the questionnaire was distributed via the hospital administrative staff.

The response rate from three hospitals was around 13% after a few months. More consultants were recruited in centre B and some hip consultants in centre E were contacted, which enhanced this rate. Finally, a 17% take up from all five centres were achieved, with 618 out of 105 of the first questionnaires returned. This rate was less than previous research conducted in Manchester. Response rate was reported as 93% at six months post-operatively. Mail survey was utilised to recruit patients who were on the waiting list for THR[82]. Time of recruitment in THR journey was different with this current study. Thus, recruitment the patients on the waiting list of THR may increase the response rate of recruited participants.

This low response rate may relate to the fact that the questionnaire schedule was designed to explore the effects of the pre-operative education programme. As such, two points of collecting data were established prior to the surgery taking place - one (baseline) prior to the initial assessment and around one month pre-operatively, following attendance at the pre-operative education programme. Participants could have been recruited at the initial assessment in the orthopaedic clinic, whilst waiting for assessment or via other routes such as online surveys. However, this was rejected because the initial appointment with the consultant might have impacted on psychological factors and expectation at the baseline

data. Additionally, this study was objected to measure the impact of the whole of the hospital team including the pre-operative programme from the perspective of patients. In centre A, the highest number of participants was recruited, possibly due to use of a first class stamp, in line with Edwards' review of a first class stamp to maximise the response rate[235]. However, it may also be because one of the consultants based at this trust was acting as an advisor for the project and may have raised the profile of the study in comparison to the other centres.

Loss to follow-up at one month and six months post-operatively were 36% and 59% respectively. This rate was higher than the other study conducted in Manchester that reported 7% loss to follow-up at six months post-operative[82]. These results suggest that the other techniques of maximising the response rate should have been applied to all centres, for instance, using the first-class stamp in all centres, post card reminders and monetary incentives.

Participants completed the questionnaire at home without time limits. As such, the social setting and social desirability biases were lessened. Confidentiality and anonymity were taken into account by using a pseudoanonymised code that did not link with their treatment or hip consultant[236]. This shows the benefits of completing the questionnaire at home; however, the social desirability effects may relate to symptom reporting in the questionnaire inquiry[237], but this was confirmed by the diary-interview method. Moreover, this topic should be addressed in any further study, such as by comparison of the outcomes with clinical profiles in medical records or by exploring the views of the clinician in the triangulation part of the research.

Non-responder bias was recognised. This study reported on the comparison of variables at baseline and demographic data between responders and non-responders at the end of the study. The result reported no significant difference between both groups in demographic data. Almost all variables reported no significant difference between two groups except for expectations. Non-responders had more optimistic expectation of pain and function at one month post-operative and expectation of function at six months post-operative than responders. The comparison is shown in Appendix 16.

All voluntary participants were included in the qualitative element. To assist with the response rate, all participants received the incentive of a £10 voucher after they completed a two-week diary and a face to face interview. Similarly, the accuracy of the transcripts of audio recordings following the interviews was confirmed by participants. The diary was a successful tool in which to capture the in-depth perspective of patients'experience[122,136,238] of THR. Some issues arose such as failure to write in the diary, possibly as a result of lack of motivation from the participants[239], but this was counter-balanced by the interviews which were able to fill in some information missed about critical events in the diary entry[137]. Reflective writing techniques were expressed in the diary, particularly during the recovery period. Participants found there were advantages in writing the diary and mentioned this during interview. This illustrates that the diary is a useful tool in supporting patients with managing their emotions and enables them to see visible progression of their recovery.

Evaluation was conducted by observation in all facilitating hospitals. The researcher observed as a participant in order to record data about the programme content and how it was conducted. To retain a degree of neutrality, the researcher was not introduced to patients in the group class, only in the one-on-one sessions in centre A and B, therefore observation was observed without interaction with the patients[124].

During triangulation, quantitative and qualitative findings were merged in order to explain the limitations of each data collection. These were illustrated in three main ways:

- Evaluation of the pre-operative programme was described by comparison of all variables in the pre-operative period and qualitative findings across THR.
- Findings of diaries and interviews which explained the questionnaire result in terms of changes, correlations, predictions and five case series.
- An explicit model of relationships between pain, function and QOL was created with statistical variables and qualitative sub-themes.

A convergent model in focusing on pain, function and QOL shows the importance of self-efficacy. The relationship between self-efficacy and expectations with pain, function and QOL were illustrated by patients' experiences in terms of learning behaviours,

expectations, and beliefs. The aim of study was to illustrate the overall picture of the relationship between psychological factors and expectations with pain, function, and QOL.

8.1.2 Reflexivity

Reflexivity is defined as the researcher's bias towards interpreting qualitative data results in terms of background, culture, and experiences in all steps of the research process[121,240]. During data collection, the diary, interview and observation will influence the researcher and vice versa. There is a relationship between the researcher, participants, and data interpretation and analysis. The relationship with participants was described under three topic headings: establishing relationships; participant knowledge of the interviewer; and interviewer characteristics[241]. These considerations are described later in this section.

8.1.2.1 Diaries and interviews element

To create a relationship with all participants, many points of contacts were established. Participants were contacted via post before getting the diary and either telephone or email following return of the diary and interview transcript. This was also beneficial in confirmation of accuracy of the interview transcript. Moreover, two advantages of diary inquiry are an instrument to build up the relationship prior to interview and an advantage of non-native English researcher as it allowed time to review the participant's particular situation prior to the interview. Thus, there was less need to be reactive at the interview. Following return of the diary, the diary entries were analysed in order to prepare for the interviews and highlight any important points for discussion. The diary assisted in building rapport at the interview stage. The interviews, in the main, took place at the participants' home to put participants at ease as well as support their mobility during recovery. Prior to conducting the interviews, the researcher rehearsed by carrying out a mock interview with the Director of Study in order to increase his confidence at the interview.

The other issue had been realised to convey without judgemental mind of health professional background. No concealment of the researcher background from details of contact and some participants asked the questions about their health and dietary supplement. This was where participants asked these questions, the researcher advised the participant speak to their GP or pharmacist.

At the start of the interview process, the researcher introduced himself and confirmed the content of the diary entry. Some errors in the diary were corrected at this time. These errors reduced across a period of time during this study. During several interviews, patients had their partners present. Their partners usually assisted by clarifying answers or discussing events that had occurred if the participant needed support. Audio recordings were transcribed by a University transcriber, and checked by the researcher before sending to the participants for final checking and validating.

An analysis of the qualitative study was conducted before the quantitative analysis in order to prevent a bias of statistical results. It might lead the researcher to focus on significant factors. In the thematic analysis, two other members of the research team analysed the diary entry and interview transcript of two participants for accuracy of the findings.

8.1.2.2 Observation in the pre-operative education programme

The researcher observed the pre-operative programme as participants to explore the effects of the programme on the patients. A time interval was arranged for at least one month for duration of the observations in each centre. Observations were conducted in each centre in August, September 2013, February, April and July 2014. The variation of intervals was depending on availability of the leader and the programme. Following observation, the content of the programme was described as soon as possible in order to understand the programme content and all techniques from the programme leader. A report of the observation was recorded by reviewing field notes and all documents provided in the programme.

Reflexivity is where the researcher shapes the direction of qualitative findings and reports. These are integrated with the quantitative results. Strengths and limitations in the triangulation have been raised. They are concluded in the next section.

8.1.3 Strengths and limitations

In the questionnaire element, there were four strengths: cover various psychological factors; the generalisable participants; reducing researcher bias; and comparison between three sub-groups at baseline. They are described below.

1. The questionnaire included many validated questionnaires to cover relevant psychological factors[89,163,164,166,187] and expectations[167] with hip outcomes[125] and overall QOL[160]. Overall QOL was the same measurement as PROMs in THR patients[41] that may link with the result for clinical implications.
2. In the generalisability, five centres supported the recruitment of patients which represented variety of participants. To confirm no difference between five centres, comparison between participants recruiting from centre A and four others was conducted and reported no significant difference in all demographics and variables except pain expectation at six months post-operative (Appendix 17). Patients in other centres were more optimistic expectations of less pain at six month post-operative. Moreover, this small sample size may approximate all English patients undergoing THR because age, proportions of female and BMI were close to NJR report[4]. However, a small sample size in North-west England with voluntary recruitment may not be fully representative of all THR patients. Future research in the other area and more participants is needed to fill this gap.
3. An independent researcher conducted the study. This may have reduced bias in the research compared with a member of the healthcare team conducting the research.
4. Indirect recruitment was used due to the independent researcher not being an NHS employee with normal access to patient data. It resulted in administering the questionnaire prior to initial assessment for THR. Three sub-groups were classified as recruited, experienced, and no schedule for THR participants at baseline. A comparison between three sub-groups is an unexpected benefit. This may be a pilot study to identify the difference between recruited participants, THR-experienced participants, and participants who did not schedule for THR. The difference of hip function between recruited participants and two others is illustrated. This should be confirmed with the clinical assessment. However, other non-significant results may be considered at initial assessment by health professionals. For example, possible clinical conditions of anxiety and depression

were found in experienced participants, which is likely for screening these participants prior to THR.

In addition, the diaries and interviews element also demonstrates two strengths.

1. Writing about pain experience and emotions for fourteen days provided benefits as well as risks to participants. In the active coping sub-themes, benefits of writing a diary included management of their feelings and being able to report their development of post-operative physical function. While some participants reported that they did not feel able to burden anyone with their issues, but that they were able to write it down in the diary. Moreover, the diary was a record of their tangible progress after the operation. By contrast, there was an evidence from some participants that pain and negative effects were magnified in their diary.

   A previous psychological study was designed to compare illness visits, mood and subjective well-being outcomes of writing about effects in four groups of participants between the control topic, past trauma event, best possible selves and both scenarios. This involved writing the diary for around fifteen minutes per day for four consecutive days. Mood and well-being outcomes were measured at baseline: immediately after writing and three weeks after, while number of visits to a health centre for illness of participants was recorded until five months after. Writing about trauma was more upsetting than participant's best possible selves' story and significantly reduced subjective well-being immediately after writing but it was not different among participants at three weeks after. Positive or negative effects from writing resulted in similar emotions at three weeks after but disappeared at a few weeks afterwards. Finally, number of visits for illness of participants in the control group was significantly higher than others not in the control group. Therefore this study indicated that the positive and negative effects of writing were beneficial to reduce visiting for illness[242]. Thus, the process of writing a diary provided some negative feelings in the short term; however, writers could obtain positive effects from the diary by expressing their emotions and their

goals over a long period. They may support the patients to cope with their emotions and focus on their targets.

2. This qualitative element also provided findings regarding psychosocial aspects to support some previous studies in terms of adjustment of unrealistic expectations[106], various coping techniques[105] and exploring participants' needs. Some participants suggested that THR veterans share their experiences with new patients, including the need for reassurance of recovery after the operation.

Three limitations of the questionnaire survey are low response rate, variety of occasions in pre-operative measurement, prohibitions of hip positions in the standardised questionnaire, and sample size.

1. The low response rate may have resulted from time point of recruiting participants from THR journey, the length of the questionnaire, and variety of agreed process. Recruiting participants prior to initial assessment with the consultant resulted in small sample size at six months post-operative but there was an advantage as described in the strengths of recruitment. Possible ways of improving recruitment may be face-to-face invitation at NHS centres e.g. before or after a pre-operative education programme, or at the initial assessment in the orthopaedic clinic while patients are waiting for assessment. This might be more effective than postal surveys because meeting with patients can help with engagement[236] and it would be possible to only recruit those undergoing THR. However, additional issues regarding access to patients in NHS clinics would also need to be overcome for an independent researcher.
2. Variation in the agreed recruitment process for the different centres may have also impacted on the response rate. Most participants were recruited from centre A due to the highest numbers of five consultants facilitating in support recruitment. This may also relate to the first class stamp provided for administrating from this centre, whereas other centres used the second class stamp. This technique was supported by Edwards' review to maximise response rate[235]. Therefore, the first class stamp may increase the response rate that should be applied in other centres.

3. In the questionnaire, HOOS subscale of sport function consisted of positions prohibited in patients undergoing THR as well as those with hip osteoarthritis. Most participants omitted this part when filling the questionnaires in during the post-operative periods, causing issues with analysis and management of missing values. Some questions in other questionnaires were ignored from the analysis because missing values were not possible to replace. Moreover, multiple imputation technique was unable to perform in particular with post-operative period and longitudinal model.

The other limitation in diaries and interviews element was requiring a good skill of writing and good vision capacity. This might have possibly affected the small number of people volunteering to participate as many people around this age may have vision problems and two participants underwent cataract surgery within six months prior to taking part in this element.

8.1.4 Key findings

Data from all parts of the study were brought together in the below triangulation to provide a multi-perspective view on the topic. This also included the correspondence of the triangulation results with the theoretical frameworks in particular with external locus of control, internal locus of control, self-efficacy, and the integrated model from theory of planned behaviour (TPB) suggested by Dixon and colleagues[63,64]. This model reported the key impact of impairment on TPB composed of perceived behavioural control (PBC), behavioural intention, and behavior as described above in chapter 1 (page 16).

8.1.4.1 Triangulation of quantitative and qualitative findings

The quantitative relationships were described by the experience of patients in qualitative findings, which are reported in the commonalities of both data set[149]. Most of the findings fit well with the integrated model of TPB[63,64] and self-efficacy framework in social-cognitive theory (SCT)[56]. A few experiences of participants express a link with locus of control.

Pre-operatively, patients' chronic pain, dysfunction and low QOL were matched with impairment in the integrated model that led the patients' expectations in undergoing THR. This dimension also resulted in negative emotion, which aligns with negative emotions and

experiences in the well-being theme of qualitative findings. This is matched with one key aspect of self-efficacy, namely the physiological and affective state. In order to cope with their illness, coping techniques were sought from a variety of external sources (i.e. GP, orthopaedic surgeon, health professionals, friends and THR veterans) as illustrated in the support theme which links with mastery experience, vicarious learning and verbal persuasion to enhance self-efficacy. In addition, the patients expected to undergo THR and have a good recovery without pain and dysfunction, as would be predicted by applying the SCT. The pre-operative education programme provided information to prepare the patients for good recovery which affected their planned future actions and enhanced self-efficacy, increased their positive mood state and reduced anxiety. However, fear of anaesthesia led to patients exploring anaesthetic choice with their friends, THR veterans and websites. The pre-operative education programme and information were not only a major source of self-efficacy for patients but also adjusted unrealistic expectations about post-operative pain and function. Patients reported preparing themselves for THR from internal drive resulted from their beliefs (i.e. weight loss, hip-specific exercise) and finding useful information from the external sources such as family, friends and health professionals.

Once THR was completed, patients also increased self-efficacy through the same routes, in particular by carrying out rehabilitation exercises. Chronic pain was no longer evident but was replaced by acute post-operative pain, although patients reported feeling better than in the pre-operative period. The recovery process involved external support of health professionals, family, friends and helping aids as discussed in the pre-operative programme and hip booklet. Patients used self-persuasion and found keeping a record of their progression in functional ability improved their confidence in getting back to normal and making a full recovery. This linked with the internal sources of the patients to achieve their expectations.

Around six months after THR, some participants expressed uncertainty in the recovery process because they felt less functional progression than a few months before and expected to return to normal state quicker than they had. This was caused by self-evaluation of their physical function based on external sources of vicarious learning from

their friends and a mastery experience from previous THR veterans. As such, patients were dissatisfied with their progression. However, friends and health professionals supported and encouraged patients while they made a full recovery, usually within twelve to eighteen months.

These findings are illustrated in the fitness of the integrated model in TPB and a variety of sources for self-efficacy in SCT. In addition, the controllability was also seen in the diary evidence at one month post-operative. The progression of functional abilities was recorded in terms of the distance of walking or the number of sticks used. However, this was not measured in the quantitative element which should be explored in the further study.

In answering the research question, the most important factors for patient recovery are self-efficacy and expectation of post-operative pain, function and QOL. Patients expressed that their chronic pain and dysfunction had led to undergo THR in order to achieve a target of good recuperation with no pain and good physical function.

8.1.4.2 Evaluation of THR process regarding quality standards

Observation of the pre-operative education programme described the nature of the learning programme and knowledge provided in the hospital. The programme provided information about THR by using various techniques to enhance effective learning. Integrating optimism during the session was included in a few centres to help increase patient focus on good recovery and reduce fear of THR. This element examined the content of the programme regarding aims in three standard guidelines[7,30,113] and all centres achieved five of eight aims. Following this programme, patients' knowledge should be assessed in order to investigate the effectiveness of the programme after it ended. At six months post-operatively, qualitative findings were integrated to evaluate the programme in line with the eight aims of standard guidelines and the result reported achievement of seven aims. The result of this element shows the effective programme using various techniques to provide necessary information to patients.

During the time of data collection, centre A rearranged some features of the programme. The group class was arranged by an occupational therapist, physiotherapist and hip

surgeon, which was mentioned in the interview from a participant in centre A in September 2013. It had been changed to three one-on-one sessions and one small group while the researcher observed the programme in February 2014. However, this change of programme does not influence the information provided because a booklet contained the same information as was reviewed in May 2013[33] and only two participants in the questionnaire stream underwent THR beforehand. The fact that there was no change in the information content was also confirmed by the lead clinician of the programme following the observation.

In addition, participants expressed that they received knowledge covering THR and recovery and that this helped them to adjust their pain and functional expectations into their daily experiences after the THR. In addition, some participants suggested some comments to improve the quality of service. For example, centre A should generate a checklist of all sessions of the programme in order to help the patients know which session they have attended.

Evaluation of the THR process showed that seven out of eight aims set out in the three standard guidelines were achieved. The first aim of explaining the THR process has been reported in chapter 6. Next, the goal of maximising functional independence is achieved by increasing the level of optimism and self-efficacy. Participant's confidence in health professionals and self-efficacy increased from qualitative findings as well as the quantitative measurement of self-efficacy showed a greater score than at baseline. Three other goals were resumption of occupational role, reduction of demand on support services and reintegration into the community. These are described by qualitative findings in the post-operative period.

With respect to the aim of reducing anxiety, no significant difference was reported at pre-operative period. In previous work, anxiety level was reduced in a review of the effects of the pre-operative programme on patients undergoing THR[243]. However, the general anxiety questionnaires used may not be sensitive enough to report the reduction of anxiety level relevant to this aim. Based on qualitative findings, anxiety, fear of THR and anaesthesia were reduced by several techniques but feelings of anxiety related to the

patient's own responsibility such as selection of anaesthesia and expectations of a good recovery were mainly expressed. Therefore, specific anxiety should be looked at in relation to THR. In addition, anxiety should be compared between baseline and either post-operatively one month or six months in order to investigate anxiety across the THR journey.

By way of answering the research question, the pre-operative education programme is an important external source of information and the psychological intervention is vital to raise the confidence of the patients and help them recuperate. This source impacts on patients' beliefs and negative emotions. This not only enhances optimism and self-efficacy as well as adjusting unrealistic expectations, but also reduces pre-operative anxiety and fear.

8.1.4.3 THR case series in centre A

There are four potential components that are correlated with recovery: links with physiotherapy; co-existing diseases; anticipation of positive events; and role models of THR.

Links with physiotherapy are related to the outcome of THR. In pre-operative period, only one case reports an advantage of physiotherapy exercises from the questionnaire and experience of this patient. In contrast to this, a previous quantitative study in Turkey reported no significant difference in post-operative hip function between patients who received pre-operative exercises and a control group[244]. However, a study in the US reported that the pre-operative exercise influenced 29% of patients, reducing utilisation of post-acute care after adjustment for relevant factors including co-existing diseases, demographic and variables in the THR procedure[245]. Therefore, pre-operative physiotherapy exercise should be evaluated with adjusting of co-morbidities, procedural factors and expectations based on two other cases in this study.

Co-existing diseases and anticipation of positive events were also considered in previous quantitative research, which reported a small but significant association of hip outcome with difference of co-existing diseases and suggested exploring the expectation effect[97]. A Scottish study in 2012 explored the expectations of THR patients and reported that they reached their expectation of function which they rated pre-operatively as importance.

Reaching their expectation was significantly related to greater improvements of hip pain, function and QOL[76]. Outcome expectations are measured in the quantitative element and the level of expectations are varied in the qualitative findings, in particular with the case series report. Therefore, clinical profiles of patients should be confirmed, in particular the severity grade of pre-operative physical function and the type of stem in THR.

In addition, vicarious learning is expressed from most participants in the qualitative element and affects their hip outcomes. This is also supported from a study by Smythe, in which qualitative case study explored the experience of a physiotherapist undergoing THR. In the post-operative period, guidance was given to help patients in their recovery[108].

8.1.4.4 Overview of relationships

Strong predictive factors identified through the triangulation of quantitative and qualitative results were also seen in the case series. These are self-efficacy and expectations about pain, function, and QOL along the THR journey. Self-efficacy of symptoms, pain, function and rehabilitation gradually increased over time and participants described their experiences by focusing on the improvement in their daily living. This confidence is also increased from reflection of people around the patients such as vicarious learning from experience of THR veterans and verbal persuasion from their friends in walking ability after THR. This is a link with external sources for increasing self-efficacy which is also augmented from the diary recording of the recuperation process at one month post-operatively. The influence of patient expectations drives and changes their behaviours in order to achieve their targets according to the framework of self-efficacy in SCT[56,58,232] and integrated model of TPB[63,64]. Moreover, depression and pain catastrophising were identified in the quantitative correlation analysis but was less evident in the qualitative findings.

8.2 Conclusion

The quantitative findings report progression of pain, function and QOL and change of psychological factors and expectations from pre-operative to six months post-operative. Correlations and longitudinal predictions of the outcomes are illustrated between each time point. All outcomes and psychological factors are improved following THR, whereas

major psychological factors related to the outcomes consist of anxiety, depression, pain catastrophising, self-efficacy and expectations. Moreover, pre-operative fear of THR and anaesthesia are the potential predictors of hip pain and hip-related QOL at one month post-operative. The significant correlations between the outcomes with depression, pain catastrophising, self-efficacy of symptoms, and expectation of pain at around one month pre-operatively are also reported. Due to the small sample size, it was not possible to evaluate prediction of outcomes at six months post-operatively in the longitudinal design. Moreover, these results were performed in a multiple number of tests of comparisons and correlations, which were then considered with the familywise error. This issue led to the results that should be viewed in isolation with caution and integrated with the qualitative findings.

