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A biopsychosocial approach to returning to preoperative levels of physical activity following total hip replacement: insights from older patients

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Dedication

This thesis is dedicated to my Abba Father in heaven, for it is by His grace, loving kindness, and mercies it has been brought to completion

Declaration of authorship

I, Olu Ejuoneatse, MSc, declare that this thesis entitled, 'A biopsychosocial approach to returning to preoperative levels of physical activity following total hip replacement: insights from older patients' and the work presented in it are my own, and has not been submitted in substantially the same form for the award of a higher degree elsewhere, and that the word count does not exceed 80,000 words.

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"Blessed is she who believed, for there will be a fulfilment of those things which were told her from the Lord" [The Holy Bible: Luke 1:45, New King James Version]. I thank God for providing me with the opportunity to commence this work, the grace, help and people by which to complete it to His glory.

I would like to acknowledge the four participants who gave their time to take part in this study. There would be no thesis without them, and I hope I have done justice to their experiences.

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To my Dad, Mum, and sisters, I say a big thank you.

Abstract

This thesis proposes a biopsychosocial [BPS] analysis of postoperative recovery in Total Hip Replacement [THR] to elucidate understanding of the BPS characteristics influencing recovery. This understanding is vital for future assessment and intervention development especially within the occupational therapy [OT] practice. However, to be able to quantify postoperative recovery using reliable and valid measures, the construct of recovery must first be well defined. Thus, this was defined as return to preoperative levels of physical activity [PA]−specifically the pre-symptomatic [or historic] phase and assessed using the University of California at Los Angeles [UCLA] activity level scale.

A pragmatic approach was taken to this research as the most practical method for answering the two research questions [RQs] posed. The RQs were addressed via two studies – a systematic literature review [SLR] and an investigative study utilising an Interpretive Phenomenological Approach [IPA]. The results of each study collectively contribute to the overall purpose of this thesis.

The first RQ was addressed using the results from the SLR that answered the question: "what are the potential biological, psychological, and social outcomes predicting return to preoperative levels of PA following THR?". This allowed for the development of a BPS representation of all aspects of the patient's life influencing recovery following THR. However, limited by their quantitative nature, the SLR results revealed a lack of individualised experience in relation to the BPS outcomes influencing recovery. Consequently, detailed insights capable of exploring in-depth all of the BPS influences as they act on the recovery process from an individualised perspective was lacking. As a result, an IPA study was sought to gain deeper understanding from the perspective of women aged 60 and over – a subset of the THR population revealed as being at a disadvantage.

Thus, the purpose of study 2 was to gain insight into the lived experiences of PA in historic physically active women aged 60 and over to elucidate understanding of the factors influencing participation and/or return to preoperative levels following THR for the treatment of osteoarthritis [OA]. Results from the SLR indicated OA as the predominant diagnosis for THR amongst participants reason for the specific focus on condition. Data analysis of the semi-structured interviews and recovery assessment using the UCLA activity level scale conducted amongst four women identified three key factors. First, worsen/poor preoperative functional levels informing low recovery expectations as a result of delayed time until surgery. Second, unsatisfactory support from healthcare professionals, one that was perceived as ageist. Thirdly,

individual factors – the two persistent being negative beliefs held about other joint problems [pre-existing/recent] and older age. Better interaction with the healthcare system via individually tailored preoperative education on the recovery process and rehabilitation programs designed to facilitate return to PA may help address these factors.

The culmination of both the SLR and IPA study enabled a richer understanding of the biological predispositions, psychological factors, and the social-environmental influences acting on postoperative recovery in THR. This informed the proposition of a theory driven, evidence-based principles to guide the development and implementation of targeted evaluation and interventions based on the combination of the BPS dimensions that influence postoperative recovery – return to preoperative levels of PA following THR.

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Abbreviations

NJR	National Joint Registry
THA	Total Hip Arthroplasty
THR	Total Hip Replacement
TKR	Total Knee Replacement
OA	Osteoarthritis
NHS	National Health Service
HRQoL	Health-Related Quality of Life
OT	Occupational Therapy
OHS	Oxford Hip Score
HHS	Harris Hip Score
BPS	Biopsychosocial
SF-36	Medical Outcome Study Short Form 36
PA	Physical Activity
UCLA	University of California at Los Angeles
QAPAQ	Quality Assessment of Physical Activity Questionnaire
LEAS	Lower-Extremity Activity Scale
RQ	Research Question
IPA	Interpretive Phenomenological Approach
HCPs	Healthcare Professionals
SLR	Systematic Literature Review
GT	Grounded Theory
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-analyses
PICO	Population, Intervention, Comparators and Outcomes
BMI	Body Mass Index

QUIPS	Quality in Prognosis Studies
AVN	Avascular necrosis
PASIPD	Physical Activity Scale for Individuals with Physical Disabilities
PASE	Physical Activity Scale for the Elderly
IPAQ-SF	International Physical Activity Questionnaire Short Form
HAAS	High-Activity Arthroplasty Score
SCSAAQ	Schulthess Clinic Sports and Activity Questionnaire
RTS	Return to Sports
ASA	American Society of Anaesthesiologists
SAQ	Sports Activity Questionnaire
VAS	Visual Analog Scale
WOMAC	Western Ontario and McMaster Universities Osteoarthritis Index
PT	Physiotherapy/Physiotherapist

CHAPTER 1

General introduction

1 Introduction

According to the National Joint Registry [NJR], total hip arthroplasty [THA] or replacement [THR] is one of the most successful and commonly conducted orthopaedic operations in the United Kingdom [UK] (1). The numbers of THR procedures continue to increase annually (2) as it accounts for 18% of the current registry volume between 2019 to 2021 alone (3). Costing the National Health Service [NHS] a considerable amount; a single hip replacement ranges between £5,000-12,000 depending on the complexity of the procedure (4). There are several indications for THR such as osteoarthritis [OA], rheumatoid arthritis, genetically inherited conditions, cancer, and hip fractures (5). However, OA was the sole indication given in 88% of the cohort for primary surgery, the majority of which was carried out on females [females 59.8%: males 40.2%] at a median age of 69 years (3).

Whilst THR have been shown to improve recovery, much of the effectiveness data have focused all too often on audit measures and biologic or physiologic outcomes. Evaluation has traditionally focused on mortality rates, surgical and technical aspects, survival rates and assessment by the treating surgeon (6,7). More recently, outcomes such as duration of hospital stay (8), pain relief, joint function, health-related quality of life [HRQoL], and patient satisfaction after THR are increasingly now reported (9–17). However, these measures are not comprehensive enough to capture the full concept of recovery. For instance, duration of hospital stay may be affected by external elements such as socioeconomic, cultural, and institutional factors (18). These measures are of the greatest interest to clinicians and not so much so for the patients who actually are the ones recovering.

Noteworthily, patients tend to be more active than those who previously underwent THR and so have high expectations regarding functional outcome after surgery (19,20). Consequently, for many patients, an important postoperative recovery goal is the ability to return to a higher level of physical functioning (21) or activity (19,22,23) such as a sport that has been stopped due to an arthritic hip (20,24). This was confirmed by Hobbs et al. (25) in their cohort study across 12 European countries with 1,108 participants. Findings suggested that most patients' expectations post-THR related to enabling them to carry out valued activities rather than reversing impairments. Thus, biologic, and physiologic outcomes are incomplete measures of recovery because they are unlikely to persist beyond the short term or may be confounded between disease-specific symptoms, those related to THR and its potential complications. Therefore, there is a need for a shift in the emphasis of outcome reporting from these audit measures to longer-term patient- and recovery-centric measures (26).

Postoperative care programmes after joint replacement surgery tend to include strategies for mobilisation, such as patient education [pre-and post-operative] and physiotherapy (pre/rehabilitation). For individuals with THR, occupational therapy [OT] is routinely provided as part of the rehabilitation service. However, little is known about its effectiveness in returning patients to higher level of physical functioning or activity because most rehabilitation interventions post-THR are not designed with that goal in mind (27). They often focus on reducing hospital stay, pain relief, improving physical functioning and HRQoL (28) all of which are outcomes which again are of more interest to clinicians. Consequently, it was not surprising when Alviar et al. (29) found some gaps in coverage for significant areas of activity and participation in their systematic review assessing outcomes in rehabilitation after hip replacement. Of the eight patient-reported outcome measures reviewed, the Oxford Hip Score [OHS] which is specifically developed for hip replacement population did not address 'recreation and leisure'. A possible explanation for this shortcoming could be because there are currently no guidelines pertaining to the rehabilitation of people following THR. However, the College of Occupational Therapists (30) practice guideline revised edition includes a new recommendation regarding return to physical and sporting activities albeit reflective of younger patients. They suggest that return to physical and sporting activities be considered within an OT assessment and interventions. For use in OT practice in addressing the needs of varied patient populations, Gentry (31) suggest implementing interventions in areas of impact across the biopsychosocial [BPS] model. According to author, the biological, psychological, and sociological dimensions of the model have a direct impact on intermediate and ultimate rehabilitation outcomes. For the patients, rehabilitation outcomes are paramount for continued [or return to] participation in desired roles and activities (31). While each patient brings a unique combination of injury and sociodemographic characteristics, biological predispositions, and comorbidities to the rehabilitation setting, the therapist can impact recovery by providing targeted evaluation and intervention based on the combination of each dimensions (31).

With an ageing population (32) who present with multiple medical comorbidities, the promotion of healthy ageing is considered a key driver to improving the health of this population. Healthy ageing defined as the ability to lead a healthy, socially inclusive lifestyle relatively free from illness or disability (33) is more likely in those actively engaging in physical activities to improve their health and wellbeing (34). Physical inactivity not only has consequences for health, but it also places a substantial cost burden on health services through the treatment of long-term conditions and associated acute events such as heart attacks, strokes, falls and fractures (35). This is in addition to the costs of social care arising from the loss of functional capacity (35). Insufficient or lack of physical activity [PA] is among the ten most important risk factors for the health burden in

England (36); an estimation of almost one in ten premature deaths from coronary heart disease and one in six deaths from any cause (37). However, an estimated potential saving of £7.6bn could be achieved in the NHS & healthcare system if older people are supported to become more physically active (32). The uphold of an active lifestyle or being regularly physically active has several general health benefits as it helps to prevent and manage over 20 chronic conditions (38) and is linked to a reduction in all-cause mortality (38,39). For older people, like most THR patients, regular PA can delay the age-related decline in musculoskeletal fitness (39) and assists in chronic disease rehabilitation (38). Being regularly physically active helps maintain mobility, physical functioning, muscle strength and balance which have all been proven to prevent falls and fractures (40). However, should a fall occur, physically active people are less likely to suffer a bone fracture because their bones are stronger and have higher bone mineral density (41). Findings from a recent population-based cohort study of 1596 participants revealed that the risks of falling and recurrent falls at age 90+ years were 35–45% lower in participants who reported 30+ minutes/day of active PA at age 60–70s (42). Therefore, in addition to symptom relief, if THR is effective in returning patients to higher level of physical functioning or activity, it could potentially benefit the overall health of individuals undergoing the surgery and a good use of health and societal resources.

This thesis therefore proposes a BPS analysis of postoperative recovery in THR to elucidate understanding of the BPS characteristics influencing recovery. This understanding is vital for future assessment and intervention development especially within the OT practice.

1.1 Conceptual framework

Frameworks have been described as the map for a study which gives a rationale for the development of research questions [RQs] or hypotheses (43). Thus, the two concepts used to frame the research were: postoperative recovery and BPS model explained below. These concepts served as a framework to define the focus and goal of the research, inform the search strategies and literature review, present the research findings, and allow for the use of conceptual models that may be useful to design and guide rehabilitation approaches following THR.

1.2 Postoperative recovery

Although postoperative recovery is commonly used as a concept, it is difficult to identify a standard or consistent definition (26,44). Recovery may have different meanings for different stakeholders, such as administrators, surgeons, doctors, nurses, and patients. This lack of a consistent definition is further complicated by the fact that postoperative recovery is a complex construct that encompasses multiple domains and timeframes. To be able to quantitate postoperative recovery using reliable and valid measures, the construct of recovery must first be well defined (26,44).

1.2.1 What does postoperative recovery mean?

Postoperative recovery is a complex and multi-dimensional process that involves multiple domains, including physiological, psychological, social, and habitual aspects. According to Moore (45), recovery is all of these aspects interlocking, beginning with a health condition or even slightly before the condition and terminating only when the individual return to normal physical well-being, social and economic usefulness, and psychological habitus. Seemingly expatiating on this definition, Allvin et al. (44) identified the five defining attributes of recovery after surgery as:

(1) an energy-requiring process

(2) a return to a state of normality and wholeness defined by comparative standards

(3) regaining control over physical, psychologic, social, and habitual functions

(4) returning to preoperative levels of independency/dependency in activities of daily living

(5) regaining one's optimum level of well-being

What these definitions have successfully done is emphasise the multidimensional aspect of recovery. This imply that assessment of any one dimension while ignoring the remainder will not fully capture the whole construct of recovery (26). For example, consider a physically active patient who undergoes THR. At the routine 6-weeks postoperative visit, the patient reports no major physical symptoms, but is unable to resume normal physical or sporting activities because of lack of confidence which negatively affects the patient's psychologic, social, and economic domains. In this case, focusing only on the physical domain and ignoring the other domains will incorrectly describe this patient as 'recovered' from surgery.

1.2.2 Conceptualising postoperative recovery

In truth, there is no single definition of recovery. What is certain is, there are overlapping phases of recovery that are of interest to different stakeholders, and subsequently the outcomes of relevance may vary depending on the phase. It is important that researchers report the timeframe or phase of recovery of interest. In ambulatory surgery, postoperative recovery can be divided into three phases: early, intermediate, and late (44). Each phase has its relevant outcomes of interests along with examples of validated generic instruments as highlighted below (26).

(1) Early recovery from anaesthesia allowing transfer out of the recovery room and best measured through biologic and physiologic parameters.

(2) The intermediate phase occurs before the patient is discharged from hospital and best described with symptoms such as gastrointestinal function, pain, and nausea, as well as

mobility and the ability to perform basic activities of daily living as these are criteria that assess the ability to be safely discharged.

(3) Long-term recovery or the late phase occurs in the weeks and months after discharge from hospital. It is best estimated with measures of functional status and HRQoL because these outcomes have been shown to remain impaired in the postoperative period and take the greatest time to recover (46). In addition to measures of functional capacity, PA can be estimated through the administration of validated questionnaires (47).

The ideal time point at which to perform the assessment is also clearly dependent on the RQ, the course of the disease or intervention under investigation and type of measure. This was revealed by Bachmeier et al. (9) in their study assessing changes in physical function and QoL with the Medical Outcome Study Short Form 36 [SF-36] health survey in patients undergoing hip and knee joint replacement 1 year after surgery. These authors found that patients in the hip replacement group had a greater improvement for all domains at all follow-ups [3, 6, 9, 12 months] except regarding emotional role functioning.

Finally, for future research on postoperative recovery, Lee et al. (26) recommends identifying all instruments that are currently used to measure recovery and then determine their validity for the context of recovery within specific populations of operative patients. According to authors, it is essential to determine whether these instruments are specifically validated for the patient population and setting in which they are used (48). This is important because often times, validity information based on patients with other diagnoses are juxtaposed onto the new setting under study (48). For instances where no valid measure of postoperative recovery exists, a valid patient-reported measure should be developed that satisfies the context of recovery defined and also needs to be phase-specific (26).

1.3 The BPS model

In the measurement of a person's health, wellness, and recovery from injury or illness, the biomedical model was the traditional approach for diagnosis and treatment. This model states that the physiological aspects provide all the necessary information to properly diagnose a patient (49). The model was widely accepted and used for many years, and only recently have psychologists proven that it is not the best model to diagnose and treat a patient (50). Psychologists now emphasise the use of the BPS model instead. Introduced in the 1980s to complement the traditional biological model of disease that views a disease solely as a consequence of biological malfunction (51), this model led to a more comprehensive, holistic approach for diagnosing and treating patients. The BPS model offers a multi-dimensional perspective by recognising the impact

of biological [genetic, biochemical, etc.], psychological [mood, beliefs, personality, behaviours, etc.] and social [cultural, familial, socioeconomic, medical, etc.] factors on the development and outcomes of illness and disability (51,52). It considers the physiological or biological aspects of the disorder, the psychological factors from which a patient may suffer, and the social or environmental influences acting on the patient (53). With this model, all aspects of the patient's life are taken into consideration, which allows for a more accurate diagnosis and a better treatment plan (49,54).

The BPS perspective recognises the interrelated biological and psychosocial impacts of disease and disability and serves as a model from which interventions can be based in an attempt to meet the complex needs of patients with chronic and disabling conditions. It forms the basis of the World Health Organisation International classification of functioning and disability and is widely used in research into complex healthcare interventions for treatment of musculoskeletal conditions such as chronic back pain (55). The model is recognised as both a philosophy of practice and practical conceptual guide, highly regarded in a variety of healthcare fields (56–58) and has been used to guide the treatment of various health conditions including chronic and disabling conditions (59–61). It is no wonder its adaptation for use in OT practice in addressing the needs of varied patient populations (31) and specially in orthopaedics (62,63) has been recommended, making it an appropriate model to apply to this research topic.