The qualitative findings illustrate the perspective of patients in coping with pain and dysfunctions by a diary and follow-up interviews. The diary also reflected several benefits in capture of daily experience, promotion of coping with stress and dysfunction, and progression of recovery. A follow-up interview confirmed the content and expanded the critical points of the diary entry. A thematic analysis reported five main themes: physical symptoms; management and awareness; support; well-being; and cognitive aspect of self-regulatory model. These themes illustrate dynamic change over time in relation to physical symptoms, expectations, and experience. The result is also integrated with such relationships and prediction in quantitative result.

The pre-operative education programme demonstrates various techniques in providing information for patients. All programmes were identified as meeting the aims established in three standard guidelines, although some of the evidence for this evaluation was identified in the longitudinal element of the study owing to the timeline of assessment covering until six months post-operatively.

Triangulation of the data helped to identify the congruence of the findings from the three elements of the study. Relationships between psychological factors and expectations with respect to pain, function, and QOL correlated with the experience of patients. Moreover, the evaluation of the pre-operative programme is congruent with the quantitative report

of the outcomes and factors change as well as the perspective of participants regarding aims in standard guidelines.

Changes of all variables in quantitative results were integrated with qualitative findings. The pre-operative-education programme and leaflet possibly induce high fears at one month before THR. However, fear may be positive to a degree as this may drive patients to prepare themselves for undergoing THR and a good recovery. After THR, all outcomes, positive affect and self-efficacy of function were significantly improved with significant reduction of pain catastrophising at one month post-operative and self-efficacy of pain and rehabilitation were also significantly increased at six-months into recovery. Self-efficacy, positive affect, expectations and the outcomes are described from records of daily living that reported good progress of recovery.

In addition, quantitative findings reported the strong relationships between the outcomes and several psychological factors and patient expectations. This is corroborated by the qualitative findings. Self-efficacy is the specific belief that is expressed through beliefs, learning behaviours and coping techniques in qualitative findings. Expectations are identified from triangulation of both findings. Anxiety and negative emotions are reflected at time close to THR and increased in quantitative report. In longitudinal triangulations, relationships of the outcomes at one-month and six-month recovery with psychological factors are supported by qualitative findings. At both points of time, self-efficacy and expectations are mainly congruent with the qualitative results.

In evaluation of the pre-operative programme, aims of three standard guidelines are evaluated with data from all three studies. The perspective of participants is described to support the evaluation for the five aims.

In five case series, pre-operative physiotherapy exercise, anticipation of positive events, and role model of THR were highlighted. They may induce patients to devise strategies to achieve their target of recovery. However, co-existing diseases and complications after THR were also relevant. This may support patients who expect full recovery in short period and have a background of physical fitness. Pre-operative physiotherapy exercise for three

months may be designed to help patients to extend hip surgery as well as full recovery with consideration of co-existing diseases.

8.3 Recommendations

Many recommendations were raised from the findings in each element and triangulations. They are separated into practice and research recommendations. Four further improvements in the practical ways are related to self-efficacy and expectations. First, the waiting time of a few months for surgery may negatively affect the mental health of patients. This should be considered when postponing surgery – in particular, whether further support from the medical team is needed for patients in this situation. Second, self-efficacy of symptoms and function can usefully be measured at this time alongside either pain catastrophising or depression by the nurse in the medical team. This aims to identify patients who might benefit from psychological interventions to support good recovery in consideration of complications and co-existing diseases. In addition to this screening, psychological treatment should be adapted into the pre-operative education programme to enhance patient optimism by the programme leader with the support from health psychologist. Clinical psychologists may usefully support the surgical team with these techniques. As described in chapter 6, two centres were using positive words to encourage patients and a previous study reflected on the importance of optimism at three months post-operatively for functional recovery. A short cognitive behavioural therapy possibly supports patients in reducing negative affect and enhancing positive moods[95]. Moreover, a positive role model may enhance self-efficacy. A support group during the pre-operative programme probably helps patients, particularly where it includes previous THR patients. The physiotherapist may evaluate or support patients during the session. The programme included role model and the physiotherapist should be continued in recovery after the first appointment with the consultant in order to support recovery. This can possibly be carried out by the nurse in local health centre or the hospital.

Additionally, four major points for future research were found from the study. Firstly, the most potential psychological factor should be explored in further research of a larger sample size. Data analysis may be multiple regression, principal component analysis or

structural equation modelling to report the most important predictor of THR outcome. This may refer to the theoretical frameworks of self-efficacy in theory of planned behaviour or the integrated model suggested by Quinn *et al.*[64]. Secondly, effectiveness of psychological intervention should be examined by randomised control trials. These interventions should focus on reducing anxiety, depression, pain catastrophising and fear, or enhancing positive affect and self-efficacy. Moreover, effects should be measured shortly after the intervention or at extended points of time along THR recovery. For example, the questionnaires should be completed immediately at the end of the programme with a specific questionnaire relating to feelings of anxiety. This aims to measure the actual effect of receiving information from the pre-operative education programme with psychological intervention. The third suggestion is that the diary is an appropriate method of capturing details of participants from daily activities and their feelings. Also, through combining with interviews it is possible to confirm the content of the diary and explore some gaps in the information that participants do not write down in the diary. The further research may include the observation of patients during an interview to incorporate this with the transcriptions or use discourse analysis rather than thematic analysis. Lastly, the opinions of the health professionals should be explored from the findings of this study via a focus group. This also provides an opportunity for the health care staff to improve the quality of care for the future patients.

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APPENDICES

Appendix 1: Ethical approval for the longitudinal study (Questionnaire surveys and diaries and interviews)

Application for Ethical Approval No.: 13/PBS/007

McKeon, Jo

Sent: 05 September 2013 15:40
To: Techamahamaneerat, Suwapab

Dear Suwapab,

Approval for NHS Studies

With reference to your application for Ethical approval:

Impact of preoperative psychological factors on quality of life in patients recovering from hip replacement or hip resurfacing
Ref.: **13/PBS/007**

I am pleased to inform you that, following confirmation of full, unconditional ethical approval from NRES Committee North West – Liverpool Central, Liverpool John Moores University Research Ethics Committee (REC) is content to endorse this approval.

Approval is given on the understanding that the approving REC, named above, will be made aware of any adverse events or substantive changes in protocol and that LJMU REC will be informed of any such events.

Please note that ethical approval is given for a period in line with that approved by NRES and application for extension of approval must be submitted to the approving REC named above and LJMU.

Yours sincerely

PP:

Dr Sue Spiers
Chair of the LJMU REC
Tel: 0151 904 6463
E-mail: j.m.mckeon@ljmu.ac.uk

LIVERPOOL JOHN MOORES UNIVERSITY

Appendix 2: Participant Information Sheet – Questionnaire surveys

Logo of the hospital

Pain and Daily **A**ctivity in **P**atients **U**ndergoing Hip **R**eplacement **S**urgery (PAPURS)

PARTICIPANT INFORMATION SHEET – Questionnaire Version 3. 17th December 2012

You are being invited to take part in a research study. Before you decide if you wish to participate, it is important that you understand why this research is being done and what you will need to do if you agree to take part. Please take a few moments to read the following information.

1. What is the purpose of the study?

We are looking at what factors that might affect a patient's recovery from hip replacement surgery. We hope that this research will help us to understand patients' feelings, expectations, pain, daily activities, and overall quality of life during hip replacement surgery so that we can better support future patients as they undergo this operation.

2. Why have I been asked?

The surgeon that your GP has referred you to has agreed to help us to recruit patients for our study. They have sent this recruitment pack to all of their patients that have been referred with pain in their hip. We have sent this questionnaire before your first appointment with the surgeon as we want to find out your answers to the questionnaire before you meet the surgeon. Hip surgery is usually appropriate for around half of the patients that the surgeons see for pain at the hip and whether you need to have surgery yourself will depend on a number of complex factors, which your surgeon will discuss with you at your first appointment.

3. Who can take part?

If you are over 18 years old, have hip pain caused by osteoarthritis and can understand written English well, you can take part in this study. As explained above, those who go on to have hip surgery will be asked to complete a further four questionnaires.

4. Do I have to take part?

No. It is up to you to decide whether or not you wish to take part. Your care will not be affected at all whether you take part or not.

5. What will happen to me if I take part?

If you agree to take part, we would like you to complete the enclosed questionnaire about your approach to life and your experience of your condition. We expect

around half of the patients seen by the surgeon for pain at the hip will need some hip surgery and these patients will be asked to fill in a further four questionnaires, similar to the one that we have sent you today. These will be sent to you just before your surgery and around one month, six months and one year after your surgery. If you do not go on to have surgery, we will not send you any more questionnaires, but your answers to this questionnaire will still be useful in our study.

We would also like you to fill in your contact details on the enclosed form. We will use these details to write, email or telephone you after your first appointment to find out whether you will be having hip surgery. We will also use them to send you further questionnaires, if appropriate. We will **not** pass these details on to anyone else.

We are also conducting an extension study and would like to invite you to take part in this study as well. In the extension study, we will be asking people to keep diaries for three 2-week periods during their treatment and then have short interviews to discuss these. If you are interested in finding out more about this, please tick the *'I would like to know more'* box on the contact details form. We will select some patients to take part in this extension study and contact them with more details at the appropriate time. Selection will be random, but we will aim to include a range of people of different ages, including both men and women.

6. Will the research help me?

Not directly. The main aim of this study is to explore the nature of your feelings and experiences related to pain, daily activity and quality of life and the relationship between them. We hope that this will help us to understand how hip surgery impacts on people so that we are better able to help and support future patients.

7. Are there any risks?

We recognise that your condition may be very painful and/or debilitating. You may find some of the questions related to your feelings and expectations upsetting. If this happens, you can stop for a break, or you may decide that you do not wish to continue. If you are upset by anything around completing the questionnaire, you may find it helpful to speak to your GP, or to contact the Arthritis Care confidential helpline on 0808 800 4050.

If you have any questions about the study, you should contact the lead researcher on the following details:

Suwapab Techamahamaneerat (Jay)
Phone: 0151 231 2070
Email: s.techamahamaneerat@2011.ljmu.ac.uk

8. Who will know what I have said?

The research team will know what you have said, but no-one else will know that you have taken part in the study or what you have said. Wherever we use your answers to the questionnaire in any publications, we will make sure that they can't be traced back to you and may change names or places if necessary. Your surgeon will know that you have been invited, but we will not tell them whether you have participated or not. You can decide to tell them if you want to.

9. What should I do if I change my mind?

- If it is before you have returned the questionnaire, simply throw it away. If you do not return the questionnaire, no more will be sent.
- If it is after you have returned one or more questionnaires, please contact the researcher (in point 7) and your name will be taken off our list. If you would like to have the questionnaires that you have already returned taken out as well, please tell the researcher and we will remove them from the research (unless the study has finished – in which case we will not know which were your answers – see point 10).

10. What happens after the research is finished?

Any contact information that we have will be destroyed and it will no longer be possible to identify anyone who took part. The questionnaires will be kept in a secure filing cabinet in Liverpool John Moores University or on password protected computer. The results of the study will be written up as a thesis and submitted to research journals to tell people what we have found. We will also send a summary of the findings to you before we remove your personal details.

11. What if I am unhappy?

If you have a concern about any aspect of this study, you should ask to speak to the researcher who will do their best to answer your questions (their contact details in point 7 above). If you are still unhappy and wish to complain formally, you can do this by contacting the Director of Research at the University on the details below:

Professor Andy Young
Phone: 01519046475
Email: A.J.Young@ljmu.ac.uk

Appendix 3: Contact Details form – Questionnaire surveys

Appendix 8: Contact Details Form (Pain and Daily Activity in Patients Undergoing Hip Replacement Surgery)

LIVERPOOL JOHN MOORES UNIVERSITY

Logo of the hospital

Contact Details

We need your contact details so that we can send you the next set of questionnaires in the study direct from the research team. If you are happy to continue being part of this study, please fill in the form below and return it to us in the freepost envelope provided. We will not share this information with anyone and will **only** use it to contact you about this study.

TITLE	☐Mr	☐Mrs	☐Miss	☐Other……
FULL NAME				
ADDRESS				
POST CODE				
TELEPHONE				
EMAIL				
Date of FIRST appointment with your surgeon	(e.g. 12/09/2012)			
Hospital where you are receiving treatment				

In another part of the study, we will be asking people to keep diaries for three 2-week periods during their treatment and then have a short interview to discuss this. If you are interested in finding out more about this part of the study, please tick the box below and we will contact you and explain more.

☐ I would like to know more about the diary and interview part of the study

Please return this form in the freepost envelope ***as soon as possible.***

Contact details form date of issue: 12/09/2012 Contact details form version number: 1

This study has been approved by NHS research ethics committee.

Appendix 4: The questionnaire – Questionnaire surveys

Appendix 17.1: Validated questionnaire (Pain and Daily Activity in Patients Undergoing Hip Replacement Surgery)

Logo of the hospital

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Pain and Daily **A**ctivity in **P**atients **U**ndergoing Hip **R**eplacement **S**urgery (PAPURS)

School of Pharmacy and Biomolecular Sciences

Liverpool John Moores University

Before you answer the survey

Please read the information sheet as this explains why this research is being undertaken.

In this survey, we will ask your questions about your personal circumstances, experience of undergoing hip replacement surgery, the pain and problems that you might have with everyday tasks, and how you feel, so that we can see how this might affect your other answers.

If you have any questions, please contact the research team on the details given in the information sheet. When you complete this questionnaire, please return it in the free post envelope.

If you return this questionnaire, we will assume that you are happy to take part in this study. If you do not wish to take part, simply throw the questionnaire away and we will not contact you again.

How to fill in this survey

- Please read the instruction for each question carefully.
- Please try to answer all of the questions, but if you can't remember or would rather not say, please just cross out the question.
- For questions with tick-boxes (☐), please put a tick (☑) or cross (☒) in the box that is closest to your answer.
- For questions where you are asked to write something, please write clearly in the space given, but if you need more room, please use additional paper and give the question number that your answer(s) relate to.

This study has been looked at and approved by NHS research ethics committee.

The first questionnaire. Version 3. 17th December 2012

The questionnaire date of issue: 17/12/2012

The questionnaire (17.1) version number: 3

Please give your date of completing questionnaire / /

*Part A: How have you been feeling **in the past week**?*

Please read each question and tick the box next to the reply that comes closest to how you have been feeling **in the past week.**

Do not take too long over your replies; your immediate reaction to each question will probably be more reflective of your feelings.

1. I feel tense or 'wound up':

☐ Most of the time ☐ A lot of the time ☐ From time to time, occasionally ☐ Not at all

2. I still enjoy the things I used to enjoy:

☐ Definitely as much ☐ Not quite so much ☐ Only a little ☐ Hardly at all

3. I get a sort of frightened feeling as if something awful is about to happen:

☐ Very definitely and quite badly ☐ Yes, but not too badly ☐ A little, but it doesn't worry me ☐ Not at all

4. I can laugh and see the funny side of things:

☐ As much as I always could ☐ Not quite so much now ☐ Definitely not so much now ☐ Not at all

5. Worrying thoughts go through my mind:

☐ A great deal of the time ☐ A lot of the time ☐ From time to time but not too often ☐ Only occasionally

6. I feel cheerful:

☐ Not at all ☐ Not often ☐ Sometimes ☐ Most of the time

7. I can sit at ease and feel relaxed:

☐ Definitely ☐ Usually ☐ Not often ☐ Not at all

8. I feel as if I am slowed down:

☐ Nearly all the time ☐ Very often ☐ Sometimes ☐ Not at all

9. I get a sort of frightened feeling like 'butterflies' in the stomach:

☐ Not at all ☐ Occasionally ☐ Quite often ☐ Very often

10. I have lost interest in my appearance:

☐ Definitely ☐ I don't take as much care as I should ☐ I may not take quite as much care ☐ I take just as much care as ever

11. I feel restless as if I have to be on the move:

☐ Very much indeed ☐ Quite a lot ☐ Not very much ☐ Not at all

12. I look forward with enjoyment to things:

☐ As much as ever I did ☐ Rather less than I used to ☐ Definitely less than I used to ☐ Hardly at all

13. I get sudden feelings of panic:

☐ Very often indeed ☐ Quite often ☐ Not very often ☐ Not at all

14. I can enjoy a good book or radio or TV programme:

☐ Often ☐ Sometimes ☐ Not often ☐ Very seldom

*Part B: How have you felt **over the past week**?*

Please read each item and then circle the number that indicates to what extent you have felt this way **over the past week.**

Meaning:	Very slightly or Not at all	A little	Moderately	Quite a bit	Extremely
15. Interested	1	2	3	4	5
16. Distressed	1	2	3	4	5
17. Excited	1	2	3	4	5
18. Upset	1	2	3	4	5
19. Strong	1	2	3	4	5
20. Guilty	1	2	3	4	5
21. Scared	1	2	3	4	5
22. Hostile	1	2	3	4	5
23. Enthusiastic	1	2	3	4	5
24. Proud	1	2	3	4	5
25. Irritable	1	2	3	4	5
26. Alert	1	2	3	4	5
27. Ashamed	1	2	3	4	5
28. Inspired	1	2	3	4	5
29. Nervous	1	2	3	4	5
30. Determined	1	2	3	4	5
31. Attentive	1	2	3	4	5
32. Jittery	1	2	3	4	5
33. Active	1	2	3	4	5
34. Afraid	1	2	3	4	5

Part C: How do you feel when in painful situations?

This section asks about how you feel when you experience pain from your hip. The statements below describe different thoughts and feelings that may be associated with the pain from your hip. Please tick the box under the term that best describes the degree to which you have these thoughts and feelings **when you have experienced pain to do with your hip problems in the past week.** This might include pain in other parts of your body that is related to problems caused by your hip, such as back pain from walking or sitting differently.

	Not at all	To a slight degree	To a moderate degree	To a great degree	All the time
35. I worry all the time about whether the pain will end.	☐	☐	☐	☐	☐
36. I feel I can't go on.	☐	☐	☐	☐	☐
37. It's terrible and I think it's never going to get any better.	☐	☐	☐	☐	☐
38. It's awful and I feel that it overwhelms me.	☐	☐	☐	☐	☐
39. I feel I can't stand it anymore.	☐	☐	☐	☐	☐
40. I become afraid that the pain will get worse.	☐	☐	☐	☐	☐
41. I keep thinking of other painful events[1].	☐	☐	☐	☐	☐
42. I anxiously want the pain to go away.	☐	☐	☐	☐	☐
43. I can't seem to keep it out of my mind.	☐	☐	☐	☐	☐
44. I keep thinking about how much it hurts.	☐	☐	☐	☐	☐
45. I keep thinking about how badly I want the pain to stop.	☐	☐	☐	☐	☐
46. There's nothing I can do to reduce the intensity of pain.	☐	☐	☐	☐	☐
47. I wonder whether something serious may happen.	☐	☐	☐	☐	☐

[1] This refers to other situations involving pain other than at your hip

Part D: What problems do you have with your hip(s)?

This section is about the problems that you might have with your hip. Questions 48 to 52 ask about your symptoms and stiffness. Please answer these questions about your hip symptoms, difficulties, and stiffness **during the last week.** (Stiffness is a sensation of restriction or slowness in the ease with which you move your hip joint.)

		Never	Rarely	Sometimes	Often	Always
48.	Do you feel grinding, hear clicking or any other type of noise from your hip?	☐	☐	☐	☐	☐

		None	Mild	Moderate	Severe	Extreme
49.	Difficulties spreading legs wide apart	☐	☐	☐	☐	☐
50.	Difficulties to stride out when walking	☐	☐	☐	☐	☐
51.	How severe is your hip joint stiffness after first wakening in the morning?	☐	☐	☐	☐	☐
52.	How severe is your hip stiffness after sitting, lying or resting **later in the day**?	☐	☐	☐	☐	☐

Questions 53 to 62 ask about hip pain caused by different activities, please tick the box under the term that best describes your experience in terms of frequency (53) and amount of hip pain during the following activities (54-62) **in the last week.**

		Never	Monthly	Weekly	Daily	Always
53.	How often is your hip painful?	☐	☐	☐	☐	☐

		None	Mild	Moderate	Severe	Extreme
54.	Straightening your hip fully[2]	☐	☐	☐	☐	☐
55.	Bending your hip fully	☐	☐	☐	☐	☐
56.	Walking on a flat surface	☐	☐	☐	☐	☐
57.	Going up or down stairs	☐	☐	☐	☐	☐
58.	At night while in bed	☐	☐	☐	☐	☐
59.	Sitting or lying	☐	☐	☐	☐	☐
60.	Standing upright	☐	☐	☐	☐	☐
61.	Walking on a hard surface (asphalt, concrete, etc)	☐	☐	☐	☐	☐
62.	Walking on an uneven surface	☐	☐	☐	☐	☐

[2] This means making your hip joint straight, such as when stretching out on a bed

Questions 63 to 79 ask about your ability to move around and to look after yourself. For each of the following activities please tick the box under the term that best describes the degree of difficulty you have experienced **in the last week** due to your hip.

	None	Mild	Moderate	Severe	Extreme
63. Descending stairs	☐	☐	☐	☐	☐
64. Ascending stairs	☐	☐	☐	☐	☐
65. Rising from sitting	☐	☐	☐	☐	☐
66. Standing	☐	☐	☐	☐	☐
67. Bending to the floor/pick up an object	☐	☐	☐	☐	☐
68. Walking on a flat surface	☐	☐	☐	☐	☐
69. Getting in/out of car	☐	☐	☐	☐	☐
70. Going shopping	☐	☐	☐	☐	☐
71. Putting on socks/stockings	☐	☐	☐	☐	☐
72. Rising from bed	☐	☐	☐	☐	☐
73. Taking off socks/stockings	☐	☐	☐	☐	☐
74. Lying in bed (turning over, maintaining hip position)	☐	☐	☐	☐	☐
75. Getting in/out of bath	☐	☐	☐	☐	☐
76. Sitting	☐	☐	☐	☐	☐
77. Getting on/off toilet	☐	☐	☐	☐	☐
78. Heavy domestic duties (moving heavy boxes, scrubbing floors, etc)	☐	☐	☐	☐	☐
79. Light domestic duties (cooking, dusting, etc)	☐	☐	☐	☐	☐

Questions 80 to 83 ask about your physical function when being more active, such as when playing sports. For each of the following activities please tick the box under the word that best describes the degree of difficulty you have experienced **during the last week** due to your hip.

	None	Mild	Moderate	Severe	Extreme
80. Squatting	☐	☐	☐	☐	☐
81. Running	☐	☐	☐	☐	☐
82. Twisting/pivoting on loaded leg[3]	☐	☐	☐	☐	☐
83. Walking on uneven surface	☐	☐	☐	☐	☐

Questions 84 to 87 ask about your general quality of life and how this is affected by your hip. For each of the question, tick the box under the word that best describes your answer.

	Never	Monthly	Weekly	Daily	Constantly
84. How often are you aware of your hip problem?	☐	☐	☐	☐	☐

	Not at all	Mildly	Moderately	Severely	Totally
85. Have you modified your life style to avoid activities potentially damaging to your hip?	☐	☐	☐	☐	☐

	Not at all	Mildly	Moderately	Severely	Extremely
86. How much are you troubled with lack of confidence in your hip?	☐	☐	☐	☐	☐

	None	Mild	Moderate	Severe	Extreme
87. In general, how much difficulty do you have with your hip?	☐	☐	☐	☐	☐

[3] This means turning on your foot, whilst putting weight on it

*Part E: What is **your overall health** like today?*

Please tick the box that best describes your health **today** for each of the factors.

88. **MOBILITY**
- ☐ I have no problems in walking about
- ☐ I have slight problems in walking about
- ☐ I have moderate problems in walking about
- ☐ I have severe problems in walking about
- ☐ I am unable to walk about

89. **SELF-CARE**
- ☐ I have no problems washing or dressing myself
- ☐ I have slight problems washing or dressing myself
- ☐ I have moderate problems washing or dressing myself
- ☐ I have severe problems washing or dressing myself
- ☐ I am unable to wash or dress myself

90. **USUAL ACTIVITIES**
(e.g. work, study, housework, family or leisure activities)
- ☐ I have no problems doing my usual activities
- ☐ I have slight problems doing my usual activities
- ☐ I have moderate problems doing my usual activities
- ☐ I have severe problems doing my usual activities
- ☐ I am unable to do my usual activities

91. **PAIN / DISCOMFORT**
- ☐ I have no pain or discomfort
- ☐ I have slight pain or discomfort
- ☐ I have moderate pain or discomfort
- ☐ I have severe pain or discomfort
- ☐ I have extreme pain or discomfort

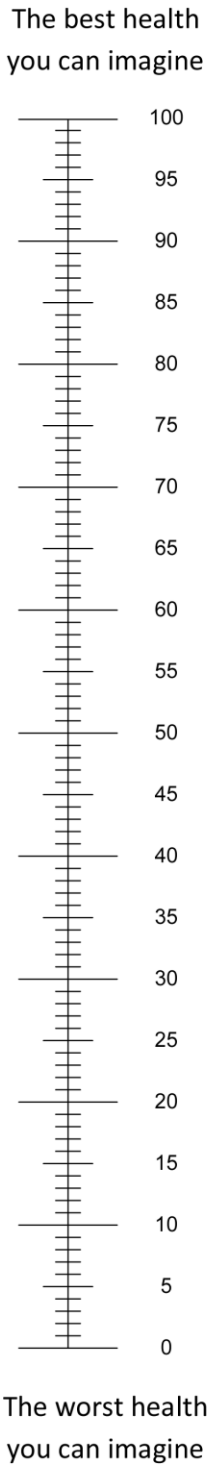
92. **ANXIETY / DEPRESSION**
- ☐ I am not anxious or depressed
- ☐ I am slightly anxious or depressed
- ☐ I am moderately anxious or depressed
- ☐ I am severely anxious or depressed
- ☐ I am extremely anxious or depressed

93. We would like to know how good or bad your health is **TODAY.**

- This scale is numbered from **0** to **100.**
- **100** means the best health you can imagine.

  0 means the worst health you can imagine.
- Mark an **X** on the scale to indicate how your health is **TODAY**.
- Now, please write the number you marked on this scale in the box below.

YOUR HEALTH TODAY = ☐



Part F: How confident are you when you are moving around?

The statements below describe how you might feel in different situations. Please tick the box that best describes how much you agree or disagree with the statement **right now.**

	I am confident that:	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
94.	I could/can walk around inside my room easily.	☐	☐	☐	☐	☐
95.	I could/can get into or out of the shower easily.	☐	☐	☐	☐	☐
96.	I could/can get assistance from others if I need it.	☐	☐	☐	☐	☐
97.	I could/can straighten up my bed area or room if I need to.	☐	☐	☐	☐	☐

Part G: How you will cope until now?

For each of the following questions, please circle the number that corresponds to how certain you are that you can do the following tasks regularly **at the present time**.

	How certain are you that…	You could do this 1=very uncertain 10=very certain									
98.	You can decrease your pain **quite a bit**?[4]	1	2	3	4	5	6	7	8	9	10
99.	You can continue most of your daily activities?	1	2	3	4	5	6	7	8	9	10
100.	You can keep arthritis pain from interfering with your sleep?	1	2	3	4	5	6	7	8	9	10
101.	You can make a **small-to-moderate** reduction in your arthritis pain by using methods other than taking extra medication?	1	2	3	4	5	6	7	8	9	10

[4] This refers to being able to reduce pain using treatment or techniques

How certain are you that…	You could do this 1=very uncertain 10=very certain
102. You can make a **large** reduction in your arthritis pain by using methods other than taking extra medication?	1 2 3 4 5 6 7 8 9 10
103. You can control your fatigue?	1 2 3 4 5 6 7 8 9 10
104. You can regulate your activity so as to be active without aggravating your arthritis?	1 2 3 4 5 6 7 8 9 10
105. You can do something to help yourself feel better if you are feeling blue?	1 2 3 4 5 6 7 8 9 10
106. You can manage arthritis pain during your daily activities as compared with other people with arthritis like yours?[5]	1 2 3 4 5 6 7 8 9 10
107. You can manage your arthritis symptoms so that you can do the things you enjoy doing?	1 2 3 4 5 6 7 8 9 10
108. You can deal with the frustration of arthritis?	1 2 3 4 5 6 7 8 9 10

Part H: How do you feel about hip surgery and having anaesthesia?

Please circle the number that best describes how fearful you are for each aspect.

Aspect	How much fear you have 0 =None 10 = Worst possible
109. Hip surgery	0 1 2 3 4 5 6 7 8 9 10
110. Anaesthesia	0 1 2 3 4 5 6 7 8 9 10

[5] This question asks how you think you managed compared to other people – are you better, worse or the same as others?

Part I: How do you think your pain will change over time if you have hip surgery?

The questions in this section ask how you think your pain will change over time, before and after your hip replacement. Please circle a number in each of the rows, telling us the best describe how level your pain will be due to your hip. You expect to experience at each of the times listed.

Time	How bad your pain will be 0 = no pain … 10 = extreme pain
111. Two weeks ***before*** hip surgery	0 1 2 3 4 5 6 7 8 9 10
112. One month ***after*** hip surgery	0 1 2 3 4 5 6 7 8 9 10
113. Six months ***after*** hip surgery	0 1 2 3 4 5 6 7 8 9 10
114. Twelve months ***after*** hip surgery	0 1 2 3 4 5 6 7 8 9 10

Part J: How do you think your mobility will change over time if you have hip surgery?

The questions in this section ask how you think your mobility will change over time, before and after your hip replacement. For each of the activities, please write a number in each of the columns, telling us your expectation of the difficulties you will have due to your hip. You expect to experience at each of the times listed.

Please write the following numbers to describe you expect:

0 = None 1 = Mild 2 = Moderate 3 = Severe 4 = Extreme

Time / Activities	***Before*** hip surgery	***After*** hip surgery		
	2 weeks	1 month	6 months	12 months
115. Descending stairs				
116. Getting in/out of bath or shower				
117. Sitting				
118. Running				
119. Twisting/pivoting on your loaded leg				

Part K: About you and your lifestyle

These questions are designed to help us understand how different people might respond to the questions you have answered so far. If you do not wish to answer any of the questions, please just put a line through it and move to the next question. The answers that you give here will not be passed on to anyone and no one other than the research team will know what you have said.

120. Please give your sex ☐ Male ☐ Female

121. Please give your year of birth

122. Please give your weight Kilograms OR ′ Stones / lbs

123. Please give your height Metres OR ′ Feet / inches

124. Do you smoke tobacco?
☐ Yes
☐ No (go straight to question 125)

a. How many cigarettes, cigars and/or pipes do you smoke per day? (please write in the space)
☐ Cigarettes
☐ Cigars
☐ Pipes

b. How old were you when you started smoking?

125. Where do you live?
☐ Care home
☐ Own home
☐ Somewhere else – please tell us where:

126. Do you live with anyone?
☐ Yes- Please tell us their relationship to you:
☐ No

127. Has anyone helped you with daily activity **during the last week**? (Tick all that apply)
☐ Family
☐ Friend
☐ Neighbour
☐ Someone else – Please tell us who:
☐ No one

128. Does your home have more than one floor? ☐ Yes ☐ No

129. What is your **usual** transport?
- ☐ Car
- ☐ Walking (go straight to question 130)
- ☐ Public transport (go straight to question 130)
- ☐ Other - Please tell us what:

a. If travelling by car, who is a driver? ☐ Yourself ☐ Carer

130. Are you currently working? ☐ Full-time ☐ Part-time ☐ Retired ☐ Not working

131. Please tick the appropriate category for annual household income: ☐ 0 - £19,999 ☐ £20,000 - £39,999 ☐ £40,000 - £59,999 ☐ £60,000+

132. Have you had hip surgery in the past? ☐ Yes ☐ No

133. Do you have any other diagnosed medical conditions?
- ☐ Yes – Please list all condition(s) that you have (Then go to question 134)
- ☐ No

134. Please tell us about how the listed condition(s) affect your pain or movement (If they do)

135. Please tell us about any treatments you are having for your hip pain (such as alternative therapies, physiotherapy etc.)

136. Please tell us what medicines you are currently taking (prescribed by your doctor or those you have bought) for your hip and other problems – including the names, how much you take and how often

If you would like to write more, please continue in the blank of overleaf.

Thank you very much for completing this questionnaire.

Please check that you have answered all the questions and return it as soon as possible in the freepost envelope provided.

Please fill in the Contact Details Form.

Your responses will be kept confidential.

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This measure is part of Measures in Health Psychology: A User's Portfolio, written and compiled by Professor Marie Johnston, Dr Stephen Wright and Professor John Weinman. Once the invoice has been paid, it may be photocopied for use **within the purchasing institution only**. Published by The NFER-NELSON Publishing Company Ltd. Darville House. 2 Oxford Road East, Windsor, Berkshire SL4 1DF, UK.

Part B has been adapted from "Development and validation of brief measures of positive and negative affect: The PANAS scales," by D. Watson, L. A. Clark, and A. Tellegen, 1988, Journal of Personality and Social Psychology, 54, 1063-1070. Copyright © 1988 by the American Psychological Association. Reproduced with permission. No further reproduction or distribution is permitted without written permission from the American Psychological Association.

Part C has been adapted from Sullivan MJL, Bishop S, Pivik J. The pain catastrophizing scale: development and validation.Psychol Assess, 1995, 7: 524-532Copyright ©1995, Michael JL Sullivan

Part D has been adapted from Hip dysfunction and Osteoarthritis Outcome Score (HOOS), English version LK 2.0

Part E has been adapted from *UK (English) v.2 © 2009 EuroQol Group. EQ-5D™ is a trade mark of the EuroQol Group*

Part F has been adapted from Barsevick AM. Improving recovery following hip surgery in older adults 1991; unpublished research.

Part G has been adapted from Arthritis Self-efficacy 11 items (http://patienteducation.stanford.edu/research/searthritis.pdf) by Lorig K, Chastain RL, Ung E, Shoor S, & Holman HR: Development and evaluation of a scale to measure self-efficacy in people with arthritis. Arthritis and Rheumatism, 32, 1, 1989, pp. 37-44

Part H has been adapted from fear visual analog scale by Kindler CH, Harms C, Amsler F, et al. in The visual analog scale allows effective measurement of preoperative anxiety and detection of patients' anesthetic concerns. AnesthAnalg 2000; 90: 706-12.

Part I has been adapted from Numerical rating scale (BS-11) in Charity no. 1103260 from http://www.britishpainsociety.org/pain_scales_eng.pdf
by Jensen, M. P., Karoly, P., & Braver, S. (1986). The measurement of clinical pain intensity: a comparison of six methods. *Pain*, *27*(1), 117–26. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/3785962.

Part J has been adapted from Hip disability and Osteoarthritis Outcome Score (HOOS) – Physical Function Shortform (HOOS-PS) English version

Additional questions for the second questionnaire (at around one month pre-operative)

Part K: About you and your lifestyle

These questions are designed to help us understand how different people might respond to the questions you have answered so far. If you do not wish to answer any of the questions, please just put a line through it and move to the next question. The answers that you give here will not be passed on to anyone and no one other than the research team will know what you have said.

119. Are you scheduled to have surgery on **one** *or* **both** of your hips? ☐ One ☐ Both

120. Where would you get/have you got information about your hip replacement (Tick all that you answer):
- ☐ Health care provider
- ☐ Leaflet
- ☐ Book – please give the name(s):
- ☐ Website – please give the names:
- ☐ Somewhere else – Please tell us where:
- ☐ Never get information about hip replacement

121. Have you been diagnosed with any new condition(s) since you completed the last questionnaire?
- ☐ Yes – Please list any new condition(s) that you have (Then go to question 122)
- ☐ No

122. Please tell us about how the listed condition(s) affect your pain or movement (If they do)

Thank you very much for completing this questionnaire.

Please check that you have answered all the questions and return it as soon as possible in the freepost envelope provided.

Your responses will be kept confidential.

Additional questions for the post-operative questionnaires

Part L: Your health and other medical conditions you may have.

128. Have you been diagnosed with any new condition(s) since you completed the last questionnaire?

☐ Yes – Please list any new condition(s) that you have (Then go to question 129)

☐ No

129. Please tell us about how the listed condition(s) affect your pain or movement (If they do)

Thank you very much for completing this questionnaire.

Please check that you have answered all the questions and return it as soon as possible in the freepost envelope provided.

Your responses will be kept confidential.

Self-efficacy of symptoms (post-operative) Questions number 98-101

Part F: How confident are you when you are moving around?

The statements below describe how you might feel in different situations. Please tick the box that best describes how much you agree or disagree with the statement **right now.**

I am confident that:	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
94. I could/can walk around inside my room easily.	☐	☐	☐	☐	☐
95. I could/can get into or out of the shower easily.	☐	☐	☐	☐	☐
96. I could/can get assistance from others if I need it.	☐	☐	☐	☐	☐
97. I could/can straighten up my bed area or room if I need to.	☐	☐	☐	☐	☐
98. My hip is healing normally.	☐	☐	☐	☐	☐
99. I can deal with the discomforts I am having from my surgery.	☐	☐	☐	☐	☐
100. I can deal with any emotional ups or downs since my surgery.	☐	☐	☐	☐	☐
101. I can accept help if I need it.	☐	☐	☐	☐	☐

Self-efficacy of rehabilitation

Part H: How do you think you will cope after the surgery?

For each of the types of activity listed below, please circle the number that best reflects how certain you feel you would be able to do activity **right now.**

During my rehabilitation, I believe I can do…	0 =I cannot do it										10 = Certain that I can do it
107. Therapy that requires me to stretch my leg	0	1	2	3	4	5	6	7	8	9	10
108. Therapy that requires me to lift my leg	0	1	2	3	4	5	6	7	8	9	10
109. Therapy that requires me to bend my leg	0	1	2	3	4	5	6	7	8	9	10
110. Therapy that requires me to stand	0	1	2	3	4	5	6	7	8	9	10
111. Therapy that requires me to walk	0	1	2	3	4	5	6	7	8	9	10
112. All of my therapy exercises during my rehabilitation	0	1	2	3	4	5	6	7	8	9	10
113. My therapy every day when it is scheduled	0	1	2	3	4	5	6	7	8	9	10
114. The exercises my therapists say I should do, even if I don't understand how it helps me	0	1	2	3	4	5	6	7	8	9	10
115. My therapy no matter how I feel emotionally	0	1	2	3	4	5	6	7	8	9	10
116. My therapy no matter how tired I may feel	0	1	2	3	4	5	6	7	8	9	10
117. My therapy even though I may already have other complicating illnesses	0	1	2	3	4	5	6	7	8	9	10
118. My therapy regardless of the amount of pain I am feeling	0	1	2	3	4	5	6	7	8	9	10

Appendix 5: Participant Information Sheet – Diaries and Interviews

Logo of the hospital

Pain and Daily **A**ctivity in **P**atients **U**ndergoing Hip **R**eplacement **S**urgery (PAPURS)

PARTICIPANT INFORMATION SHEET – Diary and Interview *Version 3. 17th December 2012*

You are being invited to take part in a research study. Before you decide if you wish to participate, it is important that you understand why this research is being done and what you will need to do if you agree to take part. Please take a few moments to read the following information.

1. What is the purpose of the study?

We are looking in depth at how factors might affect a patient's recovery from hip replacement. We hope that this research will help us to understand patients' feelings, expectations, pain, daily activities, and overall quality of life during hip replacement surgery so that we can better support future patients as they undergo surgery.

2. Why have I been asked?

You have returned a contact information form to the research team and ticked a box stating that you wanted to know more about this part of the study. We have randomly selected you from those who have expressed an interest. If you have changed your mind, please let the research team know on the contact details in point 8 below.

3. Who can take part?

If you are over 18 years old, have hip pain caused by osteoarthritis, are undergoing hip surgery and can understand written English well, you can take part in the diary and interview part of the study.

4. Do I have to take part?

No. It is up to you to decide whether or not you wish to take part. Your care will not to be affected at all whether you take part or not.

5. What if I have questions?

The researcher will arrange to meet you, where they will explain how everything works in this part of the study and you will be able to ask any questions at that meeting. If you would like to contact the researcher before, or after, this meeting please use the details in point 8 below.

6. What will happen to me if I take part?

If you are happy to take part, you will be asked to complete a consent form when you meet the researcher. They will also give you a diary, which we would like you to fill in for about 15-20 minutes each day for two weeks. You can write whatever you wish, but we are particularly interested in

- your feelings
- pain and symptoms
- any activities you do or things that you have not been able to do because of your hip
- the discussions that you have with friends or family
- what sources of information you use to find out about your condition

You would then return the diary to the research team and we will analyse what you have written. We will then arrange an interview with you about 2-3 weeks after you return the diary to talk to you about what you have written so that we can understand things more clearly. This interview will be digitally recorded so that we can be clear on what you said and we will use the recording as part of our analysis of peoples' experiences and views in this part of the study. The interview can be at the university, in your home or some other place that you prefer. We just need somewhere that is reasonably quiet and private so that we won't be interrupted and we will try to do the interview wherever you prefer.

We will ask you to keep a diary and do an interview on a total of three occasions in the study: shortly after your initial consultation with your surgeon; one month after hip surgery; and six months after hip surgery.

If you take part, we will pay for any reasonable travel expenses for interviews or meetings that are part of the study. To thank you for your time, we will also give you a £10 shopping voucher (Love2Shop or Tesco) for each of the diary & interview sessions that you complete (A total of £30 in vouchers if you complete the whole study).

7. Will the research help me?

Not directly. The main aim of this study is to explore, in depth, the nature of your feelings and experiences related to pain, daily activity and quality of life, and the relationship between them. We hope that this will help us to understand how hip surgery impacts on people so that we are better able to help and support future patients.

8. Are there any risks?

We recognise that your condition may be very painful and/or debilitating. You may find some of the questions related to your feelings and expectations upsetting. If this

happens, you can stop for a break, or you may decide that you do not wish to continue. If you are upset by anything around completing the diary or answering questions in the interview, you may find it helpful to speak to your GP, or to contact the Arthritis Care confidential helpline on 0808 800 4050.
If you have any questions about the study, you should contact the lead researcher on the following details:

Suwapab Techamahamaneerat (Jay)
Phone 0151 231 2070
Email s.techamahamaneerat@2011.ljmu.ac.uk

9. Who will know what I have said?

The research team will know what you have said, but no-one else will know that you have taken part in the study or what you have said. Wherever we use your diary or interview answers in any research, we will make sure that they can't be traced back to you, changing names or places if necessary. Your surgeon will know that you have been invited, but we will not tell them whether you have participated or not. You can decide to tell them if you want to.

10. What should I do if I change my mind?

- Please contact the researcher and your name will be taken off our list.
- If you have already returned one or more diaries and taken part in one or more interviews and would like these to be taken out of the study, please tell the researcher and we will remove them from the research (unless the study has finished – in which case we will not know which were your answers – see point 11).

11. What happens after the research is finished?

Any contact information that we have will be destroyed and it will no longer be possible to identify anyone who took part. The diary will be kept in a secure filing cabinet in Liverpool John Moores University, and audio recordings and transcripts from these will be kept on password protected computer. The results of the study will be written up as a thesis and submitted to research journals to tell people what we have found. We will also send a summary of the findings to you before we remove your personal details.