1.4 Summary and impetus for research study

1.4.1 Postoperative recovery as conceptualised for this study: return to preoperative levels of PA

A large body of evidence has suggested that clinically, successful THR recovery is associated with significantly reducing hospital readmissions, perioperative complications and the length of hospital stay in patients (64). However, from a patient's perspective, recovery following THR is even less clearly defined. Concepts of recovery are diluted in both qualitative and quantitative research. Qualitative studies exploring patients' experience, including the importance of assistance and support from health professionals, family, and friends (28,65). Quantitative studies using standardised patient-reported outcomes that evaluate symptoms [mainly pain] and physical functioning (8,10,12,15). In these studies, the recovery process are not clearly described—the context and patients' experience poorly understood. This research aims to avert these shortcomings by adhering to Lee et al. (26) and Allvin et al. (44) recommendation explained earlier in this chapter. These authors stated that the construct of recovery must first be well defined so as to be able to quantify postoperative recovery using reliable and valid measures. Hence, this study

conceptualises postoperative recovery as returning to preoperative levels of PA. This definition is consistent with the defining attribute of recovery as 'returning to preoperative levels of independency/dependency in activities of daily living' as highlighted by Allvin et al. (44). In ambulatory surgery, this is referred to as long-term recovery or the late phase and occurs in the weeks and months after discharge from hospital (44). However, based on the significant decrease in PA observed preoperatively between the 'pre-symptomatic phase' [i.e., historic] and the moment 'at time of surgery' [i.e., before surgery] in their review on returning to PA after knee arthroplasty, Witjes et al. (66) strongly recommended a clear definition of preoperative PA level in future studies to be the 'pre-symptomatic phase' and not the moment 'at time of surgery'. According to authors, it seems most rational that preoperative PA level be based on the phase when the patient was not yet restricted in participating in his or her preferred activity because of osteoarthritic complaints. As a result, the definition of preoperative PA level in this thesis refers to the 'pre-symptomatic' [or historic] phase. Consequently, the rationale of Lee et al. (26), Allvin et al. (44) and Witjes et al. (66) guides the construct of recovery in this research.

The definition of PA adopted for this research is from the UK Chief Medical Officer's guidelines which describes PA as any bodily movement produced by skeletal muscles that requires energy expenditure, extrapolated to include daily activity, active recreation, and sport (35).

1.4.2 Assessing outcomes in THR: patient activity measures

As earlier established in this chapter, the objectives of patients undergoing THR are now changing. Patients not only expect relief of pain and have their general functions restored, but also are interested to know their chances of resuming their active lifestyle or returning to a higher level of activity after joint replacement. Unfortunately, the orthopaedic literature on return to preoperative levels of PA following THR is poorly understood and has received relatively little research (67–69). Systematic reviews conducted on this topic (70,71) can be criticised for their use of physician-based [OHS], generic/disease-specific [SF-36 health survey, and the Western Ontario and McMaster Universities Osteoarthritis Index] or performance-based [accelerometery, pedometer and different stair-climb and chair tests] outcome scores. In general, these scoring systems assess objective parameters and only give information about the limitations that patient's experience. This information majorly tends to facilitate early mobilisation or inpatient recovery which further explains why most rehabilitation interventions post-THR are often focused on reducing hospital stay, pain relief, improving physical functioning and HRQoL (28). As a result, little is known about the effectiveness of the rehabilitation services provided in returning patients to PA (27). Importantly, these instruments do not consider what a patient is actually doing (72). In times of

high postoperative expectations, assessment of patient activity becomes imperative to assess surgical outcome (73). For this reason, activity-rating scales are becoming a key factor to assess the outcome of joint replacement.

1.4.3 Rationale for choice of PA assessment instrument: the University of California at Los Angeles [UCLA] activity level scale

In keeping to Lee et al. (26) recommendation with regards to identifying all instruments that are currently used to measure recovery so as to determine their validity for the context of recovery within specific populations of operative patients as explained earlier in this chapter, Terwee et al. (74) study was assessed. Using the Consensus-based Standards for the selection of Health Measurement Instruments and the Quality Assessment of Physical Activity Questionnaire [QAPAQ] checklists for appraising the qualitative attributes and measurement properties of the various approaches for assessing PA in patients with OA of the hip or knee, these authors evaluated the quality of 12 PA instruments. According to these reviewers, the success of a PA instrument depends to a large extent on its qualitative attributes and so recommended the UCLA activity level scale or Lower-Extremity Activity Scale [LEAS] as the most useful for monitoring PA levels (74). It is for this reason that both instruments were considered as a source of data collection for this study. However, the LEAS was developed for a broad population whilst the UCLA activity level scale for patients undergoing joint replacement. As a result, the UCLA activity level scale was deemed the most suitable for the purpose of this research. This is a simple scale ranging from 1 to 10 that aids the qualitative assessment of activity levels in patients with joint replacement (75,76).

1.4.4 Rationale for the use of the BPS model

As described earlier in this chapter, postoperative recovery is a complex and multi-dimensional process that involves multiple domains, including physiological, psychological, social, and habitual aspects (26,44,45). Assessment of any one dimension while ignoring the others will not fully capture the whole construct of recovery (26). This suggests that in addition to the status of the hip, recovery may be influenced by factors such as psychological states and social influences. Thus, the BPS model will be used in evaluating recovery following THR — the results will elucidate understanding of BPS characteristics that influence recovery. This will be generating vital new knowledge in OT practice regarding the biological, psychological, and sociological aspects to THR recovery as it will aid the therapist in providing targeted evaluation and intervention based on the combination of dimensions that impact on recovery (31). As a result, intervention becomes more

personalised and specialised to each patient rather than a generalised treatment plan intended to rehabilitate varied patient populations.

This model has been variably implemented as an approach to understand relationships with surgical recovery (61), pandemic behaviour in an influenza context (77), work disability after total knee replacement [TKR] (78), impacts of COVID-19 during lockdown restrictions (79) and the scale and nature of the impact on people's lives (80). Each of these studies findings informed proposals for interventions. For example, Garcia et al. (61) introduced novel non-recovery phenotypes for older adults undergoing lumbar surgery, results which provided preliminary data for the development of tailored interventions to improve clinical care and outcomes for this population. Flowers et al. (77) highlighted the duality of psychosocial [e.g., agency, cognitions, and identity] and sociocultural [e.g., social context and capacity] determinants of pandemic behaviour as what should shape future intervention development. According to Maillette et al. (78), a work disability paradigm based on a BPS approach should be considered in rehabilitation when workers experience difficulty returning to work after TKR. The data from Grimwood et al. (79) research showed a negative impact from the self-reported perception of wellbeing from a BPS stance over time. To address these BPS issues, the research implied that a place-based integrated recovery effort is needed, addressing each issue simultaneously. Finally, Stuart et al. (80) findings illustrated that people with a narrow range of BPS characteristics experience a wide range of BPS impacts which are nuanced, complex and dynamic. They proposed an integrated BPS framework for recovery to avoid such further negative outcomes from the pandemic.

The use of conceptual models such as the BPS model to guide intervention approaches will significantly advance the THR field. This means that OTs and surgeons specifically whose role is to encourage PA in this population can be better informed to recognise the dimensions of the model that have a direct impact on recovery and incorporate knowledge in the treatment of the patient.

1.5 Thesis overview

This thesis presents the results from both a systematic literature review [SLR] and an investigative study, undertaken to explore return to preoperative levels of PA following THR from a BPS stance [Figure 1]. This was addressed via the two RQs posed.

RQ 1: What are the potential biological, psychological, and social outcomes predicting return to preoperative levels of PA following THR?

Findings from the SLR informed RQ 2 with regards to the specific population to be studied. Therefore, relating to the key factors influencing PA, RQ 2 was shaped as follows:

RQ 2: What are the key factors influencing participation and/or return to preoperative levels of PA following THR for the treatment of OA as experienced by historic physically active women aged 60 and over?

This first chapter provides an introduction of the topic. This comprises of the background, statement of the problem and the identified gap in knowledge. The conceptual framework and rationale for the research were also described in detail.

Chapter 2 describes the belief system or research paradigm that informed the choice and development of the methodology used for this research. This includes an explanation and rationale for choosing an interpretive phenomenological approach [IPA].

Chapter 3 contains study 1, a systematic review and synthesis of the current literature related to the effectiveness of THR in returning people to their preoperative levels of PA, and the perceived barriers and enablers. Thus, creating the foundation for which the investigative study [study 2] presented in this thesis was developed.

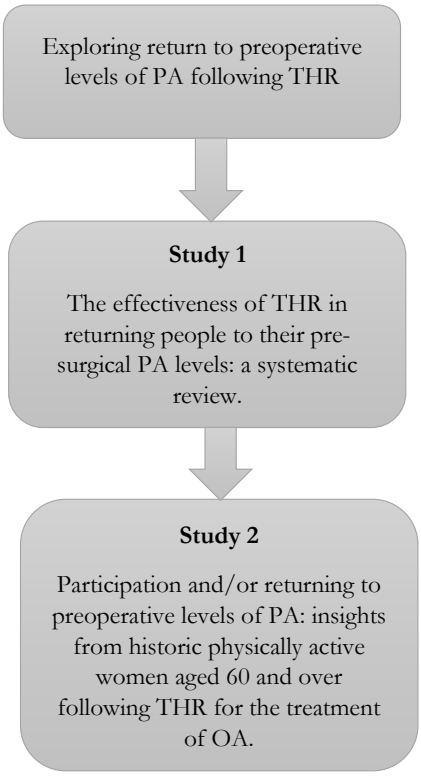


Figure 1. Overview of studies in this thesis

Chapter 4 contains the methods utilised for study 2 of the research. It presents the aims, details of the design and methods utilised. This also include the ethical considerations made.

Chapter 5 presents the findings from study 2 of the research. Written descriptions of interpretations and quotes from the participants are presented to illuminate the findings. Subsequently, a case study utilising the BPS model was used to summarise findings.

Chapter 6 discusses the findings from study 2 alongside existing research and theory. This comprised the exploration of similarities and differences.

Chapter 7 presents the concluding section of the thesis with an integrate discussion of the results of the SLR [study 1] and investigative study [study 2]. The main contributions of each phase were highlighted along with the overall contribution of this research − a proposed set of guiding principles that can support the development and implementation of targeted evaluation and interventions aiding postoperative recovery − return to preoperative levels of PA following THR. Limitations, implications and recommendations for future research and practice were discussed briefly in this chapter along with concluding statements.

CHAPTER 2

Methodology

2 Chapter overview

This chapter presents the methods used in this research and will provide an explanation of the belief system or research paradigm that guided research project. The RQs will be presented along with the overarching methodology and rationale used as it relates to the primary study. The final section concludes the chapter and provides a brief summary of the above information.

2.1 Philosophical position

Scholars advise that researchers undertaking research should be open about the philosophical positions, assumptions and beliefs used to guide their research (81,82). It is argued that philosophical positions are driven by the researchers' beliefs about the nature of knowledge and how knowledge can be acquired (81). That is, their ontological and epistemological perspectives.

Ontology relates to the beliefs and assumptions one holds about the nature of reality (83). My approach to this thesis is one that assumes that multiple versions of realities (ontology) exist, which are diverse, complex and extend beyond simply identifying the cause and effect of a phenomenon (81). That is, like Moore (45), I recognise that postoperative recovery is a complex and multi-dimensional process that involves the interlocking of multiple domains, including biological, psychological, and social aspects. This begins with a health condition or even slightly before the condition i.e., OA which is the major indication for THR and terminating only when the individual return to normal physical well-being, social and economic usefulness, and psychological habitus. OA is a chronic degenerative musculoskeletal disorder that is associated with pain, decreased function, and disability (84). Various psychological and social factors have been implicated as barriers of PA for people with hip OA. This include beliefs, lack of motivation, OA-related distress, and resigned attitude (85), higher body index, increased comorbidities, and lower mental health (84). Therefore, assessment of any one dimension while ignoring the remainder will not fully capture the whole construct of recovery (26). For example, consider a physically active patient who undergoes THR. At the routine 6-weeks postoperative visit, the patient reports no major physical symptoms, but is unable to resume normal physical or sporting activities because of lack of motivation and resigned attitude which negatively affects the patient's psychologic and social domains. In this case, focusing only on the physical domain and ignoring the other domains will incorrectly describe this patient as 'recovered' from surgery. Furthermore, each patient brings a unique combination of injury and sociodemographic characteristics, biological predispositions, and comorbidities to the rehabilitation setting that can impact recovery.

Epistemology relates to the belief one holds about how knowledge is generated (81). I hold the view that knowledge can be acquired and generated in a number of ways. This is similar to Creswell

(86) who explored the idea that more than one inquiry paradigm be used in an attempt to provide a greater appreciation and understanding of what is being studied and the practicalities experienced. This approach allows researchers more flexibility in choosing research methods with less of a focus on those that remain consistent with a particular theoretical orientation and more about choosing the method that can best address the RQs or problem being addressed (86). This thesis has been approached from this practical standpoint and is therefore most appropriately aligned with a pragmatic perspective.

2.1.1 Pragmatism

Pragmatism is a set of ideas articulated by historical figures such as John Dewey, William James, and Charles Sanders Pierce, to contemporaries such as Cherryholmes (87) and Murphy (88). It offers a credible alternative to the two predominantly existing traditions of the positivist and interpretative approach to research (81,89). The positivist ontological and epistemological position assumes that there is one reality that can be measured objectively, one truth which can be obtained – the knower and that which is to be known or observed and should be independent (90). It is also assumed that biases can be eliminated, and claims made towards generalisation. In contrast, the interpretivists dismiss the positivist philosophy and uphold the assumptions that multiple versions of reality exist, which are subjective, and peoples' experiences of these realities are diverse (90). Furthermore, the interpretivist believes that it is impossible to separate the knower from what is known and/or observed. Considering both traditional perspectives about the nature of reality and how knowledge is acquired, pragmatism bridges the gap between these two distinct perspectives.

The pragmatic perspective does not require the research to be classified as purely quantitative or qualitative in nature with either a positivist or interpretive philosophy, but instead, allows for the use of both qualitative and quantitative research approaches to collect information and make inquiry into various complex phenomena (91,92). In other words, the pragmatic perspective allows for a balanced point between the deductive and inductive perspectives of thinking, which offers practical answers for merging different paradigms (91). Therefore, where the use of either quantitative or qualitative approaches does not completely address the research problem or question, the pragmatic approach provides the justification and rationale for combining methods, allowing for a combination, mixing of methods, or mixed methodology, which may be the more appropriate for answering the RQs (91,93). Within mixed methodology, the mixing of more than one research method [described as multiple methods, rather than mixed methods] allows for the adoption of data collection and analysis methods that may provide greater insight into the research

problem (94–96). From the pragmatic perspective, instead of the method being dominant, the research problem or question is viewed as the most important concern (91) and provides the rationale for the choice of approach.

Pragmatism was adopted as the philosophical underpinning of this thesis (81,87,89,93,97) due to its key characteristics. Pragmatism asserts that there are multiple ways of knowing or seeking knowledge (98). Knowledge obtained therefore might be co-constructed as well as shaped by the experience of the world and interactions with the world in which one exist (81,89). Pragmatism focuses on using the most appropriate tools to answer the RQs (98); it is practically based, outcome directed, and methods utilised by the researcher are used to complement each other (89).

2.1.2 Operationalising pragmatism in mixed methods approach

The purpose of this thesis is to propose a BPS analysis of postoperative recovery in THR to elucidate understanding of the BPS characteristics influencing recovery. Postoperative recovery having been conceptualised as return to preoperative [i.e., 'pre-symptomatic or historic phase'] levels of PA. Thus, the information sought required the application of different research methods in order to accurately understand both the empirical evidence and the participant experience. The adoption of the pragmatic perspective and mixed methodology approach appeared best suited to support the research process necessary for understanding the 'what', 'why', and 'how' of this particular phenomenon (99). In other words, the mixing of methods was chosen in an attempt to allow for the use of the most practical methods to address the research problem or question. Also, intentional mixing of different methodological approaches can be done at different levels within a single study (81,82). Whilst pragmatism was utilised and deemed the most appropriate philosophical position that suited my ontological and epistemological approach to this research, two points must be acknowledged. The pragmatic approach is fundamentally pluralist and primarily driven using the best-suited approach to answer the RQs (89). As such, the focus and decisions made in this thesis were not driven specifically by which philosophical position should be taken but by determining the best approach needed to address the RQs.

2.2 Overview of methodology

This thesis addresses two RQs, the results of which are designed to manage patients' expectations and provide healthcare professionals [HCPs] and other key stakeholders, specifically OTs with preliminary evidence to inform assessment and interventions for THR patients. The temporal sequence of this research along with the methods used is presented in Figure 2. The results generated from each method collectively contribute to the overall purpose of this research.

Study 1 was conducted via a SLR [discussed in chapter 3], answering the first RQ: "what are the potential biological, psychological, and social outcomes predicting return to preoperative levels of PA following THR?". The SLR was based on the available evidence on postoperative recovery, specifically the barriers and enablers. As previously discussed in chapter 1, this research was guided by the BPS model in that the SLR results were organised and presented to reflect the BPS concepts. This also allowed for the development of a BPS representation of all aspects of the patient's life that either served as barriers or enablers to returning to preoperative levels of PA following THR.

Informed by the SLR, study 2 answered the second RQ: "what are the key factors influencing participation and/or return to preoperative levels of PA following THR for the treatment of OA as experienced by historic physically active women aged 60 and over?". This involved an IPA study examining their recovery experience from the pre-OA [i.e., pre-symptomatic or historic] timepoint through to post-surgery, with particular attention on lived PA experience. Postoperative recovery was assessed using an activity measure tool – the UCLA activity level scale [described in chapter 1]. The themes that emerged from this study along with previous results from study 1 were synthesised into a BPS framework that potentially can support the return to preoperative levels of PA in women aged 60 and over following THR. This study is described in more detail in chapter 4.