12. What if I am unhappy?

If you have a concern about any aspect of this study, you should ask to speak to the researcher who will do their best to answer your questions (their contact details in point 8 above). If you are still unhappy and wish to complain formally, you can do this by contacting the Director of Research at the University on the details below:

Professor Andy Young
Phone 0151 904 6475
Email A.J.Young@ljmu.ac.uk

Appendix 6: Consent Form – Diaries and Interviews

Logo of the hospital

LIVERPOOL JOHN MOORES UNIVERSITY

Centre Number: Study Number: Patient Identification Number for this trial: ☐☐☐☐

CONSENT FORM FOR DIARY AND INTERVIEWS

Title of Project: **Pain and Daily Activity in Patients Undergoing Hip Replacement Surgery**

Name of Researcher: **Suwapab Techamahamaneerat**

	Please initial all boxes
1. I confirm that I have read and understand the information sheet dated 17/12/2012 (version 3) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected.	☐
3. I understand that relevant sections of my medical notes and data collected during the study may be looked at by individuals from Liverpool John Moores University, from regulatory authorities or from the NHS Trust, where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records.	☐
4. I agree for the interviews to be recorded on an audio recorder. Data will be used for the analysis in this research study only.	☐
5. I understand that any personal information collected during the study will be anonymised and remain confidential.	☐
6. I agree to take part in the above study.	☐

Name of Participant	Date	Signature

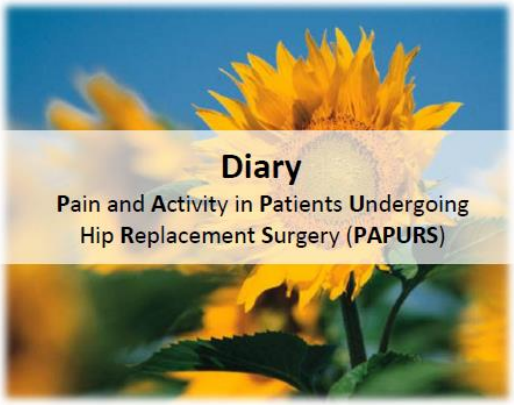
Suwapab Techamahamaneerat		
Name of Person taking consent	Date	Signature

Consent form for diary and interviews date of issue: 17/12/2012 Consent form for diary and interviews version number: 3 ***This study has been approved by NHS research ethics committee.***

Appendix 7: Diary (final version) – Diaries and Interviews

LIVERPOOL JOHN MOORES UNIVERSITY

□□□□-□



Diary

Pain and Activity in Patients Undergoing Hip Replacement Surgery (PAPURS)

School of Pharmacy and Biomolecular Sciences
Liverpool John Moores University

This study has been reviewed at and approved by NHS Research Ethics Committee.

The diary date of issue: 12/09/2012 The diary version number: 1

Instructions

- Choose a convenient time each day to write in this diary. Ideally, this should be when you can spend at least 15-20 minutes uninterrupted.
- There is a page for each day, we would like you to try to write something in it every day, ideally at about the same time each day. Please use extra paper if you need to.
- What you write in the diary is up to you, but we would like to particularly think about:
  - Your feelings, pain and symptoms you have had that day
  - Anything you have done that day or things that you have not been able to do
  - Any discussion about your pain or other symptoms that you have had with friends or family during that day
  - Any information or advice that you have needed during the day

If I have a question,

Jay, the lead researcher, will be pleased to answer any questions you might have. You can contact him using the information below:

Contact details

Telephone: 0151 231 2070
E-mail: s.techamahamaneerat@2011.ljmu.ac.uk
Address: Suwapab Techamahamaneerat (Jay)
Postgraduate student, School of Pharmacy and Biomolecular Sciences, LJMU, James Parsons building, Byromstreet, Liverpool, L3 3AF

The diary date of issue: 12/09/2012 The diary version number: 1

Date of writing diary ___/___/___

Day 1: Please tell us about your day today.

You can write what you want but it might help if you think about: your feelings, pain and symptoms; things you have done or not be able to do; discussions with friends and family; what important things relate to your health (News items, advice you have been given, any decisions you have made, or any thoughts you have had).

Continue on next page

Day 1 (continue)

Date of writing diary ___/___/___

Day 2: Please tell us about your day today.

Continue on next page

Day 2 (continue)

Did you do anything over the last 2 days to help you to cope with your pain? Could you tell a little bit more about this? Did it help?

Date of writing diary ___/___/___

Day 3: Please tell us about your day today.

Continue on next page

Day 3 (continue)

Did you sleep well during the last 2 nights? Could you tell a little bit more about this?

Date of writing diary ___/___/___

Day 4: Please tell us about your day today.

Continue on next page

Day 4 (continue)

Date of writing diary ___/___/___

Day 5: Please tell us about your day today.

Continue on next page

Day 5 (continue)

Did you do anything over the last 3 days to help you to cope with your pain? Could you tell a little bit more about this? Did it help?

Date of writing diary ___/___/___

Day 6: Please tell us about your day today.

Continue on next page

Day 6 (continue)

Did you sleep well during the last 3 nights? Could you tell a little bit more about this?

Date of writing diary ___/___/___

Day 7: Please tell us about your day today.

You can write what you want but it might help if you think about: your feelings, pain and symptoms; things you have done or not be able to do; discussions with friends and family; what important things relate to your health (News items, advice you have been given, any decisions you have made, or any thoughts you have had).

Continue on next page

Day 7 (continue)

Date of writing diary ___/___/___

Day 8: Please tell us about your day today.

Continue on next page

Day 8 (continue)

Did you do anything over the last 3 days to help you to cope with your pain? Could you tell a little bit more about this? Did it help?

Date of writing diary ___/___/___

Day 9: Please tell us about your day today.

Continue on next page

Day 9 (continue)

Did you sleep well during the last 3 nights? Could you tell a little bit more about this?

Date of writing diary ___/___/___

Day 10: Please tell us about your day today.

Continue on next page

Day 10 (continue)

Date of writing diary ___/___/___

Day 11: Please tell us about your day today.

Continue on next page

Day 11 (continue)

Did you do anything over the last 3 days to help you to cope with your pain? Could you tell a little bit more about this? Did it help?

Date of writing diary ___/___/___

Day 12: Please tell us about your day today.

Continue on next page

Day 12 (continue)

Did you sleep well during the last 3 nights? Could you tell a little bit more about this?

Date of writing diary ___/___/___

Day 13: Please tell us about your day today.

Continue on next page

Day 13 (continue)

Did you do anything over the last 2 days to help you to cope with your pain? Could you tell a little bit more about this? Did it help?

Date of writing diary ___/___/___

Day 14: Please tell us about your day today.

Continue on next page

Day 14 (continue)

Did you sleep well during the last 2 nights? Could you tell a little bit more about this?

If you would like to write more comments or anything about this research, please write here.

Thank you very much for your participation in this study.

Please put this diary

in the free post envelope that is provided in the next page.

Appendix 8: Interview schedule (Final version) – Diaries and Interviews

Interview schedule (Version 2. 12th November 2012)

Time and place: will be arranged and scheduled depend upon participants' availabilities at premises of LJMU or participant's home.

Duration for interview: Approximately an hour

Schedule

- **Introduction**

Good morning/afternoon, my name is Jay and I am a researcher at Liverpool John Moores University. Thank you so much for contributing your time to an interview today. Before we start, I'd like to remind you about the purpose of the study and what I would like you to do. You recently completed a diary, about pain and daily activities and that will be the main part of our discussion today. I may ask you to expand on something you've written or to explain what something meant. Also, I may ask you to tell me what you think about something you've said, looking back on it today. Please remember, I'm interested in what you think as we are trying to find out what it's like to be in your position – there are no right or no wrong answers.

- **Probes:**
  - Exploring situations
    - Could you tell me a bit more about … situation? (Positive or negative critical situations from the diary)
      - How did it come about?
      - What happened afterwards?
      - How did you feel about it?
      - Was there something that you or someone else could have done to stop it happening?
  - Reflection (Confirm the meaning of critical incidents)
    - Could you read this section again? Looking back on it now, what do you think?
    - Would you put something different with hindsight?
  - Expanding (Explain the meaning of critical incidents)
    - What did you mean by this?
    - Could you clarify what the issue was here?

- **Closing session**

Thank you for taking the time to answer these questions. It has been very helpful and will make an important contribution to the research. Do you have any other questions or comments?

Return diary to participant.

Interview 1: we would like you to keep two others diary at 1 month and 6 months after your surgery and have interviews following them too. Are you still happy to do this? If so, we will send you a blank diary and reminder letter around the time after your surgery at 1 month.

Interview 2: we would like you to keep another diary at 6 months after your surgery and have interviews following them too. Are you still happy to do this? If so, we will send you a blank diary and reminder letter at that time.

Appendix 9: Ethical approval for Cognitive Interviews

Dear Suwapab,

With reference to your application for Ethical approval:

Minute No.: 12.63.14.

Project: 12/NSP/038, Suwapab Techamahamaneerat, P/G Research, Impact of pre-operative psychological factors on quality of life in patients recovering from hip replacement or resurfacing (Dr Adam Mackridge).

Decision: Application approved without further information being required

Liverpool John Moores University Research Ethics Committee (REC) has reviewed the above application at the meeting held on Thursday 14th June 2012. I am pleased to inform you that ethical approval has been granted and the study can now commence.

Approval is given on the understanding that:

any adverse reactions/events which take place during the course of the project are reported to the Committee immediately;

any unforeseen ethical issues arising during the course of the project will be reported to the Committee immediately;

the LJMU logo is used for all documentation relating to participant recruitment and participation eg poster, information sheets, consent forms, questionnaires. The LJMU logo can be accessed at http://www.ljmu.ac.uk/corporatecommunications/60486.htm

Where any substantive amendments are proposed to the protocol or study procedures further ethical approval must be sought.

Applicants should note that where relevant appropriate gatekeeper / management permission must be obtained prior to the study commencing at the study site concerned.

For details on how to report adverse events or request ethical approval of major amendments please refer to the information provided at http://www.ljmu.ac.uk/RGSO/RGSO_Docs/EC8Adverse.pdf

Please note that ethical approval is given for a period of five years from the date granted and therefore the expiry date for this project will be **14th June 2017**. An application for extension of approval must be submitted if the project continues after this date.

Yours sincerely

Jo McKeon
Research Support Officer
Research Support Office
Liverpool John Moores University
Kingsway House
Hatton Garden
Liverpool
L3 2AJ

Appendix 10: Participant Information Sheet – Cognitive Interviews

LIVERPOOL JOHN MOORES UNIVERSITY
PARTICIPANT INFORMATION SHEET

Project Title: Impact of pre-operative psychological factors on quality of life in patients recovering from hip replacement or resurfacing

Researcher: Suwapab Techamahamaneerat, LJMU

You are being invited to take part in an important research study. It is to help develop a questionnaire called 'Pain and Daily Activity in Patients Undergoing Hip Replacement Surgery' However, before you decide if you wish to participate, it is important that you understand why this research is being done and what you will need to do if you agree to take part. Please take a few moments to read the following information.

1. What is the purpose of the study?

We are looking at what factors might affect people's recovery from hip replacement and want to make sure that our questionnaire is well designed. In this part of the study, we want people to fill in the questionnaire whilst telling us what they are thinking – this will help us to understand how people are interpreting the questions and work out if there are any ways that we can improve it.

2. Do I have to take part?

No. It is up to you to decide whether or not you wish to take part.

3. What will happen to me if I take part?

If you agree to take part, you will be asked to fill in a questionnaire and tell us what you think the questions mean, what your answer is and why you have chosen to answer like that. There are no right or wrong answers, we are interested in the reasons behind your answers so that we can better understand how people have interpreted our questionnaire. The interviews will take place either at LJMU or another public place near to where you live around an hour. You will be digitally recorded so that we can be clear on what you said. You will be asked to sign a consent form before starting the discussion to show that you are happy to proceed.

4. Are there any risks / benefits involved?

There are some possibly sensitive questions related to your emotions and how you hope with your hip pain. This may upset you, but if this happens, the interview will be stopped and you will be given an opportunity for a break, or you may decide that you do not wish to continue. If you are upset by anything around the interview, you may find it helpful to speak to your GP, or to contact the Samaritans on 0151 708 8888 or jo@samaritans.org.

If you take part, we will pay for reasonable travel expenses for you to come to the interview and give you a £5 shopping voucher (Love2Shop or Tesco) in recognition of your time.

This study has approved by LJMU research ethics committee.

5. Who will know what I have said?

Only the research team will know what you have said. Once we have typed up your interview, we will delete the recording. We will change names or places in the typed up version of your interview so that no-one will be able to work out that it was your interview. We may use the things you say in publications, but no-one will know that you said them. We will not tell anyone that you have taken part.

6. What should I do if I change my mind?

If it is before a discussion, please contact the researcher and your name will be taken off our list.

If during or after a discussion, please tell the researcher that you have changed your mind and your answers will be taken out.

Who should I contact if I have any question?	Who should I contact if I have any problem?
Suwapab Techamahamaneerat Phone 0151 231 2070 Email s.techamahamaneerat@2011.ljmu.ac.uk	Dr Adam Mackridge Phone 0151 231 2067 Email a.mackridge@ljmu.ac.uk

This study has approved by LJMU research ethics committee.

Appendix 11: Participation Form – Cognitive Interviews

Participation Form

If you are interested in taking part in our research project, please fill in the form below and return it to us in the freepost envelope provided. We will then select some people and contact them so we can make an appointment for the interview

TITLE	☐ Mr.	☐ Mrs.	☐ Miss	☐ Other……
FULL NAME				
TELEPHONE		**EMAIL**		
AGE		**SEX**		
DATE & TIME AVAILABLE	Please tell us time slot that you would be available (Tick all that apply)			
	Weekdays	☐ morning	☐ afternoon	
	Weekends	☐ morning	☐ afternoon	
VOUCHER	Please select the voucher type you prefer ☐ A high street shop voucher ☐ A Tesco voucher			

Please return this participation form in the freepost envelope
as soon as possible.

This study has been approved by LJMU Research Ethics Committee

Appendix 12: Consent Form – Cognitive Interviews

LIVERPOOL JOHN MOORES UNIVERSITY CONSENT FORM FOR A DISCUSSION AND TO USE A DIGITAL AUDIO RECORDER

Title: Impact of pre-operative psychological factors on quality of life in patients recovering from hip replacement or resurfacing

Researcher: Suwapab Techamahamaneerat
School of Pharmacy and Biomolecular Science, LJMU

1. I confirm that I have read and understand the information provided for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason and that this will not affect my legal rights. ☐
3. I understand that any personal information collected during the study will be anonymised and remain confidential. ☐
4. I agree that the discussion will be recorded by the audio recorder. Data will be used for the analysis in this research study only. ☐
5. I agree to take part in the above study. ☐
6. I understand that parts of our conversation may be used verbatim in future publications or presentations but that such quotes will be anonymised. ☐

.....	.....	.....
(Name of Participant)	(Date)	(Signature)
Suwapab Techamahamaneerat	.....	.....
(Researcher)	(Date)	(Signature)

Note: When completed 1 copy for participant and 1 copy for researcher

This study has approved by LJMU research ethics committee.

Appendix 13: Interview schedule – Cognitive Interviews

Cognitive interview (CI) schedule

Time and place: will be arranged and scheduled depend upon participants' availabilities at premises of LJMU or another public place near to patients' residence

Duration for interview: Approximately an hour

Schedule

- **Introduction**

Good morning/afternoon, my name is Suwapab from Liverpool John Moores University. Thank you so much for contributing your time to a discussion today. Before we start, I'd like to remind you about the purpose of the study and what I would like you to do. We have a questionnaire, about pain and daily activity, I will ask you to read each question out loud, starting from question 1, and then let you tell me out loud what your answer is and what made you answer in that way as well as any thoughts or problems you have. Please remember, you have to tell me whatever you think out loud as we are trying to find out how people interpret our questionnaire and if there are any problems or ways that we could improve it.

- **Warming up**

Before we begin the actual interview, I would like to ask you a warm-up question to help you to be more familiar with thinking aloud process.

Try to imagine where you live, and tell me how many windows there are in that place.
Probes:
As you count the windows, please tell me what you are seeing and thinking about.

- **Actual interview**

Now I am going to show you the questionnaire. I would like to ask you to read through each question and then please tell me whether or not you understand it and then please respond to that question honestly based on your experience.

Probes:
What thoughts came to your mind while reading this question?
What made you answer this question like this?
Are there any other choices/options that you would prefer?

In general, I would like to ask you what you think about this questionnaire in term of its difficulty and time to complete.

- **Closing session**

Thank you for contributing your time to answer these questions. It has been very valuable to this research project. Do you have any other questions or comments?

Appendix 14: Questionnaire amendment regarding researcher team's comment

Domain	Instruction	Scale format
HADS	Please read each question and tick the box next to the reply that comes closest to how you have been feeling in the past week. Do not take too long over your replies; your immediate reaction to each question will probably be more reflective of your feelings.	from 'vertical line' to 'horizontal line'
PANAS	Please read each item and then circle the number that indicates to what extent you have felt this way over the past week.	from 'a blank space in which to write a number' to 'circle five-number adjectival scale'
PCS	'This section asks about how you feel when you experience pain from your hip. The statements below describe different thoughts and feelings that may be associated with the pain from your hip. Please tick the box under the term that best describes the degree to which you have these thoughts and feelings. This might include pain in other parts of your body that is related to problems caused by your hip, such as back pain from walking or sitting differently.'	from 'a blank in which to write a number' to 'tick in the box of five-number adjectival scale'
HOOS	Section 1. 'This section is about the problems that you might have with your hip. Questions xx to xx ask about your symptoms and stiffness. Please answer these questions about your hip symptoms, difficulties, and stiffness during the last week. (Stiffness is a sensation of restriction or slowness in the ease with which you move your hip joint.)' Section 2. 'Questions xx to xx ask about hip pain caused by different activities, please tick the box under the term that best describes your experience in terms of frequency (xx) and amount of hip pain during the following activities (xx-xx) in the last week.' Section 3. 'Questions xx to xx ask about your ability to move around and to look after yourself. For each of the following activities please tick the box under the term that best describes the degree of difficulty you have experienced in the last week due to your hip.'	No change

Domain	Instruction	Scale format
HOOS	Section 4. 'Questions xx to xx ask about your physical function when being more active, such as when playing sports. For each of the following activities please tick the box under the word that best describes the degree of difficulty you have experienced during the last week due to your hip.' Section 5. 'Questions xx to xx ask about your general quality of life and how this is affected by your hip. For each of the question, tick the box under the word that best describes your answer.'	No change
EQ-5D	'Please tick the box that best describes your health today for each of the factors.'	No change
ASES-11	No change	from 'a numerical rating scale with line' to 'a numerical rating scale in box'
SES	'The statements below describe how you might feel in different situations. Please tick the box that best describes how much you agree or disagree with the statement right now.'	from 'circle a number' to 'tick in a box'
SER	'For each of the types of activity listed below, please circle the number that best reflects how certain you feel you would be able to do activity right now.'	from '' to 'a numerical rating scale in box'
SF-MPQ-2	'This section asks about the physical hip pain that you have. In the left column, each of the words describes a characteristic. For each of these characteristics, please circle the number that best describes how much of that specific characteristic your pain has. Please rate every pain characteristic – if you do not experience that type of pain, select '0'. For question XXX, please indicate how much pain you experience overall.'	No change
Fear VAS	'Please circle the number that best describes how fearful you are for each aspect.'	from 'a visual analogue scale' to 'a numerical rating scale in a box'

Appendix 15: Comparison of demographic data at baseline between responders and non-responders at six months post-operatively

Variables	Responders (N=16)	Non-responders (N=23)	p-value
Female	10 (63%)	10 (43%)	0.333
Age (Years)	69 (62, 81)	66 (59, 75)	0.238
Body Mass Index (kg/m^2)	27.52 (24.54, 31.36)	26.41 (24.22, 27.75)	0.387
Smoking	2 (13%)	4 (17%)	NA
Number of comorbidities	0.00 (0.00, 1.00)	1.00 (0.00, 2.00)	0.318
Other co-morbidities	7 (44%)	14 (61%)	0.342
Effect of comorbidities on pain and movement	2 (13%)	3 (13%)	NA
Number of treatment	1.50 (1.00, 2.00)	1.00 (1.00, 2.00)	0.296
Numbers of pain medications	2.00 (1.00, 2.25)	2.00 (1.00, 3.00)	0.860
Recruiting through centre A	14 (88%)	15 (65%)	NA
Living in own home	13 (81%)	20 (87%)	NA
Living with anyone	10 (63%)	18 (78%)	NA
Helper during last week	9 (56%)	17 (74%)	0.312
One-floor home	11 (69%)	18 (78%)	NA
Usual transport: Car	10(63%)	14 (61%)	NA
Walking	0 (0%)	2 (9%)	NA
Public transport	5 (31%)	5 (22%)	NA
Others	1 (6%)	2 (9%)	NA
Working status: Working	2 (13%)	3 (13%)	NA
Retired	14 (88%)	13 (57%)	NA
Not working	0 (0%)	7 (30%)	NA
Annual household income (£): 0-19999	8 (50%)	15 (65%)	NA
20000-39999	4 (25%)	5 (22%)	NA
40000-59999	2 (13%)	1 (4%)	NA

Appendix 16: Comparison of all variables at baseline between responders and non-responders at six months post-operatively

	Responders (N=16)	Non-responders (N=23)	Z	p-value
Hip symptoms	45.00 (10.00, 55.00)	30.00 (15.00, 37.50)	-0.97	0.338
Hip pain	35.00 (20.00, 37.50)	27.50 (15.00, 42.50)	-0.39	0.706
Hip function (ADL)	36.67 (13.24, 45.59)	25.00 (11.76, 42.65)	-0.46	0.652
Hip function (sports)	6.25 (0.00, 25.00)	18.75 (6.25, 25.00)	-1.23	0.226
Hip-related QOL	21.88 (6.25, 31.25)	12.50 (0.00, 31.25)	-0.84	0.411
Overall QOL	0.44 (0.05, 0.61)	0.30 (-0.02, 0.40)	-0.96	0.346
SRH	65.00 (50.00, 70.00)	60.00 (48.75, 80.00)	-0.46	0.654
Anxiety	5.00 (4.00, 7.00)	7.00 (4.00, 12.00)	-1.25	0.218
Depression	7.00 (5.25, 10.00)	7.00 (4.00, 11.00)	-0.47	0.645
Positive affect	28.50 (22.50, 32.75)	28.00 (22.00, 35.00)	-0.34	0.740
Negative affect	13.50 (11.25, 17.75)	15.00 (12.00, 21.00)	-0.90	0.375
Pain catastrophising	22.88 (14.25, 36.00)	22.00 (10.00, 34.00)	-0.20	0.849
Self-efficacy of symptoms	4.33 (2.50, 5.20)	4.00 (2.53, 5.63)	-0.42	0.686
Self-efficacy of pain	3.80 (3.00, 5.30)	2.80 (2.20, 4.60)	-1.23	0.225
Self-efficacy of function	10.00 (6.50, 11.75)	8.00 (7.00, 11.50)	-0.40	0.698
Fear of hip surgery	4.00 (2.25, 7.00)	3.00 (0.50, 6.50)	-0.70	0.495
Fear of anaesthesia	5.00 (2.25, 8.00)	2.00 (0.00, 6.00)	-1.27	0.208
Pain expectation (Q2)	8.50 (7.00, 9.00)	8.00 (6.75, 10.00)	-0.18	0.876
Pain expectation (Q3)	5.50 (4.00, 6.75)	4.00 (2.00, 6.25)	-1.65	0.101
Pain expectation (Q4)	2.00 (2.00, 4.00)	1.50 (0.00, 3.00)	-2.11	0.034
Pain expectation (Q5)	0.00 (0.00, 2.00)	0.00 (0.00, 1.00)	-0.33	0.760
Functional expectation (Q2)	61.60 (53.35, 82.80)	67.90 (46.10, 90.80)	-0.27	0.795
Functional expectation (Q3)	58.75 (47.28, 73.08)	41.70 (35.88, 55.90)	-2.25	0.023
Functional expectation (Q4)	32.15 (24.28, 44.00)	25.15 (12.70, 33.03)	-1.98	0.048
Functional expectation (Q5)	16.40 (8.80, 22.55)	10.75 (0.00, 20.00)	-1.34	0.186

Cells represent median (IQR). Q2 = at two weeks pre-operative, Q3 = at one month post-operative, Q4 = at six months post-operative, Q5 = at one year post-operative

Appendix 17: Comparison of variables between centres A and others at baseline

Variables	Centre A (N = 72)	Other centres (N = 33)
Hip symptoms	45.00 (10.00, 55.00)	30.00 (15.00, 37.50)
Hip pain	35.00 (20.00, 37.50)	27.50 (15.00, 42.50)
Hip function (ADL)	36.67 (13.24, 45.59)	25.00 (11.76, 42.65)
Hip function (sports)	6.25 (0.00, 25.00)	18.75 (6.25, 25.00)
Hip-related QOL	21.88 (6.25, 31.25)	12.50 (0.00, 31.25)
Overall QOL	0.44 (0.05, 0.61)	0.30 (-0.02, 0.40)
SRH	65.00 (50.00, 70.00)	60.00 (48.75, 80.00)
Anxiety	5.00 (4.00, 7.00)	7.00 (4.00, 12.00)
Depression	7.00 (5.25, 10.00)	7.00 (4.00, 11.00)
Positive aspect	28.50 (22.50, 32.75)	28.00 (22.00, 35.00)
Negative aspect	13.50 (11.25,17.75)	15.00 (12.00, 21.00)
Pain catastrophising	22.88 (14.25,36.00)	22.00 (10.00, 34.00)
SE: Symptoms	4.33 (2.50,5.20)	4.00 (2.53, 5.63)
SE: Pain	3.80 (3.00,5.30)	2.80 (2.20, 4.60)
SE: Function	10.00 (6.50, 11.75)	8.00 (7.00, 11.50)
Fear of hip surgery	4.00 (2.25, 7.00)	3.00 (0.50, 6.50)
Fear of anaesthesia	5.00 (2.25, 8.00)	2.00 (0.00, 6.00)
PE: two weeks pre-op.	8.50 (7.00, 9.00)	8.00 (6.75, 10.00)
PE: one month post-op.	5.50 (4.00, 6.75)	4.00 (2.00, 6.25)
PE: six months post-op.	2.00 (2.00, 4.00)	1.50 (0.00, 3.00)*
PE: one year post-op.	0.00 (0.00, 2.00)	1.00 (0.00, 2.00)
FE: two weeks pre-op.	61.60 (54.63, 74.80)	67.90 (49.63, 82.40)
FE: one month post-op.	46.10 (37.70, 66.33)	46.10 (37.70, 61.60)
FE: six months post-op.	26.90 (20.00, 35.85)	26.90 (22.55, 37.70)
FE: one year post-op.	16.40 (0.00, 26.90)	16.40 (4.60, 30.40)

Cells represent median (IQR). Wilcoxon rank-sum test was utilized to compare between centre A and others.

SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation.

*p-value < 0.05

Appendix 18: Descriptive statistics and comparison of all variables at baseline between the whole group and three sub-groups

Recruited participants (RP), Experienced participants (EP), No-surgical participants (NP)

Cells represent either mean (±SEM) or median (IQR) based on normality assumption. In column of EP and NP, there is the other row reporting z-score and p-value of comparison with RP.

	All (N=105)	**RP (N=39)**	**EP (N=25)**	**NP (N=24)**
Hip symptoms	32.65 (±1.94)	31.78 (±3.24)	29.10 (±3.92) 0.52 (p=0.604)	39.74 (±4.45) -1.47 (p=0.146)
Hip pain	31.42 (±1.76)	28.78 (±2.70)	29.14 (±3.83) -0.08 (p=0.936)	35.55 (±4.05) -1.45 (p=0.152)
Hip function (ADL)	32.69 (±1.94)	28.18 (±2.79)	29.19 (±3.54) -0.22 (p=0.824)	38.94 (±4.86) -2.06 (p=0.043)
Hip function (sports)	12.50 (0.00, 25.00)	18.75 (0.00, 25.00)	0.00 (0.00, 18.75) -2.17 (p=0.030)	17.71 (0.00, 31.25) -0.48 (p=0.639)
Hip-related QOL	18.75 (6.25, 31.25)	18.75 (6.25, 31.25)	6.25 (0.00, 18.75) -1.82 (p=0.069)	28.13 (7.81, 43.75) -1.43 (p=0.154)
Overall QOL	0.30 (±0.03)	0.29 (±0.05)	0.16 (±0.07) 1.60 (p=0.114)	0.43 (±0.06) -1.84 (p=0.071)
SRH	60.00 (45.00, 75.00)	65.00 (50.00, 75.00)	50.00 (30.00, 65.00) -2.23 (p=0.025)	70.00 (50.00, 80.00) -0.06 (p=0.956)
Anxiety	7.00 (4.00, 12.00)	6.00 (4.00, 10.00)	8.00 (3.50, 12.50) -0.66 (p=0.517)	7.50 (3.63, 11.00) -0.31 (p=0.759)
Depression	7.00 (4.00, 11.00)	7.00 (4.00, 11.00)	8.00 (4.50, 11.50) -0.32 (p=0.750)	6.00 (3.00, 9.75) -1.38 (p=0.168)
Positive affect	27.59 (±0.90)	28.26 (±1.37)	26.50 (±2.00) 0.75 (p=0.456)	29.29 (±1.98) -0.44 (p=0.659)
Negative affect	17.00 (12.00, 24.00)	15.00 (12.00, 19.00)	17.00 (12.00, 27.00) -1.31 (p=0.193)	17.50 (12.25, 29.00) -1.36 (p=0.178)
Pain catastrophising	25.02 (±1.41)	23.79 (±2.28)	27.41 (±3.25) -0.99 (p=0.326)	25.59 (±2.81) -0.72 (p=0.480)
Self-efficacy of symptoms	4.37 (±0.20)	4.19 (±0.32)	4.19 (±0.45) 0.00 (p=0.997)	5.01 (±0.41) -1.59 (p=0.118)
Self-efficacy of pain	3.77 (±0.18)	3.65 (±0.28)	3.34 (±0.34) 0.69 (p=0.492)	4.44 (±0.49) -1.52 (p=0.134)
Self-efficacy of function	9.00 (7.00, 12.00)	9.00 (7.00, 11.50)	8.00 (7.00, 11.50) -0.53 (p=0.598)	11.00 (8.00, 12.00) -1.49 (p=0.139)

	All (N=105)	RP (N=39)	EP (N=25)	NP (N=24)
Fear of THR	3.00 (1.00, 7.00)	3.00 (1.00, 7.00)	1.50 (0.00, 6.00) -0.99 (p=0.324)	5.50 (2.00, 9.75) -1.94 (p=0.052)
Fear of anaesthesia	3.00 (0.00, 6.25)	3.00 (0.50, 7.00)	1.00 (0.00, 5.75) -1.38 (p=0.170)	5.00 (0.00, 9.25) -0.85 (p=0.398)
Pain expectation (Q2)	8.00 (7.00, 10.00)	8.00 (7.00, 10.00)	8.00 (7.00, 10.00) -0.02 (p=0.989)	8.00 (7.00, 10.00) -0.19 (p=0.853)
Pain expectation (Q3)	5.00 (3.00, 6.00)	5.00 (3.00, 6.25)	3.50 (2.00, 7.50) -0.55 (p=0.588)	5.00 (2.50, 6.00) -0.08 (p=0.941)
Pain expectation (Q4)	2.00 (0.00, 4.00)	2.00 (1.00, 3.00)	1.00 (0.00, 4.00) -0.67 (p=0.510)	2.00 (0.00, 5.00) -0.63 (p=0.532)
Pain expectation (Q5)	0.00 (0.00, 2.00)	0.00 (0.00, 1.00)	1.00 (0.00, 2.00) -0.93 (p=0.364)	1.00 (0.00, 2.00) -1.20 (p=0.234)
Functional expectation (Q2)	67.90 (52.08, 82.40)	67.90 (50.80, 90.80)	67.90 (55.90,82.40) -0.11 (p=0.919)	61.60 (46.10, 82.80) -0.69 (p=0.494)
Functional expectation (Q3)	46.10 (37.70, 61.60)	48.45 (37.70, 63.18)	46.10 (37.70, 61.60) -0.28 (p=0.788)	50.80 (28.65, 61.60) -0.51 (p=0.618)
Functional expectation (Q4)	26.90 (20.00, 37.70)	28.65 (20.00, 36.75)	26.90 (20.85, 40.70) -0.12 (p=0.908)	26.90 (20.00, 41.70) -0.36 (p=0.728)
Functional expectation (Q5)	16.40 (3.45, 26.90)	14.55 (1.15, 20.00)	18.20 (5.65, 30.40) -1.27 (p=0.208)	16.40 (2.20, 38.88) -1.06 (p=0.294)

Q2 = two weeks pre-operative, Q3 = one month post-operative, Q4 = six months post-operative, Q5 = one year post-operative

Appendix 19: Changes of all variables across time

Descriptive statistics in patients undergoing THR consist of median, IQR, z-score of test statistic and p-value of Wilcoxon signed-rank test.

Variables	**Q1 (n=39)** **Median (IQR)**	**Q2 (n=20)** **Median (IQR)** **Z (p-value)**	**Q3 (n=25)** **Median (IQR)** **Z (p-value)**	**Q4 (n=16)** **Median (IQR)** **Z (p-value)**
Hip symptoms	30.00 (15.00, 46.25)	35.00 (30.00, 50.00) -0.08 (p=0.950)	60.00 (52.50, 72.50) -2.59 (p=0.007)*	75.00 (60.00, 90.00) -0.80 (p=0.445)
Hip pain	27.50 (16.88, 40.63)	31.39 (21.25, 42.77) -0.80 (p=0.454)	65.00 (49.38, 77.50) -3.23 (p<0.001)*	77.50 (55.00, 90.00) -1.01 (p=0.334)
Hip function (ADL)	26.47 (12.87, 42.65)	34.90 (15.51, 43.92) -0.81 (p=0.438)	71.67 (55.88, 76.88) -2.98 (p=0.001)*	80.88 (57.35, 88.24) -0.72 (p=0.502)
Hip function (sports)	18.75 (0.00, 25.00)	18.75 (6.25, 28.13) -0.67 (p=0.535)	31.25 (15.63, 70.83) -0.74 (p=0.625)	50.00 (28.13, 75.00) -0.94 (p=0.438)
Hip-related QOL	18.75 (6.25, 31.25)	12.50 (1.56, 31.25) -1.16 (p=0.259)	37.50 (31.25, 56.25) -3.12 (p<0.001)*	56.25 (28.13, 75.00) -1.59 (p=0.125)
Overall QOL	0.30 (0.00, 0.59)	0.42 (0.18, 0.57) -0.22 (p=0.841)	0.61 (0.45, 0.73) -2.20 (p=0.027)*	0.69 (0.33, 0.81) -0.62 (p=0.562)
SRH	65.00 (50.00, 75.00)	60.00 (45.00, 70.00) -1.34 (p=0.194)	80.00 (62.50, 82.50) -2.60 (p=0.008)*	76.50 (70.00, 85.00) -1.44 (p=0.162)
Anxiety	6.00 (4.00, 10.00)	7.00 (4.25, 12.75) -1.31 (p=0.197)	4.00 (2.50, 7.50) -1.87 (p=0.066)	2.00 (1.25, 4.50) -0.41 (p=0.704)
Depression	7.00 (4.00, 11.00)	7.00 (4.25, 9.00) -0.55 (p=0.607)	6.00 (3.50, 8.00) -1.30 (p=0.222)	3.00 (1.25, 7.00) -1.02 (p=0.315)
Positive affect	28.00 (22.00, 33.00)	28.50 (20.25, 37.25) -0.61 (p=0.557)	31.00 (25.50, 39.00) -2.20 (p=0.025)*	35.50 (29.50, 43.50) -1.27 (p= 0.216)
Negative affect	15.00 (12.00, 19.00)	13.00 (10.25, 25.00) -0.35 (p=0.740)	12.00 (11.00, 16.50) -0.84 (p=0.426)	11.50 (10.00, 15.75) -0.26 (p=0.814)
Pain catastrophising	22.75 (13.00, 34.00)	21.50 (11.75, 26.56) -0.28 (p=0.791)	5.00 (0.50, 15.00) -2.70 (p=0.004)*	3.00 (1.00, 11.00) -0.13 (p=0.915)

Variables	Q1 (n=39) Median (IQR)	Q2 (n=20) Median (IQR) Z (p-value)	Q3 (n=25) Median (IQR) Z (p-value)	Q4 (n=16) Median (IQR) Z (p-value)
Self-efficacy of other symptoms (pre-operative)	4.17 (2.54, 5.50)	4.58 (4.04, 5.92) -1.94 (p=0.052)		
Self-efficacy of other symptoms (post-operative)			12.00 (12.00, 13.75)	14.00 (12.00, 15.00) -0.04 (p=0.987)
Self-efficacy of pain	3.40 (2.40, 5.00)	3.68 (3.05, 5.15) -1.94 (p=0.052)	5.60 (3.90, 7.50) -0.93 (p=0.377)	7.40 (6.30, 9.58) -2.29 (p=0.020)*
Self-efficacy of function	9.00 (7.00, 11.50)	9.00 (7.25, 11.75) -0.03 (p=0.979)	11.00 (10.00, 13.50) -2.44 (p=0.014)*	12.00 (9.25, 16.00) -1.33 (p=0.203)
Self-efficacy of rehabilitation			8.91 (7.92, 9.83)	9.63 (7.40, 10.00) -2.16 (p=0.029)*
Fear of hip surgery	3.00 (1.00, 7.00)	4.00 (2.00, 7.75) -1.58 (p=0.115)	4.00 (1.00, 8.00) -1.32 (p=0.297)	3.00 (0.50, 8.00) -0.12 (p=0.957)
Fear of anaesthesia	3.00 (0.50,7.00)	4.00 (2.00, 9.00) -2.59 (p=0.007)*	2.00 (0.75, 8.00) -1.57 (p=0.134)	2.50 (0.00, 8.00) -0.24 (p=0.867)
Pain expectation (Q2)	8.00 (7.00, 10.00)	-	-	-
Pain expectation (Q3)	5.00 (3.00, 6.25)	5.00 (4.00, 5.00) -0.31 (p=0.770)	-	-
Pain expectation (Q4)	2.00 (1.00, 3.00)	2.00 (2.00, 3.00) -0.94 (p=0.398)	2.00 (1.00, 3.00) -1.35 (p=0.194)	-
Pain expectation (Q5)	0.00 (0.00, 1.00)	0.00 (0.00, 1.00) -0.42 (p=0.730)	0.00 (0.00, 1.00) -1.41 (p=0.313)	1.00 (0.00, 2.00) -1.38 (p=0.195)
Functional expectation (Q2)	67.90 (50.80, 90.80)	-	-	-
Functional expectation (Q3)	48.45 (37.70, 63.18)	55.90 (38.70, 71.50) -0.10 (p=0.943)	-	-
Functional expectation (Q4)	28.65 (20.00, 36.75)	26.90 (20.00, 36.75) -0.40 (p=0.716)	20.00 (12.70, 32.15) -0.11 (p=1.000)	-

Variables	**Q1 (n=39)** **Median (IQR)**	**Q2 (n=20)** **Median (IQR)** **Z (p-value)**	**Q3 (n=25)** **Median (IQR)** **Z (p-value)**	**Q4 (n=16)** **Median (IQR)** **Z (p-value)**
Functional expectation (Q5)	12.70 (1.15, 20.00)	14.55 (1.15, 25.18) -0.28 (p=0.836)	8.80 (5.65, 19.10) -1.15 (p=0.313)	37.70 (11.60, 54.63) -2.20 (p=0.031)*
* p-value < 0.05 in comparison with the previous occasion				

Q2 = two weeks pre-operative, Q3 = one month post-operative, Q4 = six months post-operative, Q5 = one year post-operative

Appendix 20: Correlations of outcomes, predictors and demographic at baseline (N=39)

	1	2	3	4	5	6	7	8
1. Hip symptoms								
2. Hip pain	.789**							
3. Hip function (ADL)	.740**	.892**						
4. Hip function (sports)	.461**	.644**	.625**					
5. Hip-related QOL	.583**	.668**	.680**	.504**				
6. Overall QOL	.687**	.738**	.759**	.399*	.730**			
7. SRH	.400*	.446**	.545**	.430*	.510**	.525**		
8. Anxiety	-.381*	-.406*	-.423**	-.255	-.498**	-.450**	-.408*	
9. Depression	-.547**	-.598**	-.540**	-.365*	-.473**	-.661**	-.527**	.591**
10. Positive affect	.513**	.450**	.415**	.337	.258	.365*	.302	-.134
11. Negative affect	-.351*	-.305	-.214	-.132	-.238	-.340*	-.195	.720**
12. Pain catastrophising	-.684**	-.710**	-.670**	-.529**	-.623**	-.712**	-.416**	.499**
13. SE: Symptoms	.594**	.615**	.618**	.357*	.651**	.736**	.534**	-.419*
14. SE: Pain	.511**	.498**	.540**	.268	.583**	.635**	.448**	-.393*
15. SE: Function	.537**	.739**	.690**	.523**	.681**	.789**	.593**	-.308
16. Fear of hip surgery	-.056	-.055	-.140	-.243	-.084	-.132	-.204	.295
17. Fear of anaesthesia	.079	.068	-.022	-.225	-.030	.028	-.142	.343*
18. PE: 2 weeks pre-op.	-.650**	-.701**	-.648**	-.507**	-.568**	-.619**	-.481**	.372*
19. PE: 1 month post-op.	-.165	-.159	-.119	-.088	-.107	-.139	-.089	.198
20. PE: 6 months post-op.	-.058	.013	-.033	-.042	.036	.046	.056	.078
21. PE: 1 year post-op.	.003	.191	.145	.219	.135	.119	.357*	.114
22. FE: 2 weeks pre-op.	-.548**	-.726**	-.788**	-.667**	-.564**	-.607**	-.651**	.453*
23. FE: 1 month post-op.	-.092	-.093	-.079	-.155	.058	-.042	-.209	.073
24. FE: 6 months post-op.	-.063	.082	.001	-.097	.147	.034	.011	-.068
25. FE: 1 year post-op.	-.016	.133	.106	-.011	.053	.071	.065	.159
26. Gender	.154	.038	-.017	.031	-.090	-.123	.128	-.149
27. Age (Years)	.392*	.240	.187	.166	.235	.172	.238	-.386*
28. BMI (kg/m^2)	.019	.020	-.027	.223	.009	-.033	.001	-.186
29. Smoking status	-.343*	-.389*	-.366*	-.434*	-.300	-.300	-.467**	.273
30. Living in own home	.182	.200	.185	.441*	.201	.071	.302	-.011
31. Living with anyone	.181	.122	.016	.101	.064	.106	.104	-.247
32. Helper	-.114	-.286	-.390*	-.351*	-.347*	-.288	-.168	.189
33. One-floor home	.087	-.093	-.090	-.126	-.161	.047	-.104	-.155
34. Working status	-.274	-.139	-.174	.061	-.028	-.157	-.193	-.079
35. House hold income	.396*	.330	.248	-.080	.317	.179	.213	.072
36. Co-morbidities	-.104	-.065	-.063	-.307	-.240	-.142	-.097	-.051
37. Co-morbidities (N)	-.088	-.071	-.049	-.221	-.232	-.148	-.195	.022
38. Co-morbidities on pain and mobility	-.018	-.011	.028	-.065	.065	-.017	-.185	-.027
39. Treatments (N)	-.027	.030	.084	.189	.062	.165	.014	.100
40. Analgesia (N)	.087	.076	.007	.249	.022	-.013	-.162	.194