2.2.1 SLR

SLRs provide a comprehensive overview of literature related to a RQ and synthesises previous work to strengthen a particular topic's foundation of knowledge, while adhering to the concepts of transparency and bias reduction. SLRs originated in the health care field where it is assumed that medical practice is based on scientific evidence (100–103). Medical research aims to provide practitioners evidence-based practical knowledge (104). However, for practicing physicians, consuming a large volume of medical studies, which are sometimes contradictory, is challenging (105). Therefore, the NHS promoted an approach aimed at holistically and systematically consolidating studies related to a particular medical question (106) and "collating the findings and presenting them in a way that was accessible and relevant to decision-makers (p. 209)" (107). As revealed in Williams et al. (108) paper describing SLRs, there are many SLR definitions, all generally consistent. However, the definition by Briner and Denyer (100) aligns more with the purpose and sequence of this thesis. According to authors, a "systematic review addresses a specific question, utilises explicit and transparent methods to perform a thorough literature search and critical appraisal of individual studies, and draws conclusions about what we currently know and do not know about a given question or topic (p. 112)." A SLR seeks all relevant literature in a detailed and

planned process aimed at addressing specifically stated RQs. They explicitly and transparently state the search process applied and criteria for inclusion. SLRs synthesise knowledge from existing literature in a manner aimed at reducing bias and producing holistic conclusions.

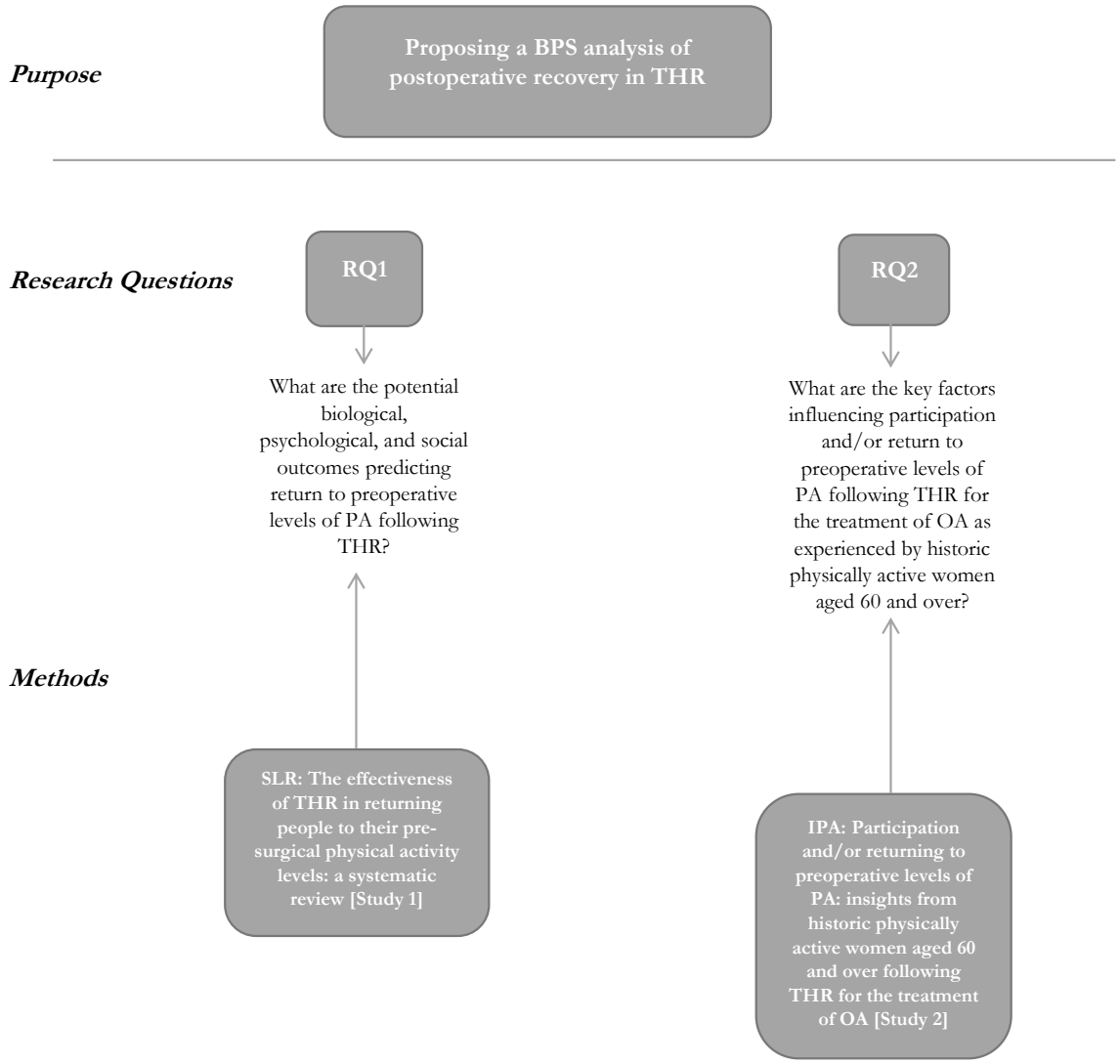


Figure 2. Overview of the sequence of studies

On the other hand, traditional reviews [also referred to as 'narrative reviews'] aim to provide a foundation for hypotheses in a particular study (104). This focus may limit what literature is sought and applied, potentially prompting bias (109). In choosing articles to include, authors conducting a traditional review may 'cherry-pick' literature, including studies primarily supporting their hypotheses (100,109). In contrast, SLRs try to answer RQs from a holistic examination, assessing and unravelling all applicable research, and seeking to synthesise prior work (104). Through exhaustive literature searches, transparent reporting, and replicable and explicit processes, SLRs strive to avoid bias often present in traditional reviews (102,107). Furthermore, whilst traditional

reviews rarely share the search methods applied to identify relevant articles, SLRs specifically and transparently report what search steps were engaged (107).

2.2.2 IPA

The choice of IPA for this study was based on its multifaceted approach. The combination of phenomenology, interpretation [hermeneutic] and idiography (110) is consistent with my pragmatic viewpoint i.e., allowing for a combination of methods which may be the most appropriate for answering the RQs.

Phenomenology focuses on peoples' perceptions of the world or the perception of the 'things in their appearing' (111) and is often defined in terms of the study of phenomena as people experience them − human experience in his or her life (112). The findings – or outcome – of this type of study is a collection of descriptions of meanings for individuals of their lived experiences; experiences of concepts or phenomena (113). The descriptions will usually appear as written phrases or statements that represent the meaning that a person – a study participant, for example – attributes to a related experience (110). This approach views individuals and the world as a reciprocal relationship in which they both exist and are mutually understood. Consequently, the best understanding of a phenomenon achievable is by interpretation only. In other words, meaning for the individual will always be influenced by the external world and will always be subject to previous or fore-understandings. For this reason, I intended to gain insights into the women's experience of PA before [from pre-symptomatic] and after THR because changes in lifestyle that occur over years of living with OA pain have previously been reported to impede a 'return to normal' (114).

Hermeneutic phenomenology does not accept that phenomenological reduction [bracketing of prior knowledge] is possible. Rather, Heidegger [the main proponent] formulated phenomenology as an interpretative activity. The interpretation theory suggests that there is a perspective in research data which arises through detailed and systematic analysis. This result generates insights which exceed and subsume the explicit claims of participants (110). The researcher, therefore, is inextricably linked with making possible the appearance of the meaning while also making sense of it. Having initially conducted a SLR [Study 1, chapter 3] which in turn informed this study, I agree completely, and is a vital reason for the choice of IPA in the first place. The theory of interpretation, or hermeneutics suggests that a phenomenon appears through clues in the text which are integrally connected to that which might otherwise be latent or not overtly present in the text. Engaging with the text for Heidegger helps the analyst to facilitate the showing of the phenomenon and allows meaning which is otherwise hidden to appear. In analysing text in detail,

the researcher can discover that which lies dormant, whether the participant who provided the text or data is conscious of this or not. This interpretation will offer a fine-grained understanding that can be used to contextualise existing quantitative research [i.e., study 1] and inform understanding of novel and under-researched topics (115). The theory of interpretation therefore fits perfectly into this study, as it is focused on a subset of the THR population identified as requiring further probing.

The third significant influence upon IPA is idiography – its concern with the particular. This is in contrast to the mainstream inquiry of psychology which is working with "nomothetic" approach (110). Idiography means an in-depth analysis of single cases and examines experiences in their unique contexts (116). This is not a focus on the individual per se but rather, on the actual experience for that person in a specific context. IPA's commitment to idiography operates at two levels: [1] the particular in the sense of detail and the depth of the analysis [2] how the experience is understood from the perspective of particular people in a particular context. As a result, a purposive sample is suggested, which means recruiting participants who could offer insight into a particular experience and provide access to a particular perspective. That is why the homogenous sample is beneficial and recruiting participants for whom the RQ is relevant [participants who have personal experience of the phenomenon] is inevitable. Subsequently, IPA works with small and homogenous sample size, enabling the examination of each case in great detail (110,117). A default sample size is 3-6 participants which according to Smith et al. (110) is enough to discover similarities and differences across the cases. At the same time, IPA does not eschew generalisations but presents a different way of establishing those generalisations (110). By utilising IPA, the researcher could study group of individuals by moving between essential themes of the analysis and present examples from the individual narratives (116). Whilst recommending caution, phenomenology additionally allows examination of similarities and differences across cases. This examination it is suggested produces fine-grained accounts of patterns of meaning for participants reflecting upon a shared experience (110).

The assumption so far is that experience is a commonly understood concept. However, this is not as straightforward as it might first appear. The next section will discuss the meaning of experience as it is understood in relation to phenomenology and this study.

2.2.2.1 Lived experience for IPA

Lived experience for IPA reflects a fundamental distinction of awareness which is more than just passing but rather is asserted. Experience is said to be lived and thus can be reflected upon. The idea of reflection is central to the understanding of experience and to the practice of research in

phenomenology. Lived experience is encapsulated in phenomenology by describing a sequence of layers, each representing an increased degree of reflection (110):

(1) The first layer is based on Sartre's immediate flow experience that involves a minimal level of awareness or pre-reflective reflexivity.

(2) The second involves intuitive, undirected reflection including daydreams, imagination, and memory.

(3) The third layer, involves attentive reflection and occurs when an experience becomes something of importance, is registered as significant and requiring attention.

(4) Finally, there is deliberate controlled reflection in which there is a formal analysis of pre-reflective reflections on past events.

These layers present what is referred to as the bandwidth for the individual when doing their reflections by themselves (110). The researcher enters this so-called reflective loop of the individual, enabling them to provide an account of their reflections. Thus, when being interviewed the individual will recount some reflection which they have already done, but the researcher will ignite new reflections − some relatively unconscious or, layers two and three, and some deliberate, or layer four. In research terms the researcher conducts the full, layer four i.e., a formal reflective phenomenological analysis on the transcript which is a record of the participant's layered set of reflections (110).

In this study, I was able to enter into the reflective loop by the prompting of recall and reflection via two research techniques – a semi-structured interview and postoperative recovery assessment. Firstly, for data collection, semi-structured or unstructured interviews are the most suitable since the aim of an IPA study is to examine how the participants talk about and make sense of their experience (118). During the interview, I facilitated comfortable interaction that enabled the participants provide detailed accounts albeit using a topic guide [see Appendix 5] as prompts to stay focus on the phenomenon. This was employed by asking open-ended and process-oriented questions focused on the personal interpretation of their experience and how they perceived themselves during this experience. The topic guide also followed the narrative flow of the participant's account (110) which meant that the interview was flexible and adaptable. The participants were invited to introduce new topics and/or issues into the interviews. This manner of interviewing is in line with IPA and described by Larkin & Thompson (119).

Secondly, recovery was assessed using an activity measure tool – the UCLA activity level scale [described in chapter 1]. The UCLA is a simple scale ranging from 1 to 10 that aids the qualitative

assessment of activity levels in patients with joint replacement. The descriptive activity levels ranges from inactive or restricted to minimum activities of daily living [level 1-2], participating in mild activities such as walking, limited housework, and limited shopping [level 3-4], moderate activities such as swimming, brisk walking, and bicycling [level 5-7], or active events such as golf, bowling, or impact sports [8-10]. This assessment provided the participants the opportunity to self-report and reflect on their PA levels before surgery [at pre-OA i.e., pre-symptomatic/historic phase and at time of surgery] and after surgery. Supplementing the interview data with this second method is in line with the conceptualisation of postoperative recovery [as detailed in chapter 1] for this study and the mixed methodology approach discussed previously in this chapter. Further details are presented in chapter 4 of this thesis.

2.2.3 Overview of philosophical position in relation to thesis studies [SLR and IPA]

This thesis is underpinned by my philosophical belief that multiple versions of realities [ontology] exist. Due to their diverse and complex nature, knowledge needs to be acquired and generated in a number of ways [epistemology]. As already established [in chapter 1], postoperative recovery is a complex and multi-dimensional process which suggests that in addition to the status of the hip, recovery may be influenced by factors such as psychological states and social influences. This informed the two RQs posed, and also the approach in which knowledge will be generated thereof. RQ 1 was answered using a SLR [study 1], however limited by the quantitative nature of studies, a detailed insights capable of exploring in-depth all of the BPS outcomes as they act on the recovery process from an individualised perspective was lacking. Here, the justification of my practical standpoint is emphasised i.e., generating knowledge using more than one approach. As a result, an IPA study was sought to answer RQ 2 aimed at gaining deeper understanding from the perspective of women aged 60 and over – a subset of the THR population the SLR revealed required more probing [study 2]. IPA was deemed most suitable because of its multifaceted approach − allowing for a combination of methods [phenomenology, interpretation and idiography] for answering the RQ. Another significant influence upon IPA is the concept of experience which is said to be lived and thus can be reflected upon. This assertion is central to the understanding of experience and to the practice of research in phenomenology. This enabled me entering into the reflective loop by the prompting of recall and reflection via two research techniques – a semi-structured interview and postoperative recovery assessment. The former facilitating the examination of how the women talked about and make sense of their experience and the latter, enabling assessment of their recovery profile using an activity measure tool – the UCLA activity level scale. Since IPA works with small and homogenous sample size, it enabled me to examine each case in great detail [one of which is presented in chapter 5 as a case study], study the women as a group by moving between

essential themes of the analysis and present examples from their individual narratives. Importantly, the choice of IPA was a cumulation of its suitability to my ontological and epistemological standpoint and alignment with the pragmatic perspective. The pragmatic approach places more value on using the best-suited approach(s) to answer RQs rather than a theoretical orientation.

2.3 Critique of IPA and alternative approaches

This section of the chapter details the two methodological approaches that were considered for this study, and the justification for IPA as the choice.

2.3.1 Grounded theory

Grounded theory [GT], and in particular constructivist GT was a potential methodology for this research. This is not unusual according to IPA proponents who describe it as the main alternative (110) as GT focuses, just as IPA does, on the individual. However, the focus is on how the individual constructs and make sense of the world, or their reality and in turn a theory emerges as constructed by the researcher. I do not necessarily view research participants in this way, but rather as individuals engaged in making sense of their experience generatively and I in turn as the researcher aiming to make sense of it. The research was more focused on exploring personal and personalised experiences. GT on the other hand seeks to explain social processes (120) and to inquire about how social structures influence how things are accomplished through a given set of social interactions (121). There were also practical considerations against using GT i.e., commitment to theory. For example, a similar thesis (122), albeit in younger active women found this approach suitable because the purpose of the research was to illuminate the lived experience of these women as they undergo THR to develop a substantive grounded theory of recovery. Furthermore, whilst both methodologies [IPA and GT] initially use purposive sampling to recruit participants who have experienced the studied phenomenon, GT also uses theoretical sampling. The researcher adds further individuals to the sample to explore the found theory until theoretical saturation is reached. Whilst this does not happen at an exact point, sample sizes therefore tends to become larger. IPA focuses on the particular individual in a particular context and a detailed account of their experience is said to be sufficient. Furthermore, approaching the research topic without the researcher being aware of the theory which already exists about that topic is a purist approach to GT and echoes the attempt in IPA [descriptive phenomenology] to bracket or adopt a phenomenological attitude. The suggested effect of theoretical sensitivity is that the researcher is not influenced by any prior knowledge of theories, so therefore will only see what is in the data, be open minded about the data, and to any emerging categories and subsequent theory generated from it. For most commentators [myself included] this approach is unrealistic. Whilst Charmaz

agrees that to delay a literature survey is an agreed technique in GT, she [like me] is also pragmatic in her view that a researcher's disciplinary and theoretical proclivities shape the collection, content, and analysis of data (123).

2.3.2 Descriptive phenomenology analysis

The focus of descriptive phenomenology is the correlation of the noema of experience [the 'what'] and the noesis ['how it is experienced']. Once 'the things themselves' have been identified, or otherwise analysed, descriptive phenomenology considers its work done (110). The researcher can then do whatever with the outcomes, but those actions will be a departure from descriptive phenomenology (148). Berg et al. (124) used this approach to explore day surgery patients' different perceptions of postoperative recovery. Since performing a phenomenographic analysis means that the data are handled as one set to achieve descriptions related to the group of respondents rather than separate individuals, the authors deemed this approach suitable. For their study therefore, this implies descriptions of various ways people perceive postoperative recovery following day surgery, ordered in different categories. Also, reflexivity often mentioned in hermeneutic phenomenology is where the researcher uses empathy or relevant prior experience as an aid to data analysis and/or interpretation of meanings. This has no place in descriptive phenomenology. As a matter of fact, reflexivity in descriptive phenomenology is antithesis to the principle of bracketing out influences on the phenomena so that they can be seen as 'the things themselves' (110). This approach lacks an interconnection between the researcher and the data as it requires the researcher to bracket previous experiences and knowledge (125) which have already been established as unrealistic. This study was more suited to the explicit incorporation of the hermeneutic in IPA as it is one approach that recommend to the researcher to interpret the meanings found in relation to phenomena (110).