** p < 0.01, * p< 0.05 SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation, N = number

	9	10	11	12	13	14	15	16
9. Depression								
10. Positive affect	-.567**							
11. Negative affect	.465**	.057						
12. Pain catastrophising	.640**	-.637**	.354*					
13. SE: Symptoms	-.712**	.521**	-.310	-.599**				
14. SE: Pain	-.528**	.338*	-.239	-.412**	.836**			
15. SE: Function	-.598**	.335*	-.232	-.537**	.683**	.610**		
16. Fear of hip surgery	.125	-.054	.336*	.262	-.099	.065	.030	
17. Fear of anaesthesia	.120	.035	.206	.065	.104	.184	.097	.721**
18. PE: 2 weeks pre-op.	.548**	-.355*	.279	.685**	-.348*	-.433*	-.423*	.092
19. PE: 1 month post-op.	.108	-.127	.074	.305	-.015	-.064	.103	.209
20. PE: 6 months post-op.	-.090	-.186	-.181	.100	.159	.191	.181	.206
21. PE: 1 year post-op.	-.157	.061	.156	-.010	.206	.384*	.265	.212
22. FE: 2 weeks pre-op.	.556**	-.295	.213	.576**	-.374	-.237	-.589**	.171
23. FE: 1 month post-op.	.082	-.063	.053	.099	.119	.203	-.045	.314
24. FE: 6 months post-op.	-.091	-.095	-.094	.042	.082	.300	.097	.234
25. FE: 1 year post-op.	-.093	-.159	.053	.113	.047	.231	.080	.228
26. Gender	-.190	.208	.021	-.048	-.011	.052	-.130	-.205
27. Age (Years)	-.314	.075	-.267	-.160	.091	.131	.061	.018
28. BMI (kg/m^2)	-.150	.121	-.190	-.017	.236	.288	.169	.018
29. Smoking status	.391*	-.183	.260	.389*	-.284	-.227	-.345*	.159
30. Living in own home	-.218	.043	-.053	-.107	.166	.163	.292	-.039
31. Living with anyone	-.244	.081	-.308	-.074	.215	.187	.234	-.006
32. Helper	.134	-.143	-.058	.300	-.295	-.242	-.261	.310
33. One-floor home	-.058	.031	-.147	-.008	-.072	.037	-.126	-.078
34. Working status	.093	-.116	-.257	.061	.008	-.136	-.022	-.022
35. House hold income	-.105	.161	.066	-.188	.168	.110	.388*	.068
36. Co-morbidities	.007	-.055	-.094	.156	-.158	-.089	-.162	.008
37. Co-morbidities (N)	.065	-.065	-.020	.210	-.205	-.097	-.192	.010
38. Co-morbidities on pain and mobility	.223	.058	.079	-.017	-.187	.055	-.089	.111
39. Treatments (N)	.099	-.013	.010	-.078	.093	.014	.194	-.065
40. Analgesia (N)	.159	.109	.011	-.078	.103	.123	.054	.085

** $p < 0.01$, * $p < 0.05$ SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation, N = number

	17	18	19	20	21	22	23	24
17. Fear of anaesthesia								
18. PE: 2 weeks pre-op.	.020							
19. PE: 1 month post-op.	.052	.355*						
20. PE: 6 months post-op.	.174	-.001	.552**					
21. PE: 1 year post-op.	.207	-.205	.257	.603**				
22. FE: 2 weeks pre-op.	.119	.699**	.170	.013	-.295			
23. FE: 1 month post-op.	.259	.066	.470*	.569**	.242	.227		
24. FE: 6 months post-op.	.163	-.234	.256	.771**	.599**	-.042	.649**	
25. FE: 1 year post-op.	.297	-.317	.200	.635**	.629**	-.190	.461*	.826**
26. Gender	-.428**	.074	.155	-.018	.139	.125	-.059	.040
27. Age (Years)	.054	-.241	-.304	-.230	.002	-.360	-.230	-.095
28. BMI (kg/m^2)	.042	.069	.175	.395*	.369*	.012	.059	.309
29. Smoking status	-.031	.381*	.141	-.177	-.335	.511**	.028	-.317
30. Living in own home	-.063	-.139	-.064	.289	.306	-.348	-.033	.383*
31. Living with anyone	.008	.101	-.003	.034	.082	.018	-.308	-.020
32. Helper	.150	.131	.041	.070	-.092	.459*	-.107	.082
33. One-floor home	-.113	-.188	-.316	-.245	-.167	.162	-.375*	-.421*
34. Working status	.071	.238	.192	.233	-.148	.240	.280	.006
35. House hold income	.215	-.046	.160	.191	.068	-.070	.056	.154
36. Co-morbidities	.064	.068	-.101	-.117	-.055	.188	-.291	.031
37. Co-morbidities (N)	.028	.075	-.170	-.076	-.074	.236	-.262	.058
38. Co-morbidities on pain and mobility	.248	.086	-.324	-.228	-.147	.168	-.245	.036
39. Treatments (N)	.159	.053	-.096	.018	-.082	-.123	.026	-.112
40. Analgesia (N)	.152	.017	-.146	.182	.120	.099	-.119	-.021

** p < 0.01, * p< 0.05 SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation, N = number

	25	26	27	28	29	30	31	32
25. FE: 1 year post-op.								
26. Gender	-.104							
27. Age (Years)	-.022	.099						
28. BMI (kg/m^2)	.278	.043	.000					
29. Smoking status	-.314	.153	-.274	-.251				
30. Living in own home	.387*	-.078	.029	.205	-.770**			
31. Living with anyone	-.149	.383*	-.044	.293	-.049	.095		
32. Helper	.023	.254	-.034	-.025	.151	-.117	.403*	
33. One-floor home	-.316	.133	.283	-.056	.238	-.332*	-.023	.166
34. Working status	-.147	-.220	-.395*	.205	.049	-.079	.070	.108
35. House hold income	.112	.100	.035	-.145	-.295	.270	.150	.100
36. Co-morbidities	.149	.182	.036	.161	.110	-.057	.220	.327*
37. Co-morbidities (N)	.198	.203	.069	.177	.206	-.054	.187	.332*
38. Co-morbidities on pain and mobility	-.065	-.067	.103	-.077	.049	-.120	.070	.108
39. Treatments (N)	-.079	-.472**	-.113	.107	-.177	.279	-.213	-.406*
40. Analgesia (N)	-.213	-.133	-.400*	.286	-.074	.206	.365*	.109

	33	34	35	36	37	38	39	40
33. One-floor home								
34. Working status	-.050							
35. House hold income	-.393*	-.123						
36. Co-morbidities	.190	-.107	-.062					
37. Co-morbidities (N)	.235	-.102	-.077	.926**				
38. Co-morbidities on pain and mobility	.126	.082	.049	.355*	.424**			
39. Treatments (N)	-.131	.076	-.165	-.013	-.053	-.019		
40. Analgesia (N)	-.188	.268	.038	-.266	-.199	.084	.280	

** p < 0.01, * p< 0.05 SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation, N = number

Appendix 21: Correlations of outcomes and predictors at around one month pre-operatively (N=20)

	1	2	3	4	5	6	7	8
1. Hip symptoms								
2. Hip pain	.815**							
3. Hip function (ADL)	.817**	.848**						
4. Hip function (sports)	.663**	.712**	.614**					
5. Hip-related QOL	.792**	.701**	.575**	.288				
6. Overall QOL	.787**	.746**	.699**	.702**	.774**			
7. SRH	.418	.646**	.383	.527*	.516*	.624**		
8. Anxiety	-.604**	-.555*	-.446*	-.392	-.497*	-.466*	-.529*	
9. Depression	-.670**	-.522*	-.492*	-.566*	-.508*	-.726**	-.668**	.677**
10. Positive affect	.508*	.368	.470*	.058	.523*	.453*	.418	-.613**
11. Negative affect	-.548*	-.497*	-.312	-.606**	-.487*	-.516*	-.654**	.730**
12. Pain catastrophising	-.712**	-.550*	-.596**	-.412	-.484*	-.549*	-.485*	.900**
13. SE: Symptoms	.536*	.594**	.566**	.458	.459*	.515*	.638**	-.495*
14. SE: Pain	.789**	.698**	.766**	.395	.657**	.668**	.447	-.393
15. SE: Function	.477*	.371	.402	.083	.370	.340	.268	-.339
16. Fear of hip surgery	-.263	-.012	-.066	.143	-.265	-.318	-.267	.401
17. Fear of anaesthesia	-.280	-.001	-.038	-.031	-.131	-.215	-.223	.255
18. PE: 1 month post-op.	.014	.166	.187	.030	.231	-.126	-.091	-.105
19. PE: 6 months post-op.	-.016	.050	.165	-.059	-.037	-.162	-.144	-.073
20. PE: 1 year post-op.	-.212	-.129	.002	-.200	-.373	-.513*	-.337	.127
21. FE: 1 month post-op.	-.241	-.065	-.178	-.187	-.094	-.517*	-.300	-.076
22. FE: 6 months post-op.	-.135	-.070	-.334	-.163	.008	-.430	-.098	.061
23. FE: 1 year post-op.	-.046	.054	-.149	-.138	.056	-.319	-.045	.134

	9	10	11	12	13	14	15	16
9. Depression								
10. Positive affect	-.680**							
11. Negative affect	.600**	-.416						
12. Pain catastrophising	.777**	-.701**	.640**					
13. SE: Symptoms	-.469*	.508*	-.543*	-.590**				
14. SE: Pain	-.498*	.484*	-.338	-.543*	.800**			
15. SE: Function	-.442	.552*	-.279	-.534*	.718**	.711**		
16. Fear of hip surgery	.316	-.456*	.472*	.469*	-.444*	-.248	-.400	
17. Fear of anaesthesia	.192	-.155	.425	.229	-.251	-.242	-.106	.759**
18. PE: 1 month post-op.	.194	.240	-.062	-.069	.036	.152	.125	.281
19. PE: 6 months post-op.	.143	.156	-.170	-.202	.155	.178	.301	-.032
20. PE: 1 year post-op.	.293	.045	.162	-.004	.114	.078	.327	.239
21. FE: 1 month post-op.	.383	-.048	.129	.107	-.156	-.220	.006	.428
22. FE: 6 months post-op.	.186	-.074	-.016	.142	.028	-.068	.353	.294
23. FE: 1 year post-op.	.201	.016	.062	.149	.211	.117	.501*	.207

** $p < 0.01$, * $p < 0.05$ SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation

	17	18	19	20	21	22	23
17. Fear of anaesthesia							
18. PE: 1 month post-op.	.223						
19. PE: 6 months post-op.	.013	.733**					
20. PE: 1 year post-op.	.278	.487*	.771**				
21. FE: 1 month post-op.	.418	.591*	.362	.435			
22. FE: 6 months post-op.	.300	.385	.359	.615*	.693**		
23. FE: 1 year post-op.	.274	.334	.348	.684**	.605*	.933**	

** $p < 0.01$, * $p < 0.05$, SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation

Appendix 22: Correlations of outcomes and predictors at one month post-operatively (N=25)

	1	2	3	4	5	6	7	8
1. Hip symptoms								
2. Hip pain	.780**							
3. Hip function (ADL)	.694**	.773**						
4. Hip function (sports)	.775**	.824**	.845**					
5. Hip-related QOL	.600**	.721**	.631**	.835**				
6. Overall QOL	.714**	.758**	.589**	.683*	.746**			
7. SRH	.457*	.328	.461*	.496	.444*	.552**		
8. Anxiety	-.683**	-.766**	-.559**	-.759**	-.569**	-.558**	-.088	
9. Depression	-.598**	-.519**	-.460*	-.384	-.439*	-.583**	-.473*	.320
10. Positive affect	.284	.110	.254	.314	.304	.329	.385	.064
11. Negative affect	-.480*	-.693**	-.575**	-.675*	-.591**	-.582**	-.224	.757**
12. Pain catastrophising	-.602**	-.544**	-.415*	-.807**	-.462*	-.415*	-.078	.655**
13. SE: Symptoms	.507*	.249	.408*	.564	.347	.305	.487*	-.139
14. SE: Pain	.450*	.577**	.519*	.628	.579**	.735**	.500*	-.390
15. SE: Function	.306	.257	.364	.445	.222	.335	.269	-.124
16. SE: Rehabilitation	.308	-.019	.178	.419	.339	.220	.649**	.076
17. Fear of hip surgery	-.592**	-.492*	-.493*	-.851**	-.410	-.481*	-.318	.554**
18. Fear of anaesthesia	-.620**	-.500*	-.629**	-.905**	-.510*	-.564**	-.407	.528*
19. PE: 6 months post-op.	-.097	-.045	.030	-.010	-.019	-.296	-.180	-.223
20. PE: 1 year post-op.	-.209	-.209	-.207	-.006	-.290	-.354	-.152	.068
21. FE: 6 months post-op.	-.002	.025	-.160	.144	-.034	-.130	-.160	-.369
22. FE: 1 year post-op.	-.141	-.118	-.298	-.085	-.050	-.198	0.000	.002

** p < 0.01, * p< 0.05 SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation

	9	10	11	12	13	14	15	16
9. Depression								
10. Positive affect	-.720**							
11. Negative affect	.370	-.095						
12. Pain catastrophising	.362	-.253	.430*					
13. SE: Symptoms	-.383	.541**	-.311	-.528**				
14. SE: Pain	-.510*	.304	-.537*	-.153	.120			
15. SE: Function	-.619**	.558**	-.148	-.175	.136	.414		
16. SE: Rehabilitation	-.497*	.616**	-.097	-.075	.623**	.131	.321	
17. Fear of hip surgery	.239	-.200	.416	.625**	-.453*	-.388	-.379	-.330
18. Fear of anaesthesia	.265	-.268	.392	.559**	-.477*	-.412	-.328	-.414
19. PE: 6 months post-op.	.077	-.308	-.143	.083	-.170	-.201	-.153	-.003
20. PE: 1 year post-op.	.034	-.288	.073	.059	-.203	.018	-.178	-.151
21. FE: 6 months post-op.	-.166	-.096	-.056	-.133	-.375	.061	.069	-.095
22. FE: 1 year post-op.	-.132	-.016	.004	-.051	-.211	.103	.078	-.013

	17	18	19	20	21	22
17. Fear of hip surgery						
18. Fear of anaesthesia	.922**					
19. PE: 6 months post-op.	.102	.019				
20. PE: 1 year post-op.	.051	.135	.562**			
21. FE: 6 months post-op.	-.174	-.051	.708**	.552*		
22. FE: 1 year post-op.	.078	.278	.543*	.632**	.854**	

** $p < 0.01$, * $p < 0.05$

SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation

Appendix 23: Correlations of outcomes and predictors at six months post-operatively (N=16)

	1	2	3	4	5	6	7	8
1. Hip symptoms								
2. Hip pain	.795**							
3. Hip function (ADL)	.684**	.919**						
4. Hip function (sports)	.605*	.721*	.721*					
5. Hip-related QOL	.837**	.884**	.745**	.575				
6. Overall QOL	.718**	.801**	.678**	.525	.936**			
7. SRH	.610*	.611*	.463	.809**	.780**	.758**		
8. Anxiety	-.681**	-.736**	-.701**	-.469	-.641**	-.620*	-.379	
9. Depression	-.604*	-.442	-.398	-.465	-.429	-.470	-.580*	.668**
10. Positive affect	.398	.362	.410	.199	.436	.436	.521*	-.544*
11. Negative affect	-.549*	-.567*	-.326	-.686*	-.687**	-.649**	-.825**	.451
12. Pain catastrophising	-.778**	-.879**	-.716**	-.565	-.847**	-.772**	-.512	.750**
13. SE: Symptoms	.763**	.735**	.623*	.573	.825**	.880**	.683**	-.832**
14. SE: Pain	.621*	.852**	.771**	.581	.841**	.859**	.798**	-.698**
15. SE: Function	.687**	.691**	.659**	.687*	.840**	.837**	.796**	-.654**
16. SE: Rehabilitation	.535	.418	.277	.239	.620*	.458	.583*	-.277
17. Fear of hip surgery	-.196	-.438	-.111	-.193	-.537	-.583*	-.448	.295
18. Fear of anaesthesia	-.359	-.262	-.209	-.232	-.524	-.452	-.449	.138
19. PE: 1 year post-op.	-.180	-.392	-.287	-.002	-.313	-.219	-.203	-.061
20. FE: 1 year post-op.	-.662*	-.847**	-.805**	-.871**	-.868**	-.818**	-.871**	.515

	9	10	11	12	13	14	15	16
9. Depression								
10. Positive affect	-.736**							
11. Negative affect	.499*	-.322						
12. Pain catastrophising	.359	-.146	.726**					
13. SE: Symptoms	-.788**	.603*	-.672**	-.738**				
14. SE: Pain	-.668**	.650*	-.663**	-.580*	.792**			
15. SE: Function	-.602*	.668**	-.564*	-.547*	.843**	.867**		
16. SE: Rehabilitation	-.285	.434	-.464	-.347	.405	.542	.582*	
17. Fear of hip surgery	.066	-.232	.686*	.505	-.475	-.491	-.278	-.474
18. Fear of anaesthesia	.011	.144	.544	.474	-.264	-.420	-.395	-.022
19. PE: 1 year post-op.	-.145	.041	.174	.089	-.078	-.130	-.106	-.061
20. FE: 1 year post-op.	.404	-.305	.773**	.671*	-.638*	-.884**	-.862**	-.444

	17	18	19	20
17. Fear of hip surgery				
18. Fear of anaesthesia	.236			
19. PE: 1 year post-op.	.287	.265		
20. FE: 1 year post-op.	.341	.563	.271	

** p < 0.01, * p< 0.05, SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation

Appendix 24: Correlations of post-operative one-month outcomes with predictors at baseline (N=25)

	1	2	3	4	5	6	7	8
1. Hip symptoms								
2. Hip pain	.780**							
3. Hip function (ADL)	.694**	.773**						
4. Hip function (sports)	.775**	.824**	.845**					
5. Hip-related QOL	.600**	.721**	.631**	.835**				
6. Overall QOL	.714**	.758**	.589**	.683*	.746**			
7. SRH	.457*	.328	.461*	.496	.444*	.552**		
8. Anxiety	-.034	-.140	-.043	-.126	-.108	-.116	.124	
9. Depression	-.055	-.061	-.016	.090	-.266	-.310	-.200	.539**
10. Positive affect	.134	.027	.233	.161	.186	.265	.174	-.031
11. Negative affect	-.201	-.218	.028	-.476	-.318	-.217	.133	.718**
12. Pain catastrophising	-.200	-.213	-.159	-.433	-.376	-.335	.020	.313
13. SE: Symptoms	.168	.089	.036	-.056	.022	.218	.049	-.340
14. SE: Pain	-.135	-.237	-.215	-.358	-.211	.061	-.080	-.329
15. SE: Function	-.115	-.162	.067	-.221	.106	.047	.106	-.188
16. Fear of hip surgery	-.378	-.410*	-.446*	-.766**	-.312	-.499*	-.340	.162
17. Fear of anaesthesia	-.350	-.471*	-.594**	-.610*	-.449*	-.610**	-.555**	.317
18. PE: 2 weeks pre-op.	.136	-.016	.025	.047	-.300	-.123	-.075	.308
19. PE: 1 month post-op.	.102	.056	.147	-.230	.056	-.118	-.356	-.027
20. PE: 6 months post-op.	.125	.113	.091	-.109	.073	.026	-.182	.101
21. PE: 1 year post-op.	.046	.048	.252	-.330	-.063	.061	.100	.156
22. FE: 2 weeks pre-op.	-.056	-.058	-.353	.099	-.312	-.120	-.262	.298
23. FE: 1 month post-op.	.080	.086	-.053	-.410	-.026	-.170	-.643**	-.034
24. FE: 6 months post-op.	.055	.175	.116	.211	.059	-.004	-.367	-.139
25. FE: 1 year post-op.	-.152	.007	.008	.198	-.043	-.235	-.206	.154

** $p < 0.01$, * $p < 0.05$ SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation

	9	10	11	12	13	14	15	16
9. Depression								
10. Positive affect	-.428*							
11. Negative affect	.369	.244						
12. Pain catastrophising	.497*	-.571**	.168					
13. SE: Symptoms	-.676**	.501*	-.118	-.407*				
14. SE: Pain	-.626**	.479*	-.100	-.226	.838**			
15. SE: Function	-.613**	.457*	.028	-.523**	.596**	.659**		
16. Fear of hip surgery	.101	-.133	.167	.266	-.061	.168	.142	
17. Fear of anaesthesia	.233	-.084	.194	.045	-.042	.047	.027	.754**
18. PE: 2 weeks pre-op.	.552**	-.212	.184	.647**	-.250	-.269	-.490*	.238
19. PE: 1 month post-op.	-.140	.028	-.089	.070	.161	.213	.274	.285
20. PE: 6 months post-op.	-.147	-.263	-.177	.247	.041	.084	.044	.255
21. PE: 1 year post-op.	-.138	-.025	.276	.158	.016	.205	.179	.145
22. FE: 2 weeks pre-op.	.499*	-.296	-.090	.541*	-.114	-.131	-.534*	.148
23. FE: 1 month post-op.	.079	-.064	-.107	.207	.146	.088	-.202	.119
24. FE: 6 months post-op.	-.115	-.234	-.299	.229	.005	.203	-.028	.157
25. FE: 1 year post-op.	-.094	-.220	-.022	.268	-.100	.003	-.124	.025

	17	18	19	20	21	22	23	24
17. Fear of anaesthesia								
18. PE: 2 weeks pre-op.	.233							
19. PE: 1 month post-op.	.128	-.022						
20. PE: 6 months post-op.	.131	.039	.730**					
21. PE: 1 year post-op.	-.089	-.078	.523*	.624**				
22. FE: 2 weeks pre-op.	.367	.680**	-.120	.074	-.228			
23. FE: 1 month post-op.	.194	.266	.670**	.503*	.198	.277		
24. FE: 6 months post-op.	.104	.028	.613**	.826**	.628**	.130	.514*	
25. FE: 1 year post-op.	.118	-.157	.496*	.743**	.626**	-.030	.291	.795**

** $p < 0.01$, * $p < 0.05$

SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation, N = number

Italic text represents outcomes at six months post-operatively.

Appendix 25: Correlations of post-operatively one-month outcomes with predictors at around one month pre-operative (N=14)

	1	2	3	4	5	6	7	8
1. Hip symptoms								
2. Hip pain	.491							
3. Hip function (ADL)	.544*	.664**						
4. Hip function (sports)	NA	NA	NA					
5. Hip-related QOL	.520	.716**	.619*	NA				
6. Overall QOL	.734**	.839**	.633*	NA	.851**			
7. SRH	.442	.169	.370	NA	.468	.542		
8. Anxiety	-.123	-.155	-.271	NA	.136	.010	.145	
9. Depression	-.382	-.239	-.474	NA	.104	-.364	-.274	.590*
10. Positive affect	.369	.154	.385	NA	.001	.271	.008	-.659*
11. Negative affect	-.057	-.479	-.187	NA	-.022	-.264	.036	.667**
12. Pain catastrophising	-.011	.004	-.205	NA	.240	.106	.163	.887**
13. SE: Symptoms	-.211	-.262	-.051	NA	-.549*	-.400	-.290	-.618*
14. SE: Pain	.061	-.330	0.000	NA	-.284	-.220	-.137	-.414
15. SE: Function	-.198	-.308	-.206	NA	-.478	-.388	-.298	-.407
16. Fear of hip surgery	-.030	-.173	-.109	NA	.139	-.102	.144	.878**
17. Fear of anaesthesia	-.201	-.118	-.261	NA	-.044	-.234	-.372	.697**
18. PE: 1 month post-op.	.033	-.003	.066	NA	.410	.035	-.024	-.280
19. PE: 6 months post-op.	-.423	-.058	-.155	NA	.071	-.026	.015	-.309
20. PE: 1 year post-op.	-.683*	-.486	-.370	NA	-.364	-.455	-.272	.006
21. FE: 1 month post-op.	-.170	-.123	-.209	NA	.147	-.049	-.229	.164
22. FE: 6 months post-op.	-.323	.012	-.281	NA	-.140	-.074	-.256	.018
23. FE: 1 year post-op.	-.437	-.142	-.252	NA	-.304	-.269	-.376	-.050

	9	10	11	12	13	14	15	16
9. Depression								
10. Positive affect	-.578*							
11. Negative affect	.430	-.280						
12. Pain catastrophising	.694**	-.639*	.456					
13. SE: Symptoms	-.506	.509	-.461	-.612*				
14. SE: Pain	-.421	.344	-.129	-.495	.757**			
15. SE: Function	-.375	.481	-.189	-.569*	.806**	.671**		
16. Fear of hip surgery	.539*	-.771**	.629*	.796**	-.639*	-.340	-.552*	
17. Fear of anaesthesia	.459	-.369	.604*	.517	-.424	-.469	-.169	.612*
18. PE: 1 month post-op.	.238	.390	-.172	-.181	.220	.258	.220	-.344
19. PE: 6 months post-op.	-.014	.251	-.323	-.418	.254	.178	.391	-.498
20. PE: 1 year post-op.	.239	.053	.131	-.203	.204	.065	.451	-.152
21. FE: 1 month post-op.	.652*	.240	.131	.320	.092	.049	.294	-.174
22. FE: 6 months post-op.	.217	-.126	-.264	.074	.410	.171	.627	-.328
23. FE: 1 year post-op.	.277	0.000	-.213	.043	.529	.215	.693*	-.327

	17	18	19	20	21	22	23
17. Fear of anaesthesia							
18. PE: 1 month post-op.	-.312						
19. PE: 6 months post-op.	-.477	.541					
20. PE: 1 year post-op.	-.133	.135	.677*				
21. FE: 1 month post-op.	.087	.498	.317	.275			
22. FE: 6 months post-op.	-.152	-.090	.307	.527	.399		
23. FE: 1 year post-op.	-.106	-.098	.251	.609	.511	.947**	

** $p < 0.01$, * $p < 0.05$

SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation.

Italic text represents outcomes at six months post-operatively.

Appendix 26: Correlations of post-operatively six-month outcomes with predictors at baseline (N=16)

	1	2	3	4	5	6	7	8
1. Hip symptoms								
2. Hip pain	.795**							
3. Hip function (ADL)	.684**	.919**						
4. Hip function (sports)	.605*	.721*	.721*					
5. Hip-related QOL	.837**	.884**	.745**	.575				
6. Overall QOL	.718**	.801**	.678**	.525	.936**			
7. SRH	.610*	.611*	.463	.809**	.780**	.758**		
8. Anxiety	-.423	-.223	-.044	-.429	-.399	-.230	-.333	
9. Depression	-.547*	-.569*	-.402	-.648*	-.720**	-.631**	-.841**	.444
10. Positive affect	.448	.482	.533*	.465	.632**	.603*	.673**	.009
11. Negative affect	-.109	.027	.268	-.174	-.031	.059	-.068	.679**
12. Pain catastrophising	-.649**	-.672**	-.561*	-.563	-.849**	-.875**	-.657**	.238
13. SE: Symptoms	.595*	.624*	.625*	.565	.695**	.732**	.734**	-.150
14. SE: Pain	.460	.355	.371	.338	.464	.401	.565*	-.208
15. SE: Function	.458	.378	.437	.462	.527*	.579*	.665**	-.023
16. Fear of hip surgery	-.002	-.113	.005	-.338	-.245	-.313	-.471	.072
17. Fear of anaesthesia	.013	-.038	.047	-.593*	-.156	-.120	-.544*	.419
18. PE: 2 weeks pre-op.	-.555*	-.631*	-.479	-.511	-.720**	-.615*	-.645**	.245
19. PE: 1 month post-op.	-.271	-.279	-.063	-.328	-.352	-.309	-.190	.298
20. PE: 6 months post-op.	-.544*	-.365	-.339	-.431	-.487	-.416	-.355	.360
21. PE: 1 year post-op.	-.332	-.208	-.072	-.240	-.240	-.185	-.178	.295
22. FE: 2 weeks pre-op.	-.400	-.451	-.316	-.647	-.589*	-.580*	-.664*	.343
23. FE: 1 month post-op.	-.326	-.254	-.086	-.357	-.286	-.313	-.350	.083
24. FE: 6 months post-op.	-.345	-.194	-.198	-.128	-.287	-.264	-.322	.176
25. FE: 1 year post-op.	-.235	-.018	-.007	-.168	-.189	-.179	-.281	.540

** $p < 0.01$, * $p < 0.05$ SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation

	9	10	11	12	13	14	15	16
9. Depression								
10. Positive affect	-.704**							
11. Negative affect	.038	.359						
12. Pain catastrophising	.612*	-.627**	-.030					
13. SE: Symptoms	-.764**	.772**	.305	-.615*				
14. SE: Pain	-.707**	.624**	.200	-.369	.872**			
15. SE: Function	-.590*	.576*	.409	-.546*	.770**	.682**		
16. Fear of hip surgery	.183	-.315	.328	.212	-.158	.086	.128	
17. Fear of anaesthesia	.466	-.311	.371	.071	-.225	-.130	-.014	.709**
18. PE: 2 weeks pre-op.	.623**	-.356	.018	.657**	-.431	-.454	-.472	.053
19. PE: 1 month post-op.	.048	.034	.560*	.512*	.121	.274	.181	.310
20. PE: 6 months post-op.	.072	-.239	.243	.549*	-.157	.055	-.132	.318
21. PE: 1 year post-op.	-.065	.072	.478	.333	.004	.230	.123	.377
22. FE: 2 weeks pre-op.	.724**	-.383	-.099	.560*	-.382	-.383	-.659*	-.132
23. FE: 1 month post-op.	.270	.039	.305	.442	.014	.072	-.387	-.214
24. FE: 6 months post-op.	.197	-.165	.073	.549	-.197	.101	-.410	.091
25. FE: 1 year post-op.	.273	-.179	.329	.542	-.304	-.074	-.438	.196

	17	18	19	20	21	22	23	24
17. Fear of anaesthesia								
18. PE: 2 weeks pre-op.	.120							
19. PE: 1 month post-op.	-.009	.246						
20. PE: 6 months post-op.	.130	.302	.627**					
21. PE: 1 year post-op.	.050	.103	.814**	.784**				
22. FE: 2 weeks pre-op.	.277	.671*	-.075	.137	-.186			
23. FE: 1 month post-op.	-.164	.425	.501	.253	.248	.556		
24. FE: 6 months post-op.	.135	.487	.363	.776**	.554	.347	.462	
25. FE: 1 year post-op.	.325	.292	.480	.818**	.667*	.332	.315	.843**

** p < 0.01, * p< 0.05

SE = Self-efficacy, PE = Pain expectation, FE = Functional expectation, N = number

Italic text represents outcomes at six months post-operatively.

Appendix 27: Poster presentation at Health Services Research and Pharmacy Practice (2014)

Presurgical pain catastrophising in relation to expectations of pain and function following total hip replacement: initial findings

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Background

Pain catastrophising score (PCS)[1]

Catastrophising

- *"an exaggerated negative mental set brought to bear during actual or anticipated painful experience"*
- *PCS consists of 3 dimensions*

1. Rumination ('I can't stop thinking how much it hurts')
2. Magnification ('I worry that something serious may happen')
3. Helplessness ('It's awful and I feel that it overwhelms me')

Total hip replacement (THR) used for patients who have severe hip pain. Prior to their initial assessment with an orthopaedic surgeon, their pain and function expectations may vary depending on both their pain experience and other psychological factors. Recent research in total knee replacement has reported a significant contribution of pain catastrophizing to expectancies of pain and function.[2]

Aim

To explore the relationship between subtypes of PCS with pain and function expectations in patients prior to their initial assessment with the hip orthopaedic consultant.

Method

Patients over 18 years & chronic hip pain

↓

Referred to orthopaedic consultant
for initial assessment of THR in 3 centres around Merseyside

↓

Before initial assessment, the postal questionnaire measured

- PCS
- Pain expectation (0-10 pain scale)*
- Function expectation (Short form of hip disability and osteoarthritis outcome scores :HOOS-PS)*

Statistical analysis: Multiple regression

*Measured at 4 points of future time:
- Two weeks before operation
- One month, six months and one year after operation

Results

48 valid questionnaires

- 30 women, 18 men
- mean age of respondents: 63 years (26-84)

Overall catastrophising explained at all times except for one month after surgery between

- 15% and 46% of the variance in pain expectation
- 13% to 22% of the variance in functional expectation

The relationship between catastrophising subtypes and expectations was explored as shown in the table 1 and 2.

Figure 1: Scatter plots of significant PCS subtype with pain and function expectation

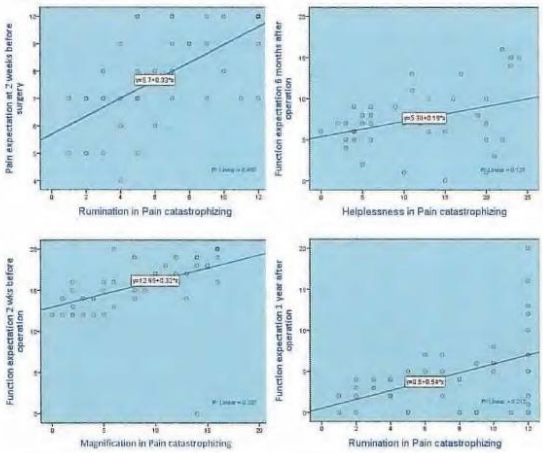

Table 1: Summary of multiple regression analysis for significant PCS subtype predicting pain expectation

Pain expectation	PCS subtype	B	SE B	β	R^2	F
Two-week pre-op.	Rumination	0.33	0.05	0.70$^{\$}$	0.49	43.27$^{\$}$
Six-month post-op.	Helplessness	0.15	0.05	0.42§	0.18	9.54§
One-year post-op.	Helplessness	0.17	0.05	0.44§	0.19	10.84§

Table 2: Summary of multiple regression analysis for significant PCS subtype predicting functional expectation

Functional expectation	PCS subtype	B	SE B	β	R^2	F
Two-week pre-op.	Magnification	0.32	0.10	0.46§	0.21	10.71§
Six-month post-op.	Helplessness	0.18	0.08	0.35*	0.13	5.44*
One-year post-op.	Rumination	0.54	0.17	0.46§	0.21	10.53§

** P<.05, § P<.01, $ P<.001*

Conclusion

- All subtypes of high catastrophising significantly predict expectation of greater pain and poorer function.
- Further investigation, contribution of other psychological factors to expectations of pain and function
- Currently, examining this using qualitative methods
- Mixed method findings may usefully inform the design of psychological programme to reduce catastrophizing, and moderate expectations of patients.
- Pharmacists: aware of the impact of catastrophising on patient expectations when discussing pain management plans

NRES (Reference number: 12/NW/850) and Research Governance approval were granted in all three centres prior to study commencement.
Acknowledgement: Many thanks to facilitating surgeons and the administrative staff at three Trusts to send the information pack to patients, including voluntary participants.
References: 1. Sullivan MJL. The Pain Catastrophizing Scale. 2009.
2. Sullivan MJL, Tanzer M, Reardon G, et al. The role of presurgical expectancies in predicting pain and function one year following total knee arthroplasty. PAIN 2011; 152:2287-2293.

Appendix 28: Poster presentation at the Annual Scientific Meeting: British Pain Society (2014)

LIVERPOOL JOHN MOORES UNIVERSITY

Impact of preoperative psychological factors on pain catastrophizing in patients prior to total hip replacement

S. Techamahamaneerat (Jay)[a], A. J. Mackridge[a], C. W. Morecroft[a], H. Poole[b], P. Thorpe[c]
[a]School of Pharmacy and Biomolecular Science, [b]School of Natural Sciences and Psychology, Liverpool John Moores University
[c]Trauma & Orthopaedics, Surgical Division, Wirral University Teaching Hospital NHS Foundation Trust

Background

Recent research in total knee replacement has reported a significant contribution of pain catastrophizing (PCS) to expectancies of pain and function. The results suggested that postoperative outcomes might be improved by psychological programme targeting patient expectation and catastrophizing.(1)
This study is focused on total hip replacement. Their pain and function expectations may vary depending on their experience of pain and PCS in regard to other psychological factors such as anxiety, depression, personality type, and self-efficacy.

Aim

To explore the relationship between key psychological factors with pain catastrophizing in patients prior to total hip replacement.

Method

- Patients who are over 18 years and chronic hip pain have been referred to orthopaedic consultant for THR initial assessment in 5 centres, North West England.

Prior to initial assessment, the patients were measured by
- Pain Catastrophizing Scores (PCS)
- 0-10 pain scale* (Pain expectation)
- Short form of hip disability and osteoarthritis outcome scores* (Functional expectation)
- Hospital Anxiety and Depression Scores (Anxiety; Anx, Depression; Dep)
- Positive and Negative Affect Scale (Positive personality type; PA, Negative personality type; NA)
- Arthritis Self-Efficacy Scale 11 (Self-efficacy in pain; SE:P and Self-efficacy in other symptoms; SE:S)

Statistical analysis
- PCS and expectations: Pearson's correlation
- Psychological factors with PCS: Multiple regression

*Measured at 4 points of future time:
- 2 weeks before operation (P1)
- After operation at 1 month (P2), 6 months (P3) and 1 year (P4)

Results (I)

- 59 valid questionnaires (35 women)
- Mean age of respondents 65 years (36-84 years)

The relationship between catastrophizing and expectancy (Table 1)
- Pain catastrophizing and pain expectation were significantly correlated at P1 (r= .54, p<.001), P3 (r= .35, p<.01) and P4 (r= .37, p<.01).
- The correlation of catastrophizing and functional expectation were significant at P1 (r= .54, p<.001) and P4 (r= .35, p=.02).

Table 1: Correlations among pain and function expectation at 4 points of time with PCS

Correlations	P1	P2	P3	P4
PCS with pain expectation	.54**	.17	.35**	.37**
PCS with functional expectation	.54**	.24	.28	.35*

*P<.05, **P<.01

Results (II)

Multiple regression was continued using 6 predictor variables; anxiety, depression, personality type, and self-efficacy in terms of pain and symptoms with pain catastrophizing

- Initial model indicated that 54.5% of the variance in catastrophizing ($R^2_{adjusted}$=.54, F(1,57)=68.34, p<.001) was explained by anxiety (β=.74, p<.001),
- The final model accounted for 58.7% of the variance ($R^2_{adjusted}$=.57, F(2,56)=39.82, p<.001) with two significant predictors, anxiety (β=.59, p<.001) and self-efficacy in other symptoms (β= -.25, p=.021).

Table 2: Correlations among psychological variables and PCS

Correlations	PCS	Anx	Dep	PA	NA	SE:P	SE:S
PCS		.74*	.66*	-.49*	.68*	-.43*	-.60*
Anx			.71*	-.43*	.85*	-.41**	-.59*
Dep				-.71*	.67*	-.46*	-.61*
PA					-.35**	.34**	.50*
NA						-.31$	-.47*
SE:P							.80*
SE:S							

*P<.001, **P<.005, $P<.01

Table 3: Multiple regression models of psychological variables with PCS

Model	B	SE B	β	R^2	R^2_{Adjust}	R^2_{change}	F_{change}
1				.55	.54	.55	68.34*
Constant	7.71**	2.55					
Anx	2.21*	.27	.74				
2				.59	.57	.04	5.68§
Constant	19.71**	5.60					
Anx	1.76*	.32	.59				
SE:S	-.33$	.14	-.25				

*P<.001, **P<.005, $P<.01, §P<.05

Conclusion

- Pain catastrophizing during the waiting period for THR was predicted by anxiety and self-efficacy in other symptoms.
- Greater anxiety and lower self-efficacy in other symptoms were associated with increased pain catastrophizing.
- Psychological factors might be addressed prior to surgery to reduce patient anxiety and improve their confidence to deal with movement difficulties.
- Patient concerns have been explored qualitatively concurrently with this questionnaire arm and underlying issues will be explored in more depth via this study.

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NRES (Reference number: 12/NW/850) and Research Governance approval were granted in all three centres prior to study commencement.
Acknowledgement: Many thanks to facilitating surgeons and the administrative staff at three Trusts to send the information pack to patients, including voluntary participants.

References:
1. Sullivan MJL, Tanzer M, Reardon G, et al. The role of presurgical expectancies in predicting pain and function one year following total knee arthroplasty. PAIN 2011; 152:2287-2293.

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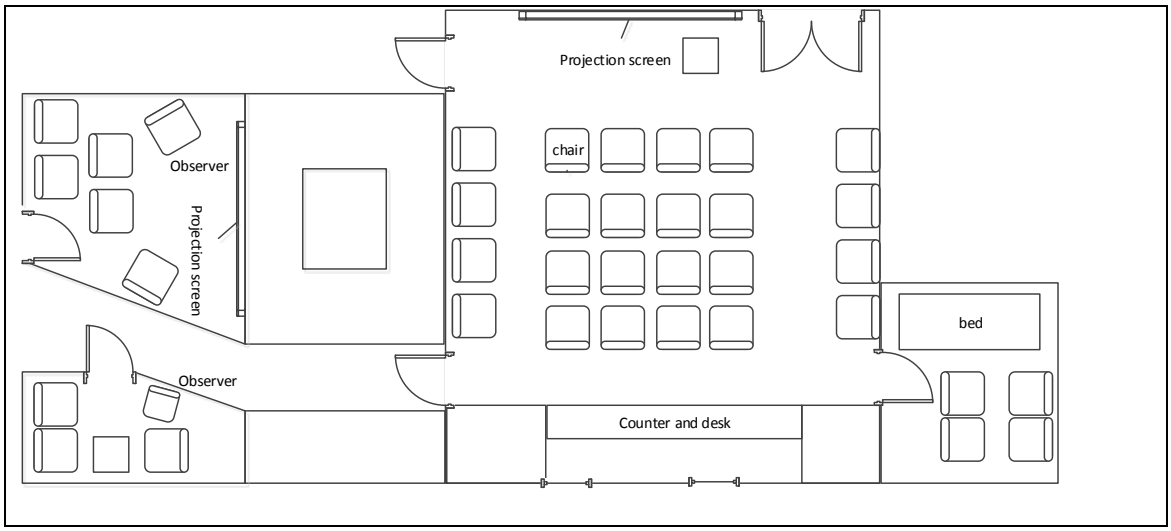
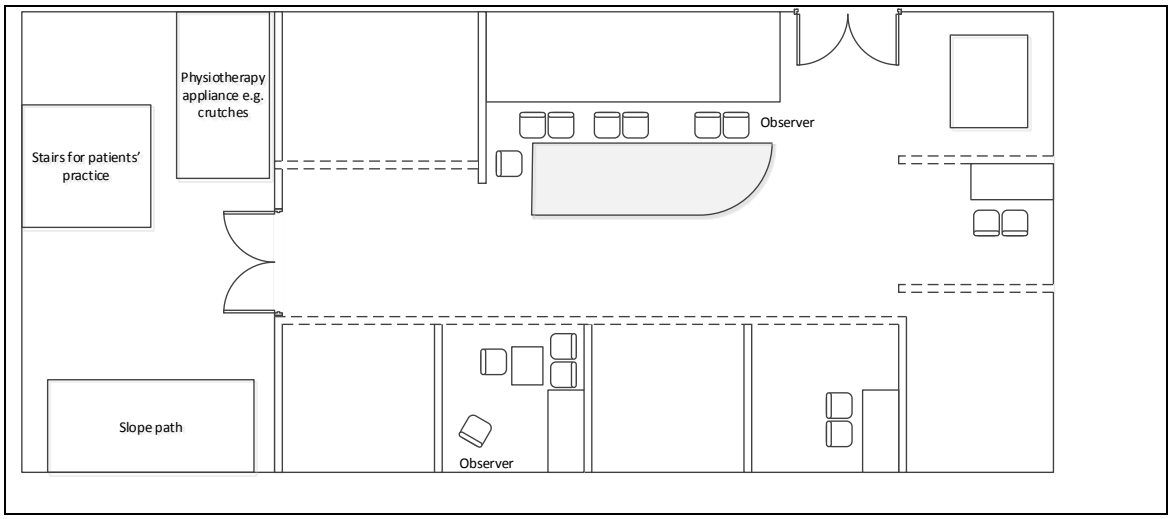
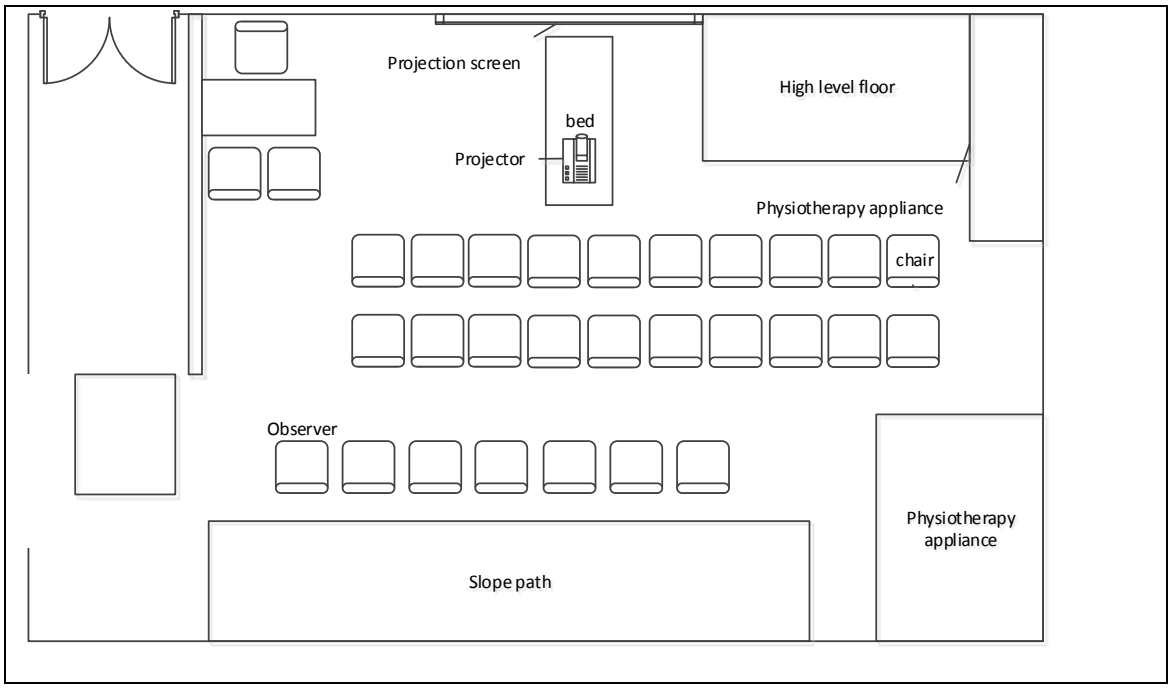
Appendix 29: Room plan of the pre-operative patient education in centre A