2.4 Justification for IPA

Understanding the theoretical underpinnings of qualitative research approaches including phenomenology, was fundamental to my decision about what methodology is a best fit for this research. However, the decision was based on my pragmatic belief system [discussed earlier in this chapter]. IPA as described so far convincingly addresses the RQs. Rather than attempting to capture the essence of a phenomenon, IPA more humbly aims to capture particular lived experienced of a particular group of people. In addition, there is an emphasis on the convergence and divergence between participants (110). This study explored the experience of women, explicitly aged 60 and over who have undergone THR for the treatment of OA. The aim was to examine their lived experience of PA [before i.e., pre-OA + at time of THR and after THR] and the sense

made of it i.e., returning to preoperative levels, specifically the influencing key factors. In a review of studies reporting the use of IPA as their methodology, the predominant subject area was found to be illness experience (126). The details of the conditions examined ranged from chronic pain, neurology, heart disease, chronic fatigue syndrome, cancer, dermatology, arthritis, and urinary problems. A 'good' quality arthritis study cited was Turner, Barlow, and Ilbery (127) interviewing 12 ex-professional footballers who developed OA. The men were shown reflecting on how the demands of their past activity likely led to their current condition. The study was able to capture the impact of OA restricted mobility on individuals whose identity was bound up with an excellence in this domain. The reviewer, also the methodology's progenitor, acknowledges that it is not surprising illness experience is a major subject area in IPA studies given that the methodology established itself first in health psychology and illness which makes it an important area within health psychology (126). This claim mirrors an earlier evaluation using a literature search of published studies in the area of health psychology (128). Furthermore, Reid et al. (129) reckons that IPA's increasing popularity within health psychology may well stem from its ability to contribute to BPS perspectives. Identity and emotional experience are said to be the main constructs which have emerged in IPA studies to date (110). As such, it is especially suited to studies that aim to relate findings to BPS concepts that dominate current thinking within the healthcare professions (120,130,131) such as this. For this reason, IPA is thought to have more impact at a scientific level and is increasingly accepted in healthcare research (128).

2.5 Chapter conclusion

This chapter provided the research paradigm that guided the research including an overview of the methodology and a brief description of the main methods used throughout. This research was undertaken based on a pragmatic perspective and therefore the research methods used reflect the approach best suited to answer the RQs rather than a theoretical orientation. The chapter introduces the two studies that collectively contributed to the overall purpose of this research – a SLR [study 1] which informed an investigative study [study 2]. Having explored some of the different phenomenological research and alternative methods, IPA was chosen as the methodological approach to structure the data analysis in study 2. The next chapter presents study 1 of this thesis.

CHAPTER 3

Study 1 — The effectiveness of total hip replacement in returning people to their pre-surgical physical activity levels: a systematic review

3 Chapter overview

This chapter discusses the relevant literature on the topic and presents the findings from a systematic review of the effectiveness of THR in returning people to their pre-surgical physical activity levels. Pre-surgical is used interchangeably with preoperative, pre-THR and pre-op. The first section of this chapter provides a rationale for, and overview of the method employed in conducting this review. The next section presents the findings from the eligible literature and identifies areas that need further investigation. The concluding section provides a summary of the chapter and highlights the results of the review used to inform the investigative study for this thesis.

3.1 Introduction

According to the NJR, THA or THR is one of the most successful and commonly conducted orthopaedic operations in the UK (1). The number performed between 2019 to 2021 alone accounts for 18% of the current registry volume (3). The cost to the NHS is considerable - a single hip replacement can cost between £5,000-12,000 depending on the complexity of the procedure (4).

One of the most severe and important preoperative complaints of patients undergoing THR is difficulty with recreational activities (132). This is not surprising as the demographics of patients undergoing THR have shown to have changed compared with decades ago. Studies indicate that more physically active patients are currently now undergoing THR (133,134) and is the reason why the ability to return to PA (19,21–23,135) or likelihood of recovering their preoperative level of sport activity (136) is of great concern. Consequently, a major patient expectation following THR is recovering valued activities (25), and the desire to return or continue on a high level of activity (19,23) such as a sport that has been stopped due to an arthritic hip (20,24). This is confirmed by a recent study by Ponzio et al. (134) which reported that 74% of active patients expected to be "back to normal" regarding ability to exercise and participate in sports. Likewise, Hobbs et al. (25) in their cohort study across 12 European countries with 1,108 participants, most of whom reported expecting THR to enable them carry out valued activities rather than reversing impairments.

It is therefore essential that people undergoing THR are well informed about potential postoperative recovery to avoid false optimism with their expectations. False optimism with unrealistic recovery expectations according to prior literature referred to patients who expected to be as able-bodied as their premorbid state (137), regain normal functioning (138), achieve recovery quickly and return to work and leisure pursuits again (139). This was despite the fact that some leisure activities, e.g., fell walking may have not been undertaken for a while prior to having surgery

because of OA symptoms (139). Noteworthily, studies on TJRs have found fulfilment of expectations to be consistently associated with patient satisfaction (140–144) and those whose expectations were met having greater gains in HRQoL than those who did not (142). Therefore, for a patient who have the expectation of returning to PA following THR, the inability to achieve this may potentially result in dissatisfaction. This highlights the importance of assessing joint replacement outcomes from the patient perspective as it is vital to today's patient-centred models of care (145).

The effectiveness of THR in fulfilling patients' expectations of returning to PA is yet to be established. The literature that does exist either reports on lower limb arthroplasties (146), or have focused on sports and work participation (147). The sparsity of published research on this topic has prompted significant variations in surgeons' advice to patients about return to PA after surgery (24,148). For instance, most recommendations on this topic are based on personal experience, preference, or opinion of individual orthopaedic surgeons (149,150). Given the lack of evidence-based information, many of the guidelines available in the literature are a variation (151,152) of the recommendation originally published by Healy in 2001 and updated 2008 following a survey of the Hip Society members (68,153) published over a decade ago. A survey of the British Hip Society was recently published but reported on the recommendations for returning to sports after THR specifically in young active patients (154). Peculiar to the existing guidelines is that they provide no recommended time periods. To mitigate these shortcomings, the European Hip Society (150) recently published their first guideline regarding sport activities after THR but this is also limited by the relatively small number [30.6%] of hip arthroplasty surgeons surveyed.

The uphold of an active lifestyle or regular PA has several general health benefits as it helps to prevent and manage over 20 chronic conditions (38), develop and maintain physical and mental function (35) and is linked to a reduction in all-cause mortality (38,39). It is thereby important to ensure that the effectiveness of THR in relation to enabling people maintain or return to PA are a good use of health and societal resources. To facilitate this, it is important to understand people's PA behaviour before and after THR, and what could potentially influence changes following surgery. As established in chapter 1, postoperative recovery may be influenced by factors other than physiological i.e., the status of the hip, such as psychological states and social influences.

Thus, this study addresses the first RQ 1 posed in this thesis: "what are the potential biological, psychological, and social outcomes predicting return to preoperative levels of PA following THR?". The purpose of which is to describe people's PA participation and activity levels pre-and

post-THR, so as to [1] ascertain the effectiveness of THR in returning people to their preoperative levels and [2] identify the perceived barriers and enablers.

3.2 Method

In accordance with the preferred reporting items for systematic reviews and meta-analyses [PRISMA] guidelines (155), this systematic review protocol was registered with the International Prospective Register of Systematic Reviews [PROSPERO] on 14 June 2019 [registration number: CRD42019137388].

3.2.1 Operational definition of PA

In line with the review protocol, the definition of PA that was used in this review is: "all forms of activity such as everyday walking or cycling to get from A to B, active play work-related activity, active recreation, dancing, gardening, or playing active games, as well as organised and competitive sport", as defined by the Chief Medical Officers in their report on PA (156). A newer version of this report is now available defining PA as: "any bodily movement produced by skeletal muscles that requires energy expenditure, extrapolated to include daily activity, active recreation, and sport" (35).

3.2.2 Search strategy

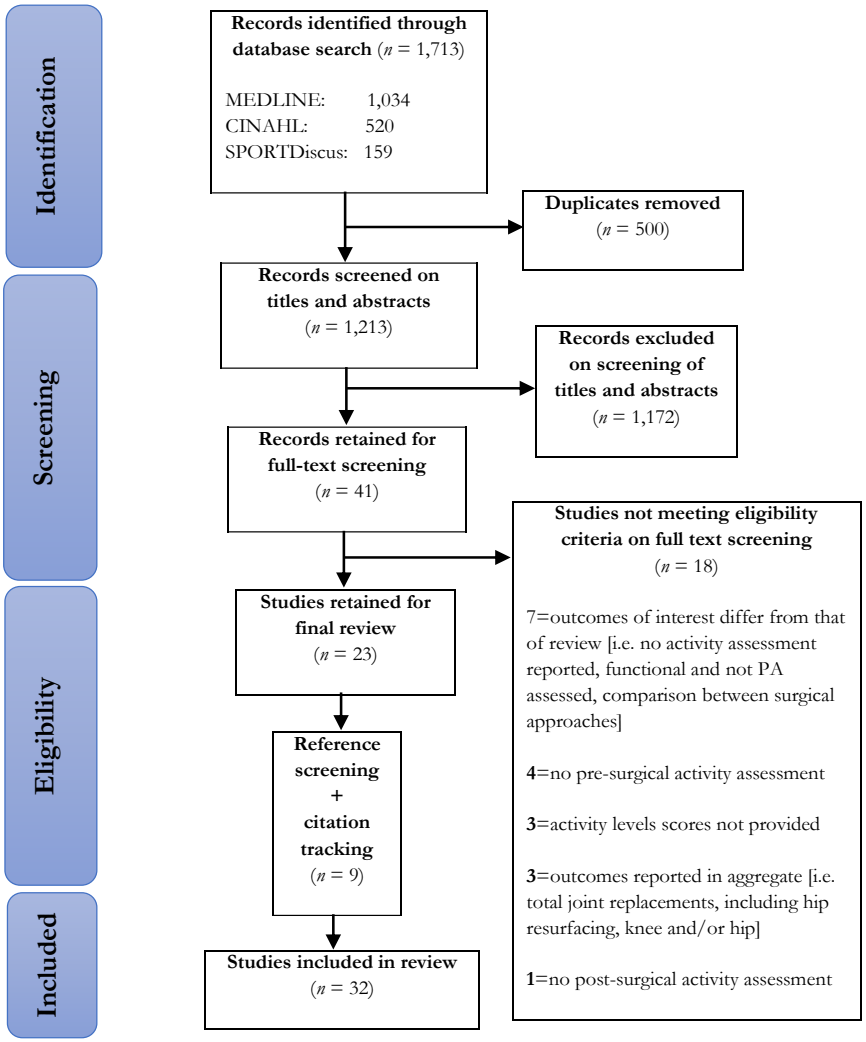
A literature search of MEDLINE, CINAHL and SPORTDiscus databases was conducted via EBSCO. The choice of these databases was based on their direct relevance to the health care and research area. Searches were performed from database inception to 21 January 2020. Four categories of keywords [and related synonyms] were used to build a search strategy and provide a systematic search: 'hip arthroplasty', 'physical activity', 'sports' and 'recovery'. A combination of medical subject headings [MeSH] terms and free text [specific to each database] was used to search for relevant studies. The search terms were truncated using the * symbol to find all terms beginning with a specific word. Within each keyword category, the different synonyms were combined using the Boolean command OR, and categories were linked with the Boolean command AND. The exact details of the search strategy conducted for CINAHL is included in Appendix 1.

3.2.3 Eligibility criteria

The search results of all separate databases were combined, after which duplicates were removed [Figure 3]. Titles and abstracts of the remaining articles were screened against the inclusion criteria based on the Population, Intervention, Comparators and Outcomes [PICO] model by Cochrane Handbook for Systematic Reviews of Interventions (157) plus study design [Table 1]. Where titles and abstracts met or appeared to meet the inclusion criteria, the full text was obtained to determine

eligibility for inclusion in the review. This process was verified by one of my supervisors who reviewed a third of the papers. No restrictions were placed on language or publication year.

Figure 3. Flow chart depicting the search process in identifying suitable papers for analysis [Adapted from PRISMA guidelines for systematic reviews]



Studies which did not meet the criteria at this stage were noted along with the reason for exclusion [Table 1]. Review articles were excluded but their references were checked for additional studies that were not identified in the primary search. Though a mixed-methods synthesis methodology was planned, no qualitative study met the inclusion criteria specifically reporting on participants PA level pre-surgery. This did not allow for recovery to be assessed or comparation made post-surgery. Therefore, reported below are the data extraction, quality assessment, data synthesis and findings of the included quantitative papers.

Table 1. Inclusion and exclusion criteria used to assess eligibility of the articles.

PICOS item[s]	Inclusion Criteria	Exclusion Criteria
Population	Human population. Participants aged >18 years.	Animal studies. Participants aged <18 years.
Intervention	Total Hip Replacement [also known as total hip arthroplasty], one of the most commonly performed orthopaedic operations in the UK.	Other lower-hip surgery [e.g. unicompartmental arthroplasty, hip resurfacing] or revision of primary total hip replacement.
Comparators	Participants pre-surgical physical activity levels. This may include any pre-surgical activity level benchmark [e.g., pre-symptomatic, lifetime, at time of surgery, several years, months or weeks before total hip replacement].	Articles not describing or reporting on participants pre-surgical activity levels.
Outcomes	• Return to physical activity rate following total hip replacement, preferably described as percentage [and number], duration, frequencies and levels [low, intermediate or high impact]. • Subjective measure of physical activity levels such as the University of California Los Angeles [UCLA] activity score, the Grimby scale, the Tegner score, the Lower-Extremity Activity Scale [LEAS], and the Naal sports questionnaire. • Time to return to physical activity after total hip replacement. • Barriers and enablers to returning to physical activity following total hip replacement. This will also include attitudes and beliefs towards physical activity, preferences for type/level of physical activity and the reason [s] why. • Patient-reported outcomes [e.g. motivation for undergoing total hip replacement; expectation[s] for surgery and/or physical activity; satisfaction with surgery and/or physical activity].	Articles not reporting any of the established outcomes.
Study design	Primary research. Qualitative or quantitative study designs.	Systematic reviews, meta-analysis, opinion pieces [e.g. comments, editorials, letters].

3.2.4 Data extraction

Data extraction was performed using a pre-formulated standardised data extraction form. Data extracted included: [i] study information: author, year, country; [ii] study design and follow-up; [iii] information about study population: cohort, population size, sex, age, body mass index [BMI],

comorbidities, diagnosis or indication for surgery, motivation for undergoing surgery, time between the onset of symptoms and THR, surgical approach, implant information; [iv] description of rehabilitation protocols used; [v] outcome measures used to assess PA; [vi] pre-operative activity and definition, e.g., pre-symptomatic or at time of surgery; [vii] post-operative activity; [viii] return to PA percentages and time to return to PA; [ix] confounding factors taken into account in the study, such as sex, age, BMI, motivation, surgeon's advice, pre-operative sports participation, complications and implant survival.

3.2.5 Quality assessment

The risk of bias of the studies was assessed using the Quality in Prognosis Studies [QUIPS] tool (158). This quality assessment method considers six domains of potential biases: [i] study population [ii] study attribution [iii] prognostic factor information [iv] measurement of outcomes [v] measurement of and controlling of confounding variables and [vi] analysis approaches. The details of the issues in the domains to be scored can be found in Appendix 2. In domain 2, a minimum follow-up period of 12-weeks was agreed upon as it coincides with the standard clinical review by which time most patients undergoing THR would have experienced a large improvement in pain and function (9). For domain 4, it was determined a priori that the definition of 'preoperative PA level' is an important issue and should stand alone with special attention to the description as 'pre-symptomatic' phase. This decision was based on Witjes et al. (66) recommendation that the 'pre-symptomatic' phase – when a patient is not yet restricted in participating in their preferred activities because of osteoarthritic complaints should be the definition of preoperative PA level. This decision also adheres to the conceptualisation of postoperative recovery as returning to preoperative levels of PA utilised in this thesis and discussed in chapter 1.

The issues per domain were scored as 'yes', 'no', 'partial' or 'unsure', which then led to a risk of bias for each domain to be rated either 'low', 'moderate' or 'high'. A study was considered to have an overall low risk of bias when the methodological risk of bias was rated as low or moderate in all six domains, with at least four domains being rated 'low'. A study was rated as having an overall high risk of bias if two or more of the domains is scored 'high' whilst in-between quality was scored as 'moderate'. No study was excluded based on quality assessment.

3.2.6 Data synthesis and analysis

The included studies were found to have one predominant characteristic under which they could be compiled: activity levels [Table 2; Appendix 3] and participation in PA [Table 3; Appendix 4] pre- and post-THR. Study characteristics and findings were summarised whilst similarities,

differences and patterns identified. The findings showed good fit with the BPS model of health (51) discussed in chapter 1, facilitating a comprehensive and meaningful interpretation of the review findings. The RQ was introduced to help infer the barriers and enablers under the three domains of the BPS model associated with returning [or, if the case, do not] to PA.

3.3 Results

3.3.1 Study details/method

Table 2 and 3 [Appendices 3 & 4 respectively] presents the data extracted for each of the included studies. The studies were all observational, majority [n=22] being retrospective and ten prospective. Studies were most commonly performed in USA [n=8], Germany [n=5], UK [n=4], Austria [n=3], France [n=3] and Japan [n=2], eight of which were multicentred. Seven studies stratified findings by age and implant fixation. Four of these studies examined patients under 60 years (159–162) with Dubs et al. (159) focusing on males. Non-conventional implants were investigated by three studies: short-stem (163,164) and tripolar prosthesis (165).

The total number of participants was 7774. Mean age ranged from 39 to 71 years, with a total age range of 14–98 years, and BMI varying from 22 to 37 kg/m^2 [from n=20 studies]. Of the 24 studies that examined the diagnosis for THR, OA was the predominant [n=23] followed by Avascular necrosis [AVN] or osteonecrosis [n=9] and Dysplasia [n=3]. The surgical approach used was described in fourteen studies with the most common being the anterolateral and posterolateral as used in four studies each. Unilateral THR was performed in 13 of the 19 studies that reported on type of procedure undertaken. Pain (166–169) and difficulties or limitations in activity of daily life (167,168) were the most commonly indicated reasons for wanting THR. The time between the onset of symptoms and THR ranged from 2 to 234 months (167,168,170). Fifteen studies provided information about the rehabilitation protocols followed. Follow-up ranged from 6 months to 10 years.

Eleven studies investigated either THR and TKR (162,166,171–175) or in addition to other joints (167,176–178). The operationalisation of pre-THR PA was quite diverse across studies. Majority used either "preoperatively" (160,163–165,170–172,174,177–180), "before THR" (159,162,166,167,173,174,181–185), or a specified time i.e., months/year(s) before surgery (169,175,176,186,187). However, eight studies (161,166–168,170,188–190) investigated the pre-symptomatic phase. Some studies assessed PA at more than one timepoint pre-surgery (166,167,170,174) and post-surgery (170,171,173,182,188).

Only two of the 32 studies, namely Abe et al. (178) and Innmann et al. (189) were rated as having an overall low risk of bias; twenty-five had moderate and seven had high overall risk of bias. The

lowest risk of bias per domain was found for 'study attrition', with only one study (185) scored as a 'high' risk for not mentioning follow up time. Notably, most studies did not provide sufficient information about 'prognostic factor' as this domain recorded the highest number of studies [n=8] with high risk of bias. A summary of all scored risks of bias per domain is listed in Table 4.

3.3.2 Return to preoperative levels of PA

Pre to post-THR, studies examined PA participation [n=23], activity levels [n=14] or both (162,164,181,184,189).

Activity levels: subjective activity rating questionnaire [activity scores]

This was used to assess participants pre- to post-THR PA levels via activity scores [Table 2; Appendix 3]. Ten of the n=14 studies utilised the UCLA activity level scale, others were the Physical Activity Scale for Individuals with Physical Disabilities [PASIPD] (173), LEAS (180), Physical Activity Scale for the Elderly [PASE] (171) and International Physical Activity Questionnaire Short Form [IPAQ-SF] (182). In all activity measures, higher scores indicate greater PA levels. The UCLA activity level scale showed an increase from 4/10 pre-THR to 6/10 post-surgery (160,162,164,165,172,177,184,189).

PA participation: self-administered sports activity questionnaire [SAQ]

Described in n=23 studies [Table 3, Appendix 4], this was used to determine participation in sports activity pre to post-THR and include the type, impact levels [low, intermediate, or high impact], time and return rate described in percentage, duration, number of disciplines and frequency. With the exception of Delasotta et al. (187), Innmann et al. (189) and Mont et al. (188) utilising the validated High-Activity Arthroplasty Score [HAAS], Schulthess Clinic sports and activity questionnaire [SCSAAQ] and National Tennis Player Rating questionnaires respectively, the others used generalised or specific sports questionnaires designed by the authors. In total, five studies gave descriptions of THR outcomes for specific sports: tennis (188), golf (170,179), Judo (167) and jogging (178). Wylde et al. (174) and Del Piccolo et al. (161) both referred to PA in general, making no mention of any specific activity. The remaining studies discussed a range of sports activity; these were a mixture of low-impact [i.e., walking and swimming], intermediate-impact [i.e., skiing and hiking] or high-impact [i.e., ball sports and jogging] according to Vail & Mallon (191) classification levels of impact on the hip joint. Reported by 2 or more studies, 20 sports activity ranging from low, intermediate to high impact were common amongst participants pre-surgery. Post-surgery, participation in low [i.e., swimming, walking, golf, gym exercise, Pilates, cycling/biking, and Yoga] and intermediate-impact activities [i.e., fitness/weight training,

gymnastics, and tennis] either increased or tend to be maintained. Contrarily, high-impact activities such as ball sports and running/jogging were most likely to be stopped.

The percentage of those who participated in sports activity pre- to post-surgery varied from a mean of 67% [pre-THR] to 58% [post-THR] as reported in n=7 studies. In two studies, preoperative PA was scored at two time periods; sports performed "during life" [97%] and pursued "until surgery" [36%] (166), and "preoperatively" [89%] and "before surgery" [82%] (174). The percentage of participants who returned to sports decreased to 52% (166) and 25% (174). Defining preoperative sports participation as "preoperatively" (164) or "before THR" (184), the percentage of participants who returned to sports increased from 15.5 to 41.2% (184) but decreased from 60.8 to 56.9% (164). Three studies clearly defined the time period of scoring preoperative sports participation: "the year prior" (175) or "pre-symptomatic" (189,190). The percentage of participants who RTS increased from 77 to 79% (189), 50.6 to 67.3% (175) and decreased from 92 to 87% (190). The rate of return to sports [RTS] after THR as reported in seven studies (161,163,167,181,185,189,190) was a mean of 70%. Comparing two patient groups, return to intensive sports was 44% vs 40% for those who underwent short-stem THR vs conventional THR respectively, and 87.5% vs 57.8% for single stage bilateral THA vs unilateral THR respectively (181). Reported by seven studies (163,164,168,176,183,189,190) the percentage of participants who were unable to RTS activity was a mean of 26%. Eleven articles considered time to RTS activity. Of the 6 studies reporting on sports activity in general, the time to RTS ranged from 1 to 24 months (163,168,181,185,189,190) with majority of participants returning 5 to 6 months (163) or 1 to 3 months (189,190). Reporting on intermediate and high impact sports respectively, it took a mean of 6.7 months to return to competitive tennis (188) and 3.9 months to begin practising Judo (167). On specific low impact activities, Chatterji et al. (186) reported a return to exercise walking at a mean time of 10 weeks, swimming was 7.8 weeks and aqua aerobics 9.2 weeks. The time to return to golf was 21.7 weeks (186), 3.8 months (179) and 5.4 months (170).

Table 4. Methodological assessment according to QUIPS[1] six domains of potential bias

Study	Study participation	Study attrition [follow-up]	Prognostic factor	Outcome Measurement	Confounding factor	Analysis	Overall risk of Bias*
Visuri & Honkanen (183)	Moderate	Low	Moderate	High	Moderate	Moderate	Moderate
Dubs et al (159)	Moderate	Moderate	Moderate	High	Moderate	Moderate	Moderate
Mont et al (188)	Moderate	Moderate	High	Low	Moderate	High	High
Chatterji et al (186)	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Huch et al (166)	Moderate	Moderate	Moderate	Moderate	High	Low	Moderate
Liem et al (179)	Moderate	Moderate	Moderate	Moderate	Low	Low	Moderate
Arbuthnot et al (170)	Moderate	Moderate	Moderate	Moderate	High	High	High
de Groot et al (173)	Low	Moderate	Moderate	Moderate	Low	High	Moderate
Wylde et al (176)	Moderate	Moderate	High	High	High	Low	High

Study	Study participation	Study attrition [follow-up]	Prognostic factor	Outcome Measurement	Confounding factor	Analysis	Overall risk of Bias*
Fowble et al (177)	High	Moderate	Moderate	Moderate	Low	Moderate	Moderate
Delasotta et al (187)	Moderate	Moderate	High	Moderate	High	High	High
Schmidutz et al (163)	Moderate	Low	Moderate	Moderate	Moderate	Moderate	Moderate
Wylde et al (174)	High	Low	High	High	Moderate	Moderate	High
Kuhn et al (160)	Moderate	Moderate	High	Moderate	Low	Moderate	Moderate
Lefevre et al (167)	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Abe et al (178)	Low	Moderate	Low	Moderate	Low	Low	Low
Harding et al (172)	Low	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Ollivier et al (168)	Moderate	Moderate	Moderate	Low	High	Moderate	Moderate

Study	Study participation	Study attrition [follow-up]	Prognostic factor	Outcome Measurement	Confounding factor	Analysis	Overall risk of Bias*
Innmann et al (189)	Moderate	Low	Low	Low	Moderate	Low	Low
Keeney et al (169)	Moderate	Moderate	Moderate	Moderate	Moderate	Low	Moderate
Del Piccolo et al (161)	High	Moderate	Moderate	Moderate	Moderate	High	High
Wu et al (180)	Moderate	Moderate	Moderate	Moderate	Moderate	Low	Moderate
Hara et al (184)	Moderate	Moderate	Moderate	Moderate	Moderate	Low	Moderate
Pritchett (165)	Moderate	Moderate	Moderate	Moderate	Moderate	High	Moderate
Smith et al (171)	Moderate	Moderate	High	Moderate	Moderate	Low	Moderate
Batailler et al (181)	Low	Moderate	Moderate	Moderate	Low	Low	Moderate
Donner et al (164)	Moderate	Low	Low	Moderate	Low	Moderate	Moderate
Guler et al (182)	Low	Moderate	Moderate	Moderate	Low	Moderate	Moderate

Study	Study participation	Study attrition [follow-up]	Prognostic factor	Outcome Measurement	Confounding factor	Analysis	Overall risk of Bias*
Jassim et al (162)	Moderate	Moderate	High	Moderate	Moderate	Moderate	Moderate
Madrid et al (185)	Moderate	High	Moderate	Moderate	Moderate	Low	Moderate
Naylor et al (175)	Moderate	Moderate	High	High	Moderate	Low	High
Ortmaier et al (190)	Moderate	Low	Moderate	Low	Low	Moderate	Moderate

QUIPS Quality in Prognosis Studies

****Low risk of bias: Rated as low or moderate in all six domains, with at least four domains being rated 'low'.***

****Moderate risk of bias: in-between quality was scored as 'moderate'.***

****High risk of bias: Two or more of the domains scored 'high'.***

The number of sports disciplines participants engaged in decreased from pre to post-THR in the studies that analysed this outcome (159,162,164,189,190) except for Visuri & Honkanen (183) comprising lower impact activities of walking, cycling, swimming, and skiing. According to these authors, the number of participants engaged in 1 or 2 exercise forms increased and some took up 3 and 4 post-surgery (183). The duration of sports practiced per week was highlighted in three studies. Following THR, participants were able to return to practicing sports activity at least 2 hours weekly. Madrid et al. (185) reported more participants were practicing sports less than 5 hours after surgery [42%] compared to before [39%] whereas, those performing sports activities for more than 2 hours increased from 8% to 14% (166) and 3 to 4 hours per week (164). The frequency of sports activity performed per week either remained the same or increased. Tennis players returned to the same [3 times per week] level of play (188) and majority of golfers [n=30 out of 46] to an unchanged level, a mean of 2.8 a week (179). For sports activities in general, mean weekly sessions increased significantly from 1.5 to 1.8 (162) and 2.3 to 2.6 times (189). Participants who engaged in sport >4 times per week significantly increased from 18% to 27% (190). Participant's sports session length did not significantly change. Schmidutz et al. (163) reported a mean duration of 67 ± 35 to 66 ± 33 minutes [p = .753] and Innmann et al. (189) was 53 to 55 minutes [p = 0.6791].

3.3.3 Barriers and enablers

These were compiled from studies reporting on factors associated with RTS [n=22], activity levels [n=14] and reasons for change [n=14] post-THR. Barriers and enablers are presented under the three conceptual domains − biological, psychological, and social factors in accordance with the BPS model of health (51).

3.3.3.1 Biological factors

Barriers

Older age: Participants believing they are too old to participate in regular PA (175) could explain why increasing age was significantly associated with low activity levels (171,190) and younger participants engaging in more sports activity (166,175,190). This age dependent decline was observed in participants aged >60 years (166,190) as age related loss of strength (190) and reduced physical fitness (189) were cited as reasons for either quitting or changing sports disciplines respectively. However, comparing the effect of age on time between implantation and RTS, Innmann et al. (189) found no statistical significant differences 11 years post-THR. Interestingly, contradictory results were reported for participants with short-stem implants. At a min of 18 months post-THR, significantly more younger participants with short-stem implants RTS faster [3

to 6 months] than their older counterparts (190) but Schmidutz et al. (163) found this not significant a minimum of 2 years after surgery. The inconsistent pattern across studies does not make it clear whether age is a barrier to time between implantation and RTS, but it appears that this may not be significant long term.

Pain: Compared to before surgery, there was significant reduction in pain after THR (160,164,172,173,177,182,188) with 98% reportedly been satisfied with their pain relief (165). Hip pain during sports activities reduced significantly after THR (164,170,189) with majority [≥80%] of the participants reporting no or very low pain (163,179,190). However, despite the reported improvement in general hip pain and pain during sports activities, pain was still frequently cited as the reason for change in PA. Participants were compelled to either restrict (163) or change sports activity (189) and even were unable to RTS (168,176,185,187) after THR because of hip pain. For example, participating in jogging post-THR was "impossible because of pain" for some joggers (178) whilst a reduction in golfing because of pain was observed amongst 4 of the 5 significantly more pre-THR active golfers in Liem et al. (179) study. For golfing specifically, three golfers who returned to playing golf were forced to retire subsequently due to back problems (170). Furthermore, compared to pain free golfers, those with pain [20%] played significantly less golf per week [2.2 times vs 2.9 times] and also took more time [7.8 months vs 4.7 months] to return to a full round of golf (179).

Pain in the replaced joint and elsewhere (166) such as vertebral, lumbar, lumbago and knee (166,178,181) was also a reported reason for reduction in sports activity (166) including either not RTS (178,181), returning to another sport or to a lower intensity (181). The most common sites of pain reported by Arbuthnot et al. (170) were the thigh [48%] and buttock [42%].

Comorbidity: Participants' pre-THR comorbidities were commonly communicated using the American Society of Anaesthesiologists [ASA] Class (162,175,177,181,185), with majority within ASA Class II indicating a patient with a mild systemic disease. Specific medical conditions reported were diabetes (171,172), cardiovascular disease (172) such as hypertension (166,182) and musculoskeletal conditions (172) i.e., knee OA (160). Post-THR, those who reported depressive symptoms less frequently participated in sports and reported lower activity levels on the PASE score (171) whilst heart failure was cited as a reason for reduction in sports activity 5 years after surgery (166). Other medical conditions of which required medications in 65% of the participants (175) or secondary illness (189) were also reported reasons for not participating in regular PA and changing a sport discipline respectively. Visuri & Honkanen (183) observed that walking [$p <$

0.001] and cycling [$p < 0.01$] became significantly more infrequent among those who had some other disease restricting mobility.

Post-surgical functional limitations: Participants reported an increase in physical functions from pre to post-THR [p .<0001] according to Harris Hip Score [HHS], confirming a significant improvement in daily activities (164). A better or higher physical function pre-THR was found to be associated with participating in regular PA (175) or sport (168) post-surgery as assessed by the OHS and HHS scores respectively. Despite these reported significant improvement, functional limitations were common reasons for change in sports activity. Participants cited decreased range of motion, and muscle weakness (178) and inability to walk unaided (175) as reason for not participating in regular PA such as jogging. Further limitations were decreased strength (163) and early fatigue (187) causing sporting activities to either be restricted or stopped respectively. Stiffness was a consistently reported reason for participants returning to a lower intensity, another sport (181) or not returning at all (168,181).

Ongoing problems with the hip and other joint problems: Following THR, participants complained of instability of the joint (166) and ongoing problems with the hip (170,175) making sport activities impossible to perform (166). This hindered participating in regular PA (175), reduction of sports activity (166) and even made a participant unable to return to playing golf (170). Similarly, participants with other musculoskeletal problems or history of >1 lower extremity arthroplasty were unable to participate in regular PA post-THR (175). For instance, a golfer was reportedly forced to retire because of other joint problems (170).

PA assessment time-point: Findings suggest that sports and activity levels tend to be affected by the time-point assessed pre- and post-THR. The percentage of those who performed sport or leisure activities historically defined as "during life", "pre-OA" or "preoperatively" had all reduced at the time of surgery reported as "until surgery" (166), "preop" (170) or "before surgery" (174) respectively. For instance, according to Huch et al. (166), the "most important lifetime" sports activities among participants were biking [59%], hiking [53%], and swimming [46%] whilst "least important" were jogging [18%], tennis [12%], dancing [6%]. At time "until surgery", only a few were still able to continue biking [11%], hiking [2%], swimming [9%] with none jogging or dancing and just 1% playing tennis (166). Following surgery, whilst participants were able to improve on the sports activity they engage in at the time of surgery, this improvement was not up to their historic levels. According to Arbuthnot et al. (170), though the mean number of golf rounds played per week increased from "preop" [0.9] to "3-5 months postop" [1.5], this were not up to "pre-OA" levels [1.7]. Also, 89% of leisure activities which were rated as quite or very important by

participants "preop" decreased to 82% "before surgery" and 25% "1-year post-op" as activities were rated as quite or very difficult to perform due to joint problems (174). "5 years after op", whilst most participants were able to return to both their "most important lifetime" activities of biking [54%], hiking [48%], swimming [44%] and "least important" activities of jogging [7%], tennis [4%], dancing [5%], the percentage were not up to "lifetime" levels (166).

This effect was also seen in studies comparing two post-THR time-points, indicating a potential decrease in PA levels overtime. Using activity scores, studies reported increases in PA from pre-surgery to any timepoint between "6 weeks and 12 months" after surgery (171,173,182). However, whilst Smith et al. (171) participants demonstrated an initial increase in PA at "12 months postop" for the PASE sub-section "duration of walking" [$p < 0.010$] and "frequency in the participation in light, moderate and strenuous sports" [$p = 0.020$], this was not evident at "24 months postop". Similarly, Arbuthnot et al. (170) observed that whilst the mean number of golf rounds played per week increased from "preop" [0.9] to "3-5 months post-surgery" [1.5], this reduced after 3-5 years [1.4].