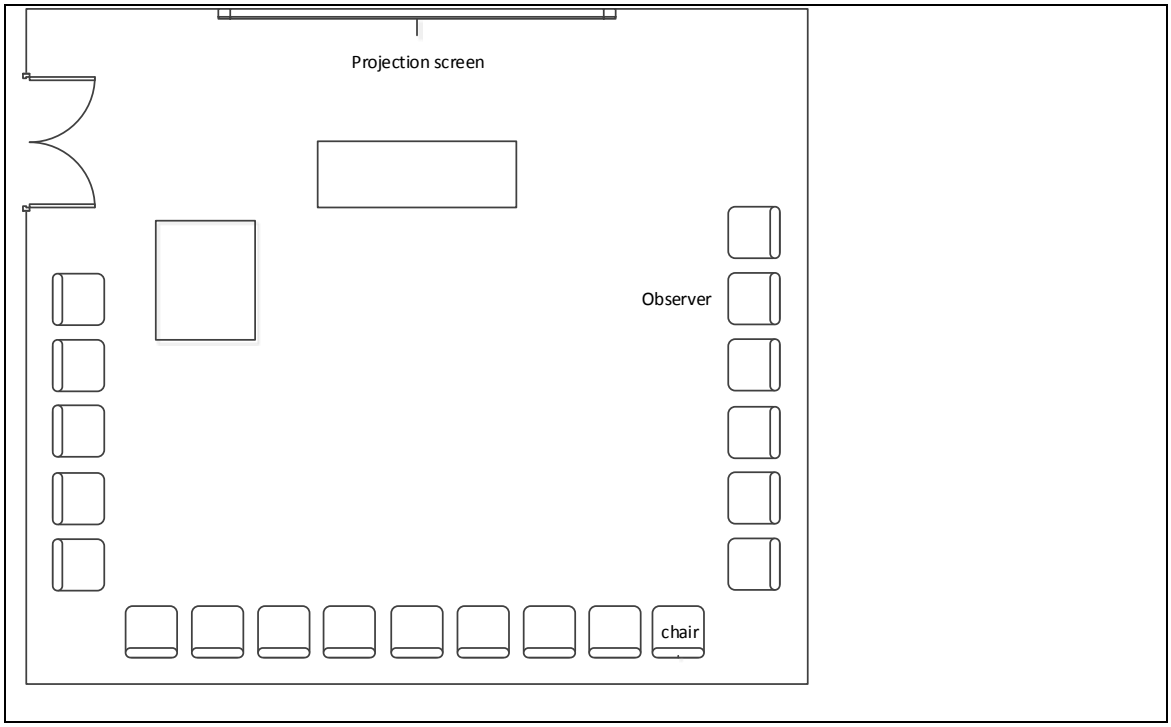
Appendix 30: Room plan of the pre-operative patient education in centre B



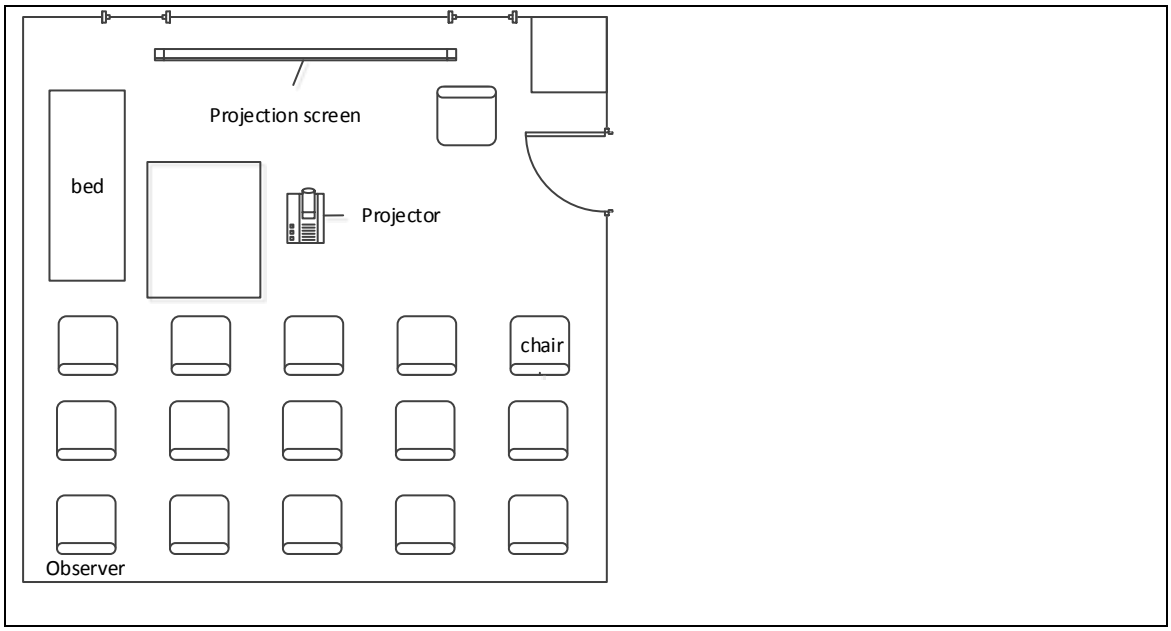
Appendix 31: Room plan of the pre-operative patient education in centre C



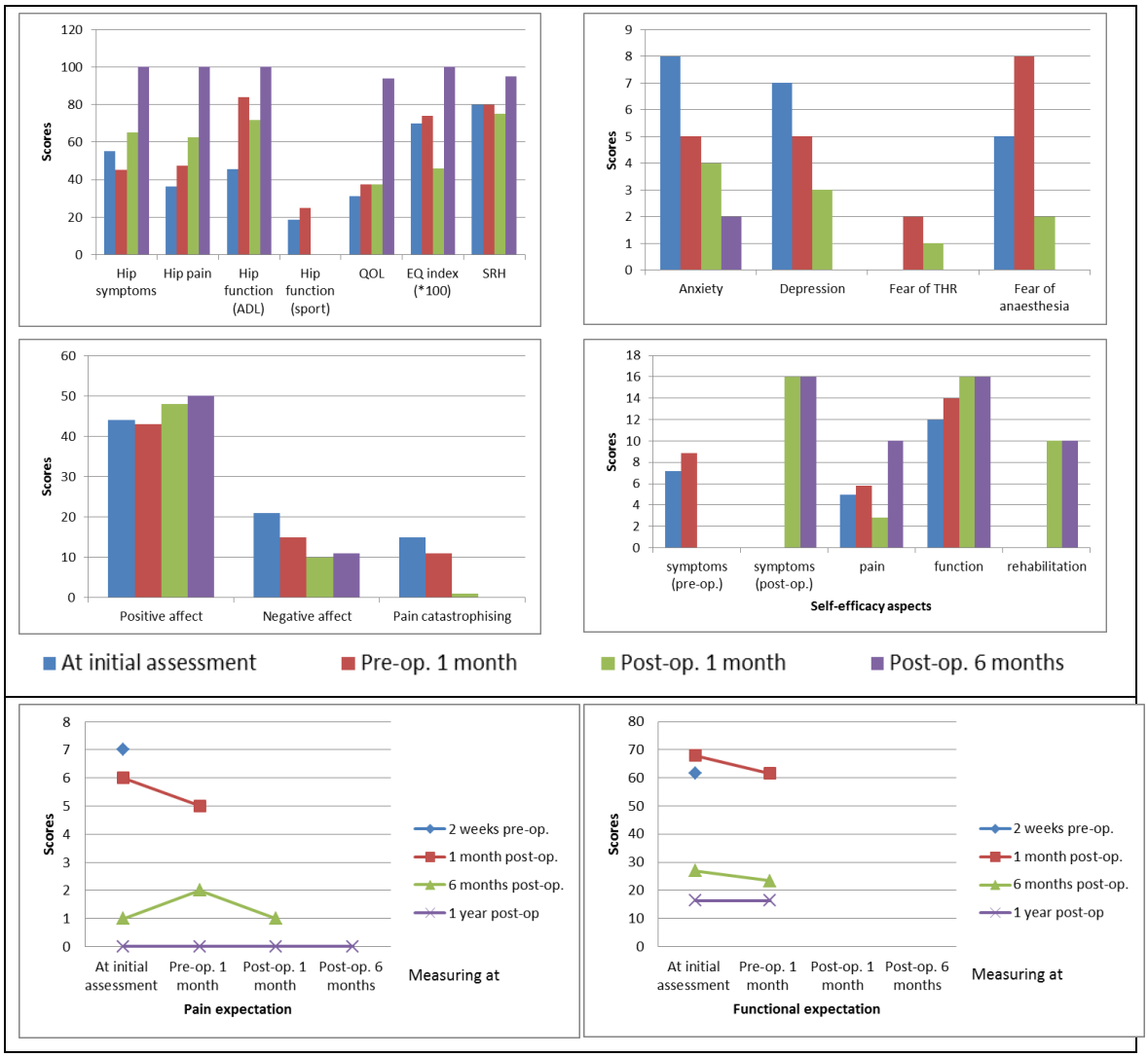
Appendix 32: Room plan of the pre-operative patient education in centre D



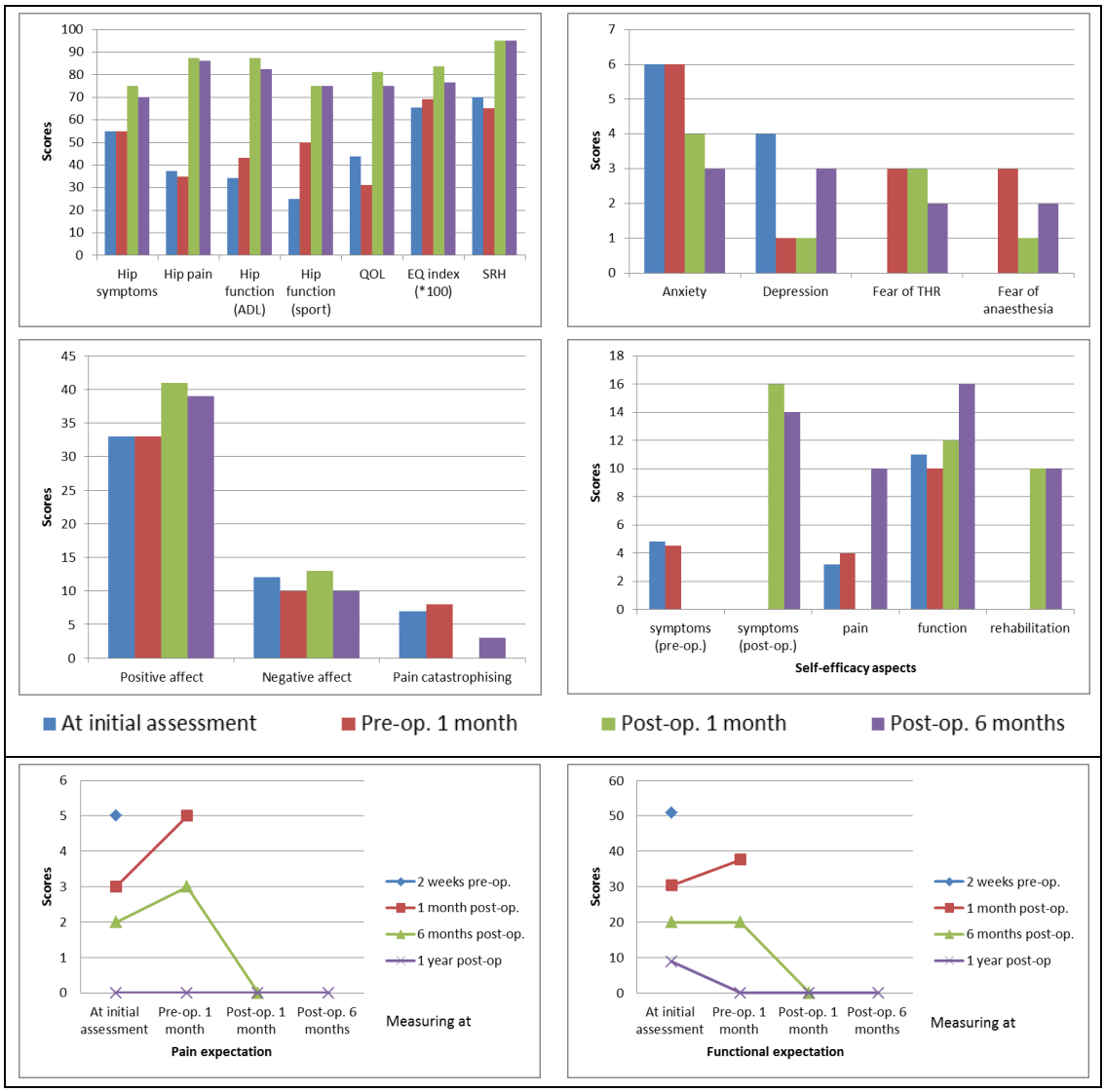
Appendix 33: Room plan of the pre-operative patient education in centre E



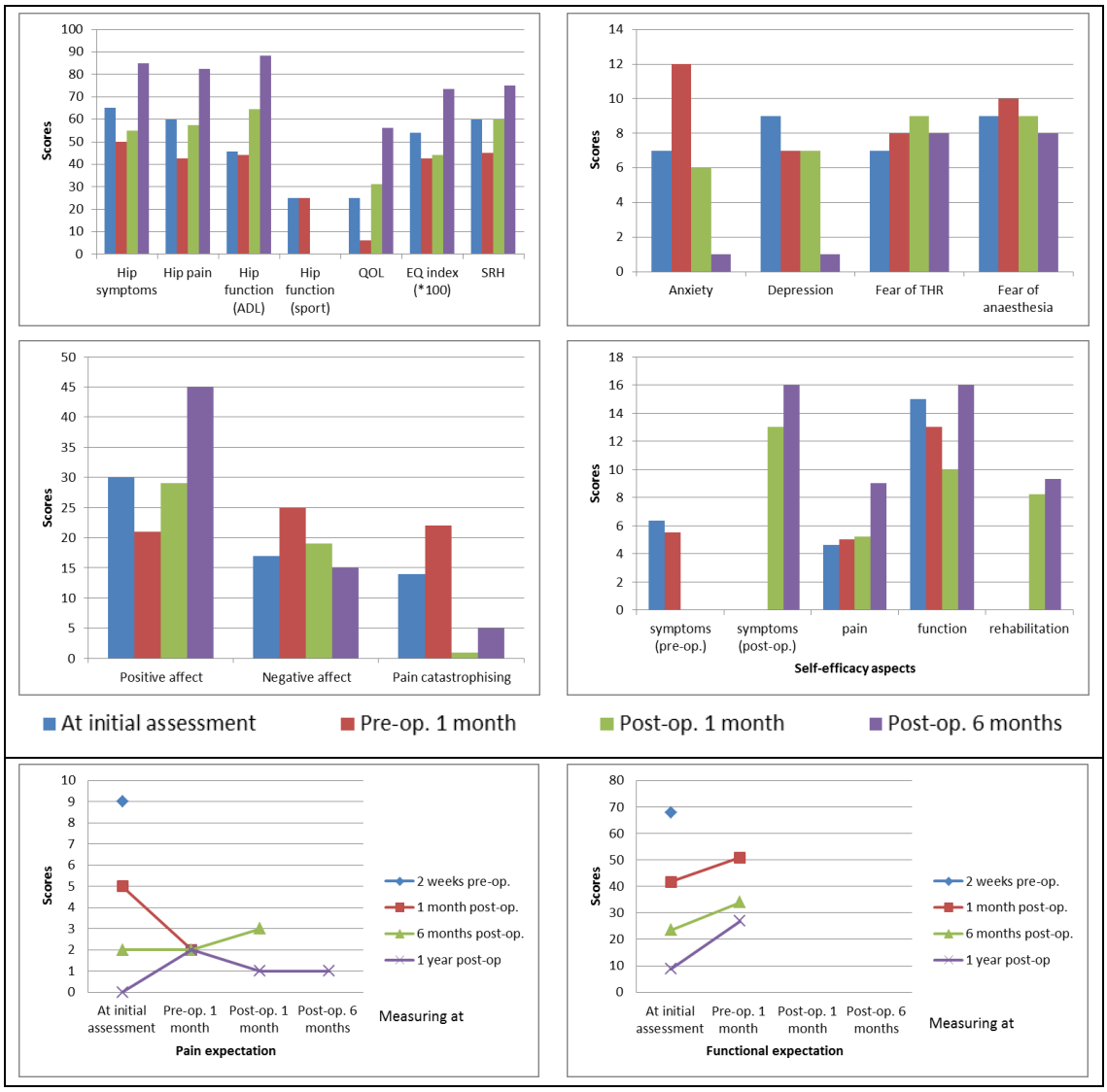
Appendix 34: Change of all variables across THR in Beryl



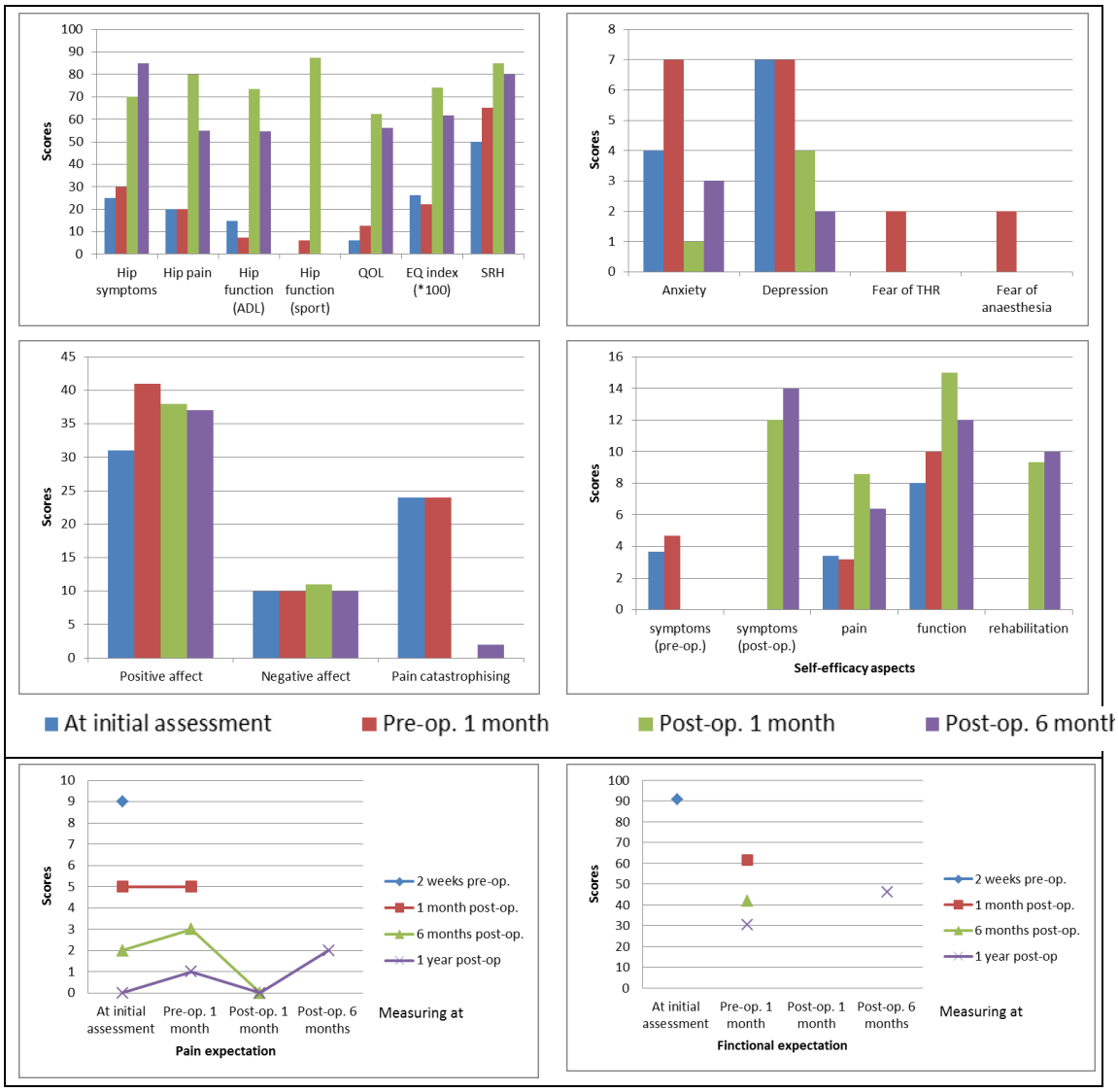
Appendix 35: Change of all variables across THR in Gladys



Appendix 36: Change of all variables across THR in Janet



Appendix 37: Change of all variables across THR in Harold



Appendix 38: Change of all variables across THR in Peter