Enablers

Being male: Men were more active than women before and after THR (166,176,186). For instance, being male was a pre-surgical factor associated with jogging after surgery (178) whilst males of all ages had higher UCLA activity scores compared with females (169) and better handicaps/driving distance in golf (179). Male sex was associated with participation in sports (184) and higher activity levels (163,184) post-THR. According to Wylde et al. (176), the odds for men returning to sport were 1.8 times greater than those for women [$p < 0.01$] as they were shown to RTS activities faster than their female counterparts (163,179). For instance, whilst it took the female golfers 4.5 months, the males returned to golfing at 3.5 months [$p = 0.001$] (179). However, women were observed to engage in significantly more sport sessions per week and this increased from pre- to post-THR (163,189,190).

Lower BMI: Lower BMI at time of surgery was associated with both participation in regular PA (175) and improvements in activity levels according to LEAS score (180) after THR. It was also an independent factor positively associated with post-THR activity levels as assessed by the UCLA activity level scale (184). As observed by Madrid et al. (185), of the total number of participants who did not RTS after the surgery, 50.3% were overweight or obese whilst 72.2% of those who perform worse had BMI above 25 kg/m^2.

3.3.3.2 Psychological factors

Barriers

Precaution: Precaution (166) as a measure to preserve the prosthesis (189) or self-imposed limitations to take care of the implant (163) was the strategy used by participants who wish to avoid wear (168,181). For others, it was simply a matter of "I don't want to stress my joint" (162). These precautionary measures informed diverse change in sports activity amongst participants post-THR such as non-participation in particular activities (162) or quitting all together (168,190).

Fear: Participants exhibited a wide range of fear returning to sports activity following THR. These were characterised in form of anxiety (178,190) and insecurity (163,175,190) to perform intermediate − and high-impact activities (163). Due to fear of dislocation, participants would rather return to another sport, a lower intensity (181) or not return to sporting activities even at a mean of 9.8 years after THR (168). The fear of causing damage to the prosthetic joint (176,185) or injury (185,187) was consistently reported as reasons for not RTS.

Reasons unrelated to the surgery [or undefined reasons]: Undefined reasons (166,170,181,185) or reasons not related to the surgery (168,179) such as "a lack of spare time" (189) or being "too busy e.g., works full-time or is a carer" (175) constituted varied changes in sports activity post-surgery. This ranged from forced retirement from golfing (170), not RTS (168,185), irregular participation (175) or a reduction (166,179).

Perceived level of activity and performance in sports following THR: Following THR, most participants [72%] reported improvement in activity levels on the global rating of change score i.e., self-perceived change in UCLA (172). Similarly, participants also reported a beneficial effect of surgery on the performance in sporting activities as perceived according to Visual Analog Scale [VAS] (186). However, this improved patient perception existed despite the fact that actual post-surgery sport scores decreased with age at 1- 2 years post-surgery (186). There were no consistent pattern across studies for this factor to be clearly classified as either a barrier or enabler. Madrid et al. (185) found no difference in age between participants who perceived equal or better sports performance and those who perceived a decrease according to non-validated authors generated SAQ. It should be noted that Madrid et al. (185) reported post-surgery follow-up simply as "after op" making it difficult to compare findings with that of Chatterji et al. (186).

Enablers

Being pre-surgically active in sports: Participation in sports activity pre-THR was an independent factor positively associated with higher activity level scores (178,184) and returning

(178) to regular sports activity of at least once per week (175) for 1 or more hours (166) after surgery. Abe et al. (178) highlighted how compared with non-joggers, those who jogged pre-surgery tend to return to jogging, have significantly higher UCLA activity scores [10 ± 0 vs 6.6 ± 2.4] and lower mean scores for pain [0.3 ± 0.8 vs 1.2 ± 2.4; P = .03] according to the Western Ontario and McMaster Universities Osteoarthritis Index [WOMAC].

Motivation: The importance of been able to continue favoured activities following THR was a strong motivation for undergoing surgery in majority of the participants (167,188). It predicted RTS after single stage bilateral THA (181) and was rated as "highly important" (162). Those who considered return to sporting activity as "very important" pre-surgery, had a significantly increased chance of doing so post-surgery (168). Likewise, a greater proportion [55%] of participants who reported being physically active post-surgery, answered "strongly agree" to whether participation in regular PA was an important goal of surgery (175). As a matter of fact, "no motivation" was the sole reason among the n=4 participants who did not RTS after single stage bilateral THA (181).

Satisfaction: Participants satisfaction with their post-THR sporting ability was very high (164,190) i.e., 90% (165) with only 6% (163) reporting not being satisfied according to VAS. Majority [69%] were as active as they expected to be before surgery (168), just one sportive patient from each group [single stage bilateral vs unilateral THR] who had hoped to increase the intensity of their sports after surgery was disappointed (181). Almost half the golfers [47.8%] enjoyed golf even more after THR and half [50.0%] enjoyed golf as much as they did pre-surgery (179). Satisfaction correlated with returning to Judo (167) and better UCLA activity level and functional scores (168). Many participants were still satisfied with their THR at even more than 8 years post-surgery: 88.9% (168) and 25 of the 27 Judokas (167). Almost all of them [98%] were pleased with their post-THR function and 95% would undergo surgery again (187) whilst n=31 of the 40 would highly likely recommend a THR to others who need one (162). However, according to Batailler et al. (181), satisfaction rate seemed slightly higher amongst those who underwent single stage bilateral [96.5%] compared to unilateral THA [92.2%], a minimum of 20 months after surgery.

3.3.3.3 Social factors

Barrier

Medical advice/recommendation: This was the most common reason for not returning to sporting activities after THR (168,176,185,187) with participants citing been told by either a "PT, surgeon, other doctor or health professional" not to do a particular activity anymore (162). Interestingly, compared with those who underwent single stage bilateral THA, this factor was only reported amongst those with unilateral THR (181). The medical advice participants received during

physiotherapy [PT] ranged from only low impact activities allowed (160,161), high impact activities discouraged (160,178) and the recommended time allowed (161,178). Though no analysis on the effect of medical advice received on time to RTS was reported, if participants in Del Piccolo et al. (161) study were to adhere to recommendations, RTS will be from 6 weeks post-surgery. For instance, 26.1% golfers felt they could have returned sooner to golfing but did not on the advice of their doctors (179). Participants were not allowed to participate in sporting activities for 6 months post-surgery (168,178) allowing soft tissue healing and minimising the risk of dislocation (168).

3.3.4 Rehabilitation

Fifteen studies described information about the rehabilitation protocol followed after THR, one of which included a pre-surgical program (183). The protocols comprised full weight bearing as allowed (160,161,164,172,173,178,182–184,190) or educational program (181,185) in addition to pain management (181,182). These studies failed to provide enough evidence on the effect of rehabilitation on return to PA, Madrid et al. (185) specifically stated that the program was not focused on the resumption of sports activity. PT was provided either in-hospital only (186), outpatient only (179), both (172,190) or as deemed necessary (173). The duration of the PT provided ranged from time of discharge to the 10th week post-surgery.

3.4 Updated literature search

Search strategy: Given that the literature searches conducted for this SLR were performed on 21 January 2020, a re-run was thus deemed necessary as a means to update the evidence base. Thus, searches were conducted for MEDLINE, CINAHL and SPORTDiscus databases via EBSCO from January 2020 until 11 January 2024. Searches were performed following the same protocol described earlier in this chapter [section 3.2]. Similar to initial search results, no qualitative study met the inclusion criteria specifically reporting on participants PA level pre-surgery. Studies retained for final review upon meeting the inclusion criteria were n=8 [see Figure 5; appendix 14 for the PRISMA flowchart depicting the search process].

Overview of search results: Table 8 and 9 [Appendices 12 & 13 respectively] presents the data extracted for each of the included studies. Similar to earlier results, the studies were all observational, majority [n=6] being retrospective and two prospective. Studies were most commonly performed in Japan [n=3] and the USA [n=2], one each in Spain, Germany, and France. Two studies each were multi-centred (136) and conducted in select group of participants stratified by activity status (134,192) or specific sports participation (136,193). Osawa et al. (192) assessed RTS between two groups; those who returned as much as or more than before surgery versus

those who could not participate in sports as much as before surgery. Ponzio et al. (134) on the other hand compared active versus inactive patients. Skiers and active golfers were examined by Lancaster et al. (193) and Pioger et al. (136) respectively.

The total number of participants was 2338, and BMI varied from 16.8 to 43.8 kg/m^2 [from n=5 studies]. Whilst the participants age ranged from 19–90 years, contrary to previous findings, the overall cohort were largely made up of younger patients. Takeuchi et al. (194), Navas et al. (195) and Payo-Ollero et al. (196) studies comprised of patients <60 years with the latter two focusing on patients <40 years or with a mean age of 41 years [range 37-48]. Similar to the findings reported earlier, unilateral THR for the treatment of OA was the predominant procedure conducted and indication for surgery respectively. Of the 6 studies that examined the diagnosis for THR, OA was the predominant [n=5] followed by AVN and DDH [n=2]. Six participants in Takeuchi et al. (194) reported "other reasons" as diagnosis for THR. The most common surgical approach was posterolateral, used in four of the five studies that described this. Unilateral THR was performed in 4 of the 5 studies that reported on type of procedure undertaken. The time between the onset of symptoms and THR was reported by only Navas et al. (195) and this ranged 0.5 to 23 years, this is slightly longer than previously reported. Only three studies (192,194,196) provided information about the rehabilitation protocols followed. Follow-up ranged from 1 to 7.5 years which is shorter than previously reported.

Contrary to prior search results, these studies all focused on THR except for Lancaster et al. (193) who investigated participants with TJR [either THR or TKR]. Similarly, the operationalisation of pre-THR PA was quite diverse across studies. This ranged from 'before' (136,192,196), 'preop' (134,194,197) or '≤5yrs prior to surgery' (193). Only Navas et al. (195) investigated the pre-symptomatic phase described as PA participation "before the onset of first symptoms". PA was assessed in more than one timepoint [3 months and 1 year] post-surgery in just one study (197) unlike prior search with more studies assessing PA at more than one timepoint both pre-and post-surgery.

Compared to prior findings where the lowest risk of bias per domain was found for "study attrition", this update recorded this domain as having the highest risk of bias. Additionally, none of the studies were rated as having an overall low risk of bias. The studies were all rated as having an overall moderate risk of bias, with just one (193) having a high overall risk of bias. The lowest risk of bias per domain was found for "analysis" and "study participation", with no study scored as a 'high' risk. Notably, most studies did not provide sufficient information about "study attrition" (193,197) and "confounding factor" (134,197) as each domain recorded the highest number of

studies [n=2] with high risk of bias. A summary of all scored risks of bias per domain is listed in Table 8 [appendix 15].

Return to preoperative levels of PA: Pre to post-THR, n=5 studies each examined PA participation, activity levels or both (195,196).

Activity levels: subjective activity rating questionnaire [activity scores]

This was used to assess participants pre- to post-THR PA levels via activity scores [Table 8; Appendix 12]. Four studies (194–197) utilised the UCLA activity level scale whilst one (134) used the LEAS. This is similar to prior finding which also reported the UCLA activity level scale as the most predominant activity measure used. The UCLA activity level scale showed an increase from 3/10 preop to 8/10 post-surgery, revealing a postop increase compared to previously reported. For studies that reported a decrease in UCLA activity levels pre to postop (196) and at two timepoints postop (197), the differences were not significant.

PA participation: self-administered sports activity questionnaire [SAQ]

Described in Table 9, Appendix 13, this was used to determine participation in sports activity pre to post-THR and include the type [sports discipline], impact levels [low, intermediate, or high impact], time and return rate described in percentage, duration, number of disciplines and frequency. With the exception of Navas et al. (195) who utilised the validated SCSAAQ, the others used generalised or specific sports questionnaires designed by the authors. In total, two studies gave descriptions of THR outcomes for specific sports: skiing (193) and golf (136). The others discussed a range of sports activity, with Payo-Ollero et al. (196) stratifying sports participation as low or high impact. Apart from skiing and golf, reported by >2 studies, the two most popular PA engaged in pre-surgery was walking and swimming. According to Vail & Mallon (191) classification levels of impact on the hip joint, these were of low impact. Post-surgery, participation in these activities either increased (196) or tend to be maintained (195), this was as previously reported.

The percentage of those who participated in sports activity pre- to post-surgery varied from a mean of 28.7% [pre-THR] to 98.5% [post-THR] (136,192,193,195). This findings is a reversal of the previous report − this showed a significant decrease preop and increase postop in the percentage of people participating in sports preop which as opposed to previous findings was 67% to 58% . The percentage of participants who were unable to RTS activity was reported in two studies comparing patients groups. Within 5 years after surgery the percentage of skiers who were unable to RTS activity was 26% (193). For the participants in the group of those who 'RTS as much as or more than before surgery', 21% did not participate in sports a mean of 3.3 years after THR (192). Similarly, the percentage of participants who were unable to RTS activity was

previously reported as a mean of 26%. Two studies reported a mean of 5 months as the time to RTS activity. Payo-Ollero et al. (196) reported on sports activity in general amongst participants with a mean age of 41 years and Pioger et al (136) in golfers. This time coincides with the time to return to golf previously reported as 3.8 months (179) and 5.4 months (170).

The number of sports disciplines participants engaged in increased from pre to post-THR (196). Similar to previous findings, the number of participants engaged in 1 or 2 sports increased (183), for those who engaged in 9 sports preop, a decrease to 5 was observed whilst those participating in 3 sports maintained theirs (196). The frequency of sports activity performed per week was reported only by Navas et al. (195) who showed a significant increase ($p < 0.0001$) from 1 to 3 days per week before the onset of first symptoms to 3.9 years after THR. Patients being active 3x per week was also previously reported for tennis players (188) and majority of golfers (179). Participant's sports session length per week was highlighted in two studies. This increased from a range of a minimum of 23 minutes (195) to 8 hours of golf play (136) before THR, to 82 minutes and 9 hours a minimum of 2 years post-THR respectively. Apart from the short session length reported by Navas et al. (195) before THR, these duration are longer compared to previous findings which reported no significant changes (163,189).

Barriers and enablers

Biological factors

Barriers

Pain: Corroborating previous findings, THR significantly improved pain pre to postop $p < 0.0001$ (195) and significant decrease $P < .001$ in hip pain while playing golf was observed (136) using VAS for assessment. Similarly, despite these reported improvements, pain located in the operated thigh in 40% of the cases (136) was reported. These authors further revealed that for the n=9 golfers who did not return to golfing a minimum of 2 years after THR, the reported experience during or after golfing activity was a resting joint pain [n=4] and pain felt either in the buttock [n=2] or groin [n=3]. Pain in the buttock was one of the most common sites of pain previously reported by 42% of the golfers in Arbuthnot et al. (170) study.

Ongoing problems with the hip and other joint problems: Following THR, two frequently reported complications as previously reported also was instability of the joint (166) and ongoing problems with the hip (170,175). In this update, three participants reported a feeling of hip instability when playing sports (196). The problems with the hip cited were "muscle weakness in the leg of the joint replacement," "change in sensation around your replaced joint," and "more symptoms than you would like in the replaced hip" (134). One participant each reported hip

dislocation with femoral nerve injury after trauma and fracture-dislocation that required a hip prosthesis replacement (196). Ponzi et al. (134) described a "difference in leg-length that is new since surgery" likewise Navas et al. (195). Comparing complications 6 months postop between active and inactive patients, Ponzi et al. (134) reported they were similar.

PA assessment time-point: Prior results using activity scores revealed that whilst PA may increase from pre to postop, for studies assessing two postop timepoints, levels tend to decrease overtime (170,171,173,182). In this update Harada et al. (197) confirms this finding as it was observed that UCLA activity score significantly increased [$P < 0.05$] from preop [3.4] to 3 months postop [4.8] and reduced at 1 year [4.6].

Enablers

Being male: This update corroborates previous findings that men were more active than women before and after THR (163,169,178,179,184,189,190). Male sex [p=0.029] was an independent risk factors for return to sports a mean of 3.3 years after THR (192), with UCLA activity scores in males more significantly higher [$p < 0.05$] than females, both pre and 4.9 years postop (194). The practiced sports disciplines before onset of the first symptoms was 1.4 [women] vs 2.1 [men] which increased to 3.7 [women] vs 4.4 [men] 3.9 years after THR (195). Similarly, the minimum session length per week was 18.4 ± 33.1 min per session [women] and 25.4 ± 31.2 min [men]. According to previous findings, compared to men, women tend to engage in significantly more sport sessions per week and this increased from pre- to post-THR (163,189,190). This was also observed in this update but preoperatively only by one study. Navas et al. (195) reported that before surgery, women appeared to perform more sports sessions per week [frequency] − 1 day per week compared to men who were active 0.8 day but following surgery, both sexes participated in sports at the same frequency − 3x times per week.

Better pre-surgical functional ability: Elaborating more on the factor 'post-surgical functional limitations' as a biological barrier to returning to preoperative levels of PA as previously reported is this new factor. Like previous report, this update also revealed an improvement in physical functions as reported in one study. The golfers in Pioger et al. (136) study showed improvement in handicap of 1.8 from pre to postop [$P = .012$] according to VAS. Also, a strong correlation was found between preop handicap, time to return – practice [$P = .0003$] and 18-hole golf course [$P < .0001$] with stronger players returning earlier a minimum of 2 years after THR (136). This further confirms prior findings, re-emphasising that a better or higher physical function pre-THR is associated with participating in regular PA (175) or sport (168) post-surgery as assessed by the

OHS and HHS scores respectively. Apart from pain, unlike prior findings, none of the participants reported functional limitations as reasons for change in sports activity.

Psychological factors

Barriers

Fear: Previous findings reported participants as exhibiting fear of returning to sports activity following THR due to anxiety (178,190) with fear of dislocation making some rather returning to another sport, a lower intensity (181) or not return to sporting activities even at a mean of 9.8 years after THR (168). This was confirmed in this update, with Osawa et al. (192) revealing anxiety of dislocation [$p<0.01$] as an independent risk factor for RTS a mean of 3.3 years after THR.

Enablers

High expectations: Not previously reported, high expectation regarding exercise and sports was associated with higher sports and recreation scores by a mean of 8.4 ± 3.3 points [P =.012] 2 years postop according to HSS-HRES (134).

Satisfaction: These findings correlate with previous which reported participants satisfaction with their post-THR sporting ability was very high (164,165,190). When asked how satisfied they were with the results of surgery for improving their ability to do recreational activities, Ponzi et al. (134) reported that 79% of inactive and 81.6% active patients were very satisfied. According to Takeuchi et al. (194), satisfaction correlated with UCLA activity level [$p < 0.001$] 4.9 years postop. Ollivier et al. (168) had also previously reported satisfaction correlating with better UCLA activity and functional scores. These current findings suggest that dissatisfaction may be influenced also by sex and multi-comorbidity. Ponzi et al. (134) reported that 2 years postop, female patients were more likely to be dissatisfied with the overall results of surgery compared with male [P = .04] whilst patients with ASA of 3 to 4 were more likely to be dissatisfied with ability to perform housework and yard work [P = .003] and ability to participate in recreational activities [P = .007].

Social factors

Barrier

Medical advice/recommendation: Previously highlighted as the most common reason for not returning to sporting activities after THR (168,176,185,187) with participants citing been told by HCP not to do a particular activity anymore (162), this findings also found out that 65.2% of Payo-Ollero et al. (196) participants were dissuaded by their doctors from playing sports. Similar to the medical advice received during PT that only low impact activities were allowed (160,161) and high impact activities discouraged (160,178) from prior findings, the doctors in Payo-Ollero et al. (196)

study recommended only low impact activities such as swimming [n=44%] and static bicycle [n=17.5%]. These activities correlated with the most practiced sports after THR. Similarly, the sports instruction after THA given to participants in Osawa et al. (192) study was that hard contact sports and active marine sports were not allowed. Participants not allowed to participate in sporting activities for 6 months postop as previously reported (168,178) was again re-echoed by Osawa et al. (192) stating that the combined movement of hip flexion and internal rotation was prohibited. The reasons were also similar − risk of dislocation (168,192).

Rehabilitation: Only 3 studies described information about the rehabilitation protocol followed after THR, none included any pre-surgical program. The protocols focused on full weight bearing for all studies, walking training (192,196) and ROM training (192). Similarly, full weight bearing as allowed was also the predominant protocol followed in the previous findings as reported by 10 of the 15 studies that described outcome.

3.5 Discussion

The aim of this SLR was to describe people's PA participation and activity levels pre-and post-THR, so as to ascertain the effectiveness of THR in returning people to their preoperative levels and identify the perceived barriers and enablers. The combination of findings from prior [21 January 2020] and updated [11 January 2024] literature search revealed the following:

1) Both searches consistently show that, pre-surgery, people were only mildly physically active according to the UCLA activity level score of 4/10 and 3/10 reported by prior and updated results respectively. THR is effective in increasing people's PA levels from mildly physically active pre-surgery to either being moderately [6/10] or highly [8/10] active post-surgery as reported by prior and updated results respectively. Whilst the former corroborates with other studies (198,199), the latter reveals a significantly higher post-surgical increase in activity levels.
2) According to prior results, the percentage of those returning to any sports activity decreased from 67 to 58%, indicating that more people participated in PA pre-surgery. This is contrary to the increase from 28.7% to 98.5% reported in updated search results.
3) Prior search results identified the most common sports activity to participate in pre-surgery as Pilates, Yoga, golf, cycling/biking, and tennis. Post-surgery, these tend to be maintained, with an increase in swimming, walking, gym exercise fitness/weight training and gymnastics which are low-to-moderate impact activities, corroborating with activity levels. Similarly, updated search reported the two most popular PA engaged in pre-surgery as walking and swimming, with participation either increasing or maintained post-surgery. However, since these are low impact activities, they do not corroborate with post-surgical activity levels [8/10] which

according to the UCLA activity descriptive rating levels should comprise active events such as golf, bowling, or impact sports. This suggests a possible over-estimation of activity levels.

4) The time to RTS activity was similar for both searches − an average of 4 months [prior] and a mean of 5 months [updated].
5) The important barriers to returning to PA consistently reported by both searches were: pain, ongoing problems with the hip and other joint problems, PA assessment time-points, fear, and medical advice/recommendation. Barriers specifically reported by prior search were older age [>60 years], comorbidity, post-surgical functional limitations, precaution, and reasons unrelated to the surgery [or undefined reasons].
6) The consistently reported enablers were being male and satisfaction, with the update further revealing that overall satisfaction with the results of surgery may be influenced by multi-comorbidity [ASA 3-4] and sex − females more likely to be dissatisfied. Enablers specific to prior search were lower BMI, motivation, and being pre-surgically active in sports whilst high expectations and better pre-surgical functional ability were newly identified.

The key significant difference between both search results was the significant increase in PA both in activity levels and in the percentage of people who participated in sports after THR as reported in the update. A possible explanation for this could be because the updated search was made up of predominantly younger cohort of THR participants especially as older age had previously been reported as a barrier to returning to PA. Moreso, none of the studies stratified outcome by age.

The factors inhibiting return to PA following THR showed a good fit with the BPS model (51). Discussed in detail in chapter 1, this model offers a multi-dimensional perspective by recognising the impact of biological [genetic, biochemical, etc.], psychological [mood, beliefs, personality, behaviours, etc.] and social [cultural, familial, socioeconomic, medical, etc.] factors on the development and outcomes of illness and disability (51,52). It considers the physiological or biological aspects of the disorder, the psychological factors from which a patient may suffer, and the social or environmental influences acting on the patient (53). Thus, suggesting that in addition to the status of the hip, recovery may be influenced by factors such as psychological states and social influences as confirmed in this study. Furthermore, most of the barriers emerged under the biological domain of the BPS model and were OA related. This indicates that OA which was the predominant diagnosis for THR amongst participants not only confirms the NJR report (3) that it was the sole reason given in 88% of the cohort for primary surgery but that it has a central role and impact in people's lives and experiences. OA is a chronic degenerative musculoskeletal disorder that is associated with pain, decreased function, and disability (84). This is in line with previous qualitative findings that in hip and knee OA, pain is a factor that makes PA an aversive

experience leading to activity avoidance before joint replacement (85) which explains why the participants in this review were only mildly physically active pre-surgery. This is quite concerning because better or higher physical function pre-THR was observed to be associated with participating in regular PA (175) or sport (168). This was clearly portrayed by the correlation found between pre-surgical handicap and time to return [practice and 18-hole golf course], with stronger players returning earlier (136). Following surgery, for many, pain in other joints as well as comorbidity including other symptomatic joints resulted in change in PA (114). In this review, pain, physical functions, PA assessment time-points, and comorbidity were the most consistently reported for change in both PA participation and activity levels. This is similar to prior study by Peter et al. (200) who also highlighted the prevalence of major comorbidities such as musculoskeletal pain, hypertension and cancer as potentially impacting on PA participation following hip and knee arthroplasty. Additionally, as revealed in this review, overall satisfaction with the results of surgery may be influenced by multi-comorbidity [ASA 3-4].

Beliefs and perspectives relating to PA following THR were psychological variables identified as crucial enablers. Whilst most participants in this review did experience relief from their pain in the affected joint following THR and acknowledged the beneficial effect of THR on the performance of sporting activities, many did not return to their previous PA or returned at a decreased level. For many, this change in PA had more to do with their age, precaution [i.e., to avoid wear], fear of dislocation or reasons not related to the surgery. The basis for this fear-avoidance belief or not wanting to stress their joint replacement (162) remains unclear as studies did not report whether it was self-imposed or a medical recommendation. Also, the rationale behind why patients do not want to test their new joint (162) is of great concern. An explanation for this could be related to findings from Harding et al. (67) study where the authors revealed that people were contented knowing they can be physically active but had no intention to be active rather, they identified new limitations to a physically active lifestyle such as age and comorbidities. The age limitations further clarifies the increase in PA both in activity levels and in the percentage of people who participated in sports as reported in updated search results. The cohort was made up of predominantly younger THR participants. Contrarily, participants in the prior search results believed they were too old to participate in regular PA citing age related loss of strength and reduced physical fitness as reasons for either quitting or changing sports disciplines respectively. This suggests that after joint replacement, a person's perceptions about their age, desire to preserve the prosthesis, anxiety/insecurity to perform high impact activities or being "too busy" as reported by participants replaces the pre-surgery problem of pain or any other concern. To get insights into people's reasoning and motivations to be physically active, Booth (201) suggested gaining access to their

beliefs about PA. This assertion is highlighted in the UKactive latest report which revealed that disease [much of which is preventable] and negative beliefs/attitudes about growing older are processes negatively ascribed to ageing (32). This could arguably be associated to the change in PA following THR as comorbidities (166,189) and >60 years (166,169) were reported reasons for change in activity participation after THR. This brings to fore the value of post-surgical PT shortly after surgery and/or longer-term follow-up in secondary care especially for patients who are particularly troubled by lack of confidence and faith in their prosthesis as suggested by Blom et al. (28). Unfortunately, most rehabilitation after THR tend to focus on improving independent mobility or physical functioning but not designed to return patients to high levels of PA as observed in this review and corroborated by Pozzi et al. (27). None of the included studies reported on the effect of rehabilitation on return to PA. Liem et al. (179) merely highlighted the potential role of longer-term [more than 3 weeks] PT either continued after discharge or on an outpatient basis in improving golfing performance − driving distance and handicap. Importantly, no study reported on OT which ought to be routinely provided for patients with THR as part of the rehabilitation service (28). It was observed that the rehabilitation services offered to participants rather focused on PT. Evidence is needed with results that can generate insights into the role of OTs in enabling increased PA and/or RTS activity following THR given that the College of Occupational Therapists (30) recommend that these outcomes be considered within an OT assessment and interventions. Notwithstanding, by identifying the barriers and enablers of returning to PA following THR, this review has provided some insights that can inform narratives for guideline development.

The identified barriers and enablers are not standalone and independent entities but were interwoven concepts determining return to PA post-THR. Similar to Vogel et al. (202), motivation was identified as a fundamental determinant on how much PA participants achieve post-THR. Participants motivation for undergoing surgery influenced outcomes following THR and could be a potential indicator for returning to PA or not. Findings revealed that being able to continue favoured activities following THR was rated highly important to participants (162) and considered a goal (175). Consequently, not a surprise it was a motivation for having THR (167,168,188), demonstrating participants high expectations of surgery. Following surgery, not only were expectations fulfilled but it correlated with better activity level i.e., UCLA activity scores (168), RTS (167,175,188) and satisfaction (167,168). Similar correlations have previously been reported (143,203,204), and confirmed by Ponzi et al. (134). These authors reported that high expectations regarding exercise and sports was associated with higher sports and recreation scores 2 years postop (134). Scott et al. (143) added that the level of preoperative expectation is not significantly

associated with fulfilment, but that THR better meets the expectations identified as important by patients. Thus, it was not surprising to see that highly motivated participants whose pre-THR goal was to continue their sport activities do not always adhere to their surgeon's recommendation (167,188) or medical advice as shown by the 26.6% who participated in non-recommended activities according to the AAHKS and Hip Society criteria (168) after THR. Non-adherence to medical recommendation regarding returning to certain high impact activities was observed to be connected to participants motivation for undergoing surgery in the first instance. Ollivier et al. (168) reported that the desire to RTS was an indicated reason for wanting THR in 23.9% of their participants. Also, the Judokas in Lefevre et al. (167) study all continued Judo demonstrations against advice whilst others participated in sports not recommended by their surgeons such as skiing, jogging and tennis. Noteworthily, in 55% of the Judokas, the motivation for undergoing THR was to continue practicing Judo. Similarly, "to be able to continue playing tennis" was participants motivation for undergoing surgery and they all returned at same level and frequency of play even though the surgeons of 52% were completely opposed to any tennis playing (188). This makes true the fact that patients will attempt to return to the sport that they are familiar with or have the desire to return to and as such, advice should be adjusted accordingly (148). Contrarily, one cannot help but wonder whether participants who reported "precautionary measures [including to preserve the prosthesis]" as reason for change in activity participation were just less motivated, merely adhering to the medical advice received or lacked adequate knowledge of the recovery process. Regardless, this evidence strongly proves the need for HCPs and those working with people with THR to be provided with the needed knowledge to direct treatment, educate and advise patients based on scientific evidence rather than assumptions or personal opinions. This will further curb the negative advise especially against return to higher-impact sport activities.

Whilst this SLR may have identified the 'what' i.e., key barriers and enablers to returning to PA following THR, due to the quantitative nature of studies, they did not explore in-depth the 'how' and 'why'. By using predefined questionnaires for instance, findings will potentially lack personalisation as some studies required participants to select from a group of possibilities that answered why they stopped specific activities (187) or explained the reduction of their sporting activities (166). The question then is what happens when these pre-defined answers do not capture participants views as reflected. For example, the "undefined reasons" given for being forced to retire from golfing (170) and not RTS (185). The "reasons unrelated to surgery" causing reduction in golfing by one significantly active golfer (179) or for stopping sports entirely (168). Furthermore, despite the reported improvement in pain and physical functions, these were still frequently cited as reasons for change in PA post-THR. For instance, participants had to stop sporting activities

due to early fatigue (187). Since fatigue is triggered by a wide range of causes such as medical and lifestyle, an insight into this reason would have given more clarity. Consequently, these studies miss important facets as they are devoid of information from qualitative findings better placed to capture patients' attitudes, beliefs, and experiences which can explicate deeper meaning into the complexity associated with questions (205). For instance, the disparities: [1] differences in perceived and actual performance in sporting activities observed [2] impact levels of sports activities engaged in pre- and post-THR not corroborating with post-surgical activity levels, and the possible influence of older age (185,186) and over-estimation of activity levels needs clarification.

Though a mixed-methods synthesis methodology was planned, no qualitative studies was found that met the inclusion criteria − described PA levels pre- and post-THR. The two most relevant qualitative studies identified were that of Smith et al. (206) and Webster et al. (114) but none reported on the PA levels/behaviour of their participants from pre -to- post-surgery. In Smith et al. (206) meta-ethnography of 13 papers on patients' perceptions of PA before and after joint replacement, only one paper was found relating to PA in people with THR (67). These authors explored beliefs and perspectives relating to PA at 6 months after THR and TKR for the treatment of OA in sedentary people. Aimed at understanding why people do or do not engage in activities following THR and TKR, Webster et al. (114) findings suggest that a variety of socio-cultural factors impact participation in activity which also aligns with this review findings. For many, the change in activity had more to do with either pain in the other joint following surgery or other non-medical factors such as the context of their lives. These factors need to be explored before and after surgery to truly understand the participants' journey. Given that participation decreases as this study findings suggests, an exploration on how response and attitudes to PA changed over time – pre- to post-surgery would be a valuable addition to the evidence-base (206).

An important review finding is the effect of assessment timepoint on PA outcomes. Pre-THR, a significant decrease in the percentage of participants who returned to sports and their performance levels was revealed between the "pre-symptomatic" [i.e., historic or "during life"] phases and moment at "time of surgery" [or before surgery]. This decrease may be because the moment at "time of surgery", participants were already restricted by symptoms. According to Arbuthnot et al. (170), the interval between being unable to continue low impact activities such as playing golf and THR is an average of 8.8 months. For high impact activities such as Judo, a mean of 4.5 years delay between the onset of symptoms and THR (167) was reported. These findings confirm Witjes et al. (66) recommendation that pre-surgical activities level should be based on the phase when the patient was not yet restricted in participating in their preferred activities because of osteoarthritic

complaints. Following THR, this review findings also suggest that sports participation (170) and activity levels according to PASE (171) and the UCLA activity scores (197) decreases overtime – notably after 12 months post-surgery. Consequently, research exploring in-depth patients' reasons for change in sports participation between the 'pre-symptomatic' or 'historic' phase and moments 'before surgery' or 'at time of surgery', and longer term post-THR is recommended.

This SLR findings hold implications for clinical practice specifically in identifying patients who are less likely to return to PA and the strategies to improve this outcome with regards to barriers that are modifiable. These results emphasise the need for an optimal pre-surgical interaction between healthcare providers and patients, to allow patients a chance to foresee a reasonable outcome after THR (203). All healthcare providers who manage people with THR have a key role in facilitating the return to PA through their advice or decision to seek multi-disciplinary input. This knowledge can be used to guide patient counselling and shared decision-making pre-surgery (204) and is particularly important to surgeons and OTs working with adults undergoing THR.

There are certain limitations to this study. Firstly, there were only three studies with an overall low risk of bias for both prior and updated search. Majority of the included studies were of moderate [n=25] or high [n=7] for the former, and with the exception of Lancaster et al. (193) rated as high, the others had an overall moderate risk of bias for the latter. Another limitation of this SLR is that it consists of studies with broad heterogeneity in the investigated study populations, chosen outcome measures and assessment timepoints. For instance, most studies [11 of the 32] and [1 of 8] as reported by prior and updated searches analysed THR and TKRs collectively. This therefore potentially confused the conclusions as it relates to returning to PA specifically in THR. Aasvang et al. (207) advised that caution should be exercised when including hip and knee replacement in the same trials because the site of arthroplasty is an independent factor for recovery and the risks and intensity of pain, psychological variables, and inflammatory responses are different for the two procedures, suggesting different underlying pathological mechanisms. To avoid such confusions, and to aid precision of the knowledge generated in this research area, a focus on a specific joint is recommended. Furthermore, the review could potentially be limited to participants who underwent unilateral THR due to OA – as they form the majority. Of the studies that examined the diagnosis for THR in both searches, OA was the predominant reason: 23 of the 24 [prior] and 5 of the 6 [updated]. Similarly, unilateral THR was performed in 13 of the 19 and 4 of the 5 studies that reported on type of procedure undertaken according to prior and updated search results respectively. This is not much of a concern as OA is by far the most common indication for THR, estimated to be the sole reason given in 88% patients (3). Given these limitations, this findings are at most of moderate quality.

3.6 Chapter conclusion

This review is the first to identify the multi-dimensionality [biological, psychological, and social] of the factors predicting return to preoperative levels of PA at 6 months to 10 years post-THR. The findings confirm THR as effective in returning people to PA, but that participation decreases and not up to pre-symptomatic [or historic] levels. It remains unclear why this is the case, but the literature suggests it may be due to the complex interplay of some factors in the BPS model. This include being female, older age [>60 years], personal experience with pain, comorbidities [including other musculoskeletal problems], beliefs relating to PA, fear, higher expectations, better functional ability [pre and post-surgery] as well as medical advice/recommendation. However, due to the quantitative nature of current evidence, it did not provide detailed insights that explore in-depth the 'how' and 'why'. Instances include 'undefined reasons', 'reasons unrelated to surgery' which can be considered to be a gap within the THR postoperative recovery literature. Therefore, the results from this SLR were used to inform the primary study [study 2] presented in chapters 4, 5 and 6 of this thesis where this gap, the key limitations and recommendations highlighted were addressed. This was conducted using IPA, but this time focusing on a specific participant group. The next chapter describes how IPA was applied in study 2 of this thesis.

Method

Study 2 – Participation and/or returning to preoperative levels of PA: insights from historic physically active women aged 60 and over following THR for the treatment of OA

4 Chapter overview

This chapter presents the method for the primary study [study 2] undertaken for this thesis – a study triggered by the findings from study 1 [SLR], my theoretical perspective and a pragmatic approach to the RQs. An IPA framework [described in chapter 2] guided this study. It was underpinned by ontological realism and epistemological contextualism whereby the emphasis was on exploring, interpreting, and describing how participants made sense of their personal experience within their own context (208). Consequently, the results are a direct reflection and interpretation of participants' experiences.

4.1 Introduction

The first RQ of this thesis was addressed using the results from the SLR discussed in the previous chapter. The SLR was based on the available evidence on postoperative recovery, conceptualised as return to preoperative levels of PA following THR – the barriers and enablers. As previously discussed in chapter 1, this research is guided by the BPS model in that the SLR results were organised and presented according to its domains. Results answered the question: "what are the potential biological, psychological, and social outcomes predicting return to preoperative levels of PA following THR"? This allowed for the development of a BPS representation of all aspects of the patient's life influencing recovery following THR. The definition of 'preoperative PA level' in this thesis refers to the 'pre-symptomatic' [or historic] phase − when the patient was not yet restricted in participating in their preferred activity because of osteoarthritic complaints. However, limited by their quantitative nature, the SLR results revealed a lack of individualised experience in relation to the BPS outcomes influencing recovery. Consequently, detailed insights capable of exploring in-depth all of the BPS influences as they act on the recovery process from an individualised perspective was lacking. As a result, an IPA study was sought to gain deeper understanding from the perspective of women aged 60 and over – a subset of the THR population revealed as being at a disadvantage.

Thus, this study aims to gain insight into the lived experiences of PA in historic physically active women aged 60 and over to elucidate understanding of the factors influencing participation and/or return to preoperative levels following THR for the treatment OA. Results from the SLR indicated OA as the predominant diagnosis for THR amongst participants, reason for the specific focus on condition.

4.2 Sample and recruitment

Four women were recruited after giving their informed consent to participate in the current research study. The sections below give an explanation and discussion about the sampling method chosen and the recruitment procedure.

4.2.1 Sampling method and recruitment

To ensure the research is of high scientific standard, I adhered to relevant regulations [e.g., Data Protection Act], followed research principles [UK Policy Framework for Health and Social Care Research] with regards to participant recruitment and getting Research Ethics Committee approval. Ethical approval was submitted and gained from the University of Cumbria, Research Ethics Committee [Appendix 6]. The University's research guidelines/policy were therefore adhered to.

Upon approval by the ethics committee, research adverts were distributed across England and Scotland in community and public settings i.e., libraries, cafés, and charities. Online advertisements via social media were also conducted. A purposive sampling approach (86) was used to recruit participants who met the following predetermined criteria: [1] aged 60 or over [2] had undergone a unilateral THR for the treatment of Osteoarthritis [3] surgery took place 12 weeks to 6 years ago. Twelve [12] weeks coincides with the standard clinical review by which time patients undergoing THR have experienced a large improvement in pain and function (9) [4] indicate most appropriate 'lifetime', 'historic' or 'pre-symptomatic' activity level as ≥6 on the UCLA activity level scale (72,209). To achieve this, participants were required to recall their PA levels prior to symptom [OA] onset leading to THR. The UCLA activity level scale evaluation has 10 descriptive activity levels ranging from inactive or restricted to minimum activities of daily living [level 1-2], participating in mild activities such as walking, limited housework, and limited shopping [level 3-4], moderate activities such as swimming, brisk walking, and bicycling [level 5-7], or active events such as golf, bowling, or impact sports [8-10]. The rationale for the UCLA activity level scale as the suitable choice for PA assessment was described in chapter 1 & 2. For this study, the level ≥6 indicates regular participation in moderate activities [i.e., golf, bicycling, double tennis] to impact sports [i.e., jogging/running, football, single tennis]. The listed activities comply with Vail et al. (191) classification according to the levels of impact on the hip joint. The research advertisement was designed to reflect activities rated from ≥6. A confirmation of participants activity rating was conducted during the interview. Please see Appendix 7 for a sample research advertisement.

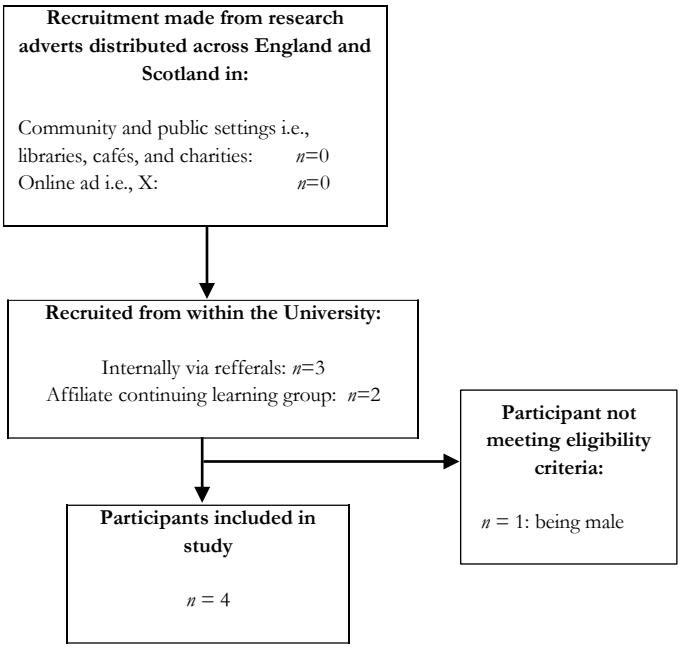


Figure. 5: Flow chart depicting the recruitment process for study 2

As described in figure 5 above, no recruitment was made from either the community, public settings or via online advertisements. Eventually, four women were recruited from within the University network: internally via referrals and an affiliate continuing learning group.

4.2.2 Data collection procedure

The study participants [four women] received a full written explanation of the study including the rationale, selection criteria and potential risks and benefits involved with taking part [see Appendix 8]. Furthermore, they were asked to sign a consent form before the interview and informed of their right to withdraw at any point within the study up to and including the final writing up stage. A full copy of the consent form used can be found in Appendix 9. Following written informed consent, in-depth semi-structured interviews were conducted via audio recording. The interviews were conducted at the women's preferred location: University premises [n=3] and own home via Skype call [n=1]. Interview questions were guided by topic guide [see Appendix 5] developed and informed by SLR [study 1, chapter 3]. The questions aimed to elicit the women's lived experiences of PA prior to onset of restricting symptoms for hip problem, OA diagnosis, preparing for, undergoing, and recovering from THR. The core topics covered included: support whilst preparing for/recovering from surgery; hopes for, and expectations of surgery and recovery, experiences of surgery and recovery. The interviews were supplemented with a postoperative recovery assessment in line with the conceptualisation of postoperative recovery for this thesis [as

detailed in chapter 1]. Recovery was assessed using an activity measure tool – the UCLA activity level scale [see Appendix 11]. Via this assessment, the women were presented the opportunity to self-report and reflect on their lived PA levels. They were asked to talk about this as part of the interview. Supplementing the interview data with a second method further enabled the revelation on how response and attitudes to PA changed over time (206). The use of topic guides helped to ensure consistent issues were addressed across women. However, open-ended questions and detailed probing/prompts were used to encourage the women to talk about their experiences and to tell their story in their own words, keeping with methods of IPA (210). This enabled generation of rich data and exploration of issues that emerged as important to each woman. Interviews were audio-recorded, lasted between 55 and 100 minutes, and transcribed verbatim by me − the only person who had access to the audio recordings. Data was stored according to relevant regulations; all information was kept in a secure storage until they were transcribed. Part of the transcription process involved anonymising any potentially identifying information such as locations, comments, or names. Pseudonyms were given across each transcript. A table with participant's pseudonyms and demographic information was compiled [see Table 5]. Full details regarding dissemination of data were included within the Participant Information Sheet [see Appendix 8] to which the women provided their consent to use verbatim anonymised quotations in the final write-up of study and publication.

4.3 Introduction to the participants

Table 5 provides an overview of the characteristics of each participant. Briefly, participants were n=4 women between the ages of 64–76 years who had undergone a unilateral THR for the treatment of OA, and surgery took place 13 weeks to 4 years ago. They all identified themselves as white and had completed University education – only two [Grace; Mary] were still working. Just one [Rose] of the women was single and lived alone. The approximate time between onset of symptoms [i.e., hip complaint OR OA diagnosis] and THR ranged from 1-22 years. The hip commonly affected was the left.

Along with their demographic characteristics, Table 5 offers information about the women's lived PA activity levels assessed via the UCLA activity level scale. This was divided into three descriptive activity levels overtime:

(1) Historic: Regular participation in active events such as golf, bowling, and impact sports [8-10]

(2) At time of THR: Sometimes participate in mild activities such as walking, limited housework, and limited shopping [level 3-4].

(3) **Current:** Regular participation in moderate activities such as swimming, brisk walking, and bicycling [level 5-7].

The women reported only engaging in limited and mild activities 'at time of surgery' as shown by the decline in activity levels. Following surgery, they all had returned to PA albeit not up to pre-symptomatic/historic levels.

4.4 Participants lived PA profiles

The next section briefly introduces each woman without compromising anonymity and confidentiality. In addition to support the idiographic element of IPA, the intention is to provide the reader with some background information and lived PA profile of each woman.

4.4.1 Rose

Rose rates her historic activity levels as 9/10 on the UCLA activity level scale. She participated in aerobics/aqua-aerobics, cycling, swimming, Yoga, Pilates, and long/brisk walks. Before her arthritic hip, she started to do Tai-Chi as well. However, at the time of surgery, due to mobility and pain, her activity levels plummeted to 3/10. Rose had to stop most of her historic activities, including Tai-Chi as she could not walk unaided. Currently [4 years post-THR], she is torn between 5-6/10 activity level score. Whilst she has returned to Pilates and aqua aerobics, she does fewer long walks and can no longer brisk walk. Rose has cut down on her swimming and avoids some Yoga poses.

4.4.2 Mary

Mary is an ex-Olympic high jumper and a volunteer athletic coach. Following retirement, she started running, jogging, teaching aerobics, going to gym and even fell walking. Mary rates her historic activity levels as a UCLA activity level score of 10. Prior to surgery, she found all kinds of PA really difficult including house chores i.e., lifting heavy things. She stopped walking/fell walking because of her inability, discomfort, and thoughts of probably doing more damage. She considers a score of 3 as the appropriate level of her activity at time of surgery. Currently, 13+ weeks post-THR, she rates her activity level as 6. She is walking, doing housework/domestic chores and recommended exercises but worrying about it because of the thoughts that she may be doing damage. She has not returned to coaching as tracks were closed at the time of interview, so it remains unclear whether return would have been possible then had the tracks been open. Mary is still inclined to hunch over at the hip and have the tendency to keep her knees bent — the former had become kind of habitual and the latter a strategy to protect them.

Table 5. Participants characteristics

Characteristics	Rose	Lilian	Grace	Mary
Age	70 years	64 years	65 years	76 years
Occupation	Retired	Retired	Employed [former PT]	Retired [volunteer athletic coach]
Marital status	Single, lives alone	In a relationship, lives alone	Married	In a relationship, lives alone
Study hip	Left	Right	Left	Left
Approximate time between onset of symptoms [i.e., hip complaint OR OA diagnosis] and THR	1 year	22 years	≤2 years	≤5 years
Indication for THR	Pain, immobility	Pain, poor posture [bent forward]	Pain, loss of range of movement and hip locking	Immobility
Approximate time since THR	4 years	>2 years	≤3 years	≥13 weeks
Prior medical condition/ Treatment	Hysterectomy	Non-Hodgkin's lymphoma		
Comorbidity		Other musculoskeletal problems [OA in left hip]	Blood pressure	Other musculoskeletal problems -OA in both knees -Bunions on both feet [right one operated on]
Prior joint surgery	Partial left knee replacement		Keyhole surgery for left knee OA	
PA profiles [UCLA scores]	Historic: 9/10 At time of THR: 3/10 Current: 5-6/10	Historic: 9/10 At time of THR: 3/10 Current: 6/10	Historic: 6-9/10 At time of THR: 4/10 Current: 8/10	Historic: 6-10/10 At time of THR: 3/10 Current: 6/10

4.4.3 Lilian

Lilian considers the historic phase of her life as when she was fittest, rating her activity level a 9. She was biking, walking uphill including Helvellyn and played tennis. Prior to her surgery, her activity level had decreased to 3 because she was not really participating in any PA. Lilian was deliberately avoiding any activity as it was just too painful. Currently [2 years post-THR], though a bit wobbly, she can ride a bike and has taken up new activities such as paddling, salsa dancing and Pilates. She does walks and has returned to walking uphill but not Helvellyn which she intends to do again one day. Lilian cannot yet run or jump.

4.4.4 Grace

Grace a former physiotherapist rates her historic activity level as 6. She used to do a bit of mountaineering and walking [hill/dog walks, and long walks sometimes]. However, she stopped running and jogging 7 years ago prior to her hip problem. Before surgery, she maintained her dog walk partly because she has got fields at her house and so could get around them. She could no longer do anything that needed bending [i.e., could not reach her foot to put on socks or clip her toenails] or using her leg more actively because it was way too painful. Grace rated her activity level as 4 'at time of surgery'. Currently [2+ years post-THR], she is back to horse riding, gardening, and dog walking. She is yet to return to fell walking, climbing, sailing, and mountaineering but now swims and cycles a bit. Grace feels she could still cycle a bit more if she wanted, would not return to backpacking but want to go back to Yoga.

4.5 Data analysis

The IPA framework proposed by Smith et al. (110) guided the analytical process. The authors advise researchers who are conducting IPA for the first time, to engage 'closely' with the steps suggested within the framework, to help make the process more manageable. This framework involves a step-by-step guide to facilitate the researcher through the organisation and development of the analysis. However, this should be treated as a flexible method of analysis, moving in both directions through the analysis, rather than a cookbook application. Working through the stages of analysis was an iterative process (110), transcripts were worked through sequentially in order to move from a participant account to the joint account and from the descriptive account to the interpretative account. In doing this, I partook in the cyclical process [a manifestation of the hermeneutic cycle as described earlier in this chapter] which involved moving from an individual participants' descriptive account to own interpretation and back to the individuals' descriptive account (110). Throughout each of the transcript analysis, I was mindful of themes emerging from the data. Attention was paid to similarities, differences, and novelties within the data set. This

process evolved throughout analysis and was conducted for individual transcripts [and across multiple cases]. An audit trail was kept ensuring interpretations was traced back through the stages of analysis. The stages employed are described in more detail below.

4.5.1 **Stage 1:** Reading and re-reading

This involved immersing oneself in the data. This process required reading and re-reading of the interview transcript and active engagement with the data to enter the participant's world. I listened to the audio-recording during reading and re-reading the transcript stage. The aim was to focus the analysis on the descriptive account offered by the participants. Through reading and re-reading, I was able to move from the chronological account in line with the interview topic guide, gaining a more comprehensive overview of the transcript.

4.5.2 **Stage 2:** Initial noting

To engage with the data on an exploratory level, the participants' transcripts were examined line-by-line (208). Initial notes and comments were added on the right margin of the interview transcripts to capture the meaning-making process of the participant. Although this involved an element of free reading, I was guided by the levels of analysis presented in Smith et al. (110) as described below:

i. **Descriptive comments:** Summarise what has been said by focusing on what mattered to the participants and the meaning they attributed to their experience. In addition, analysis also noted where the participants led the interview given their freedom of speech (110). This helped me understand the 'objects which structure the participant's thoughts and experiences' (110).

ii. **Linguistic comments:** Focused on exploring the specific use of language. The central focus of the linguistic comments is usually on the language being used by participants (110). This helped reflect the way the participants presented meaning. The linguistic comments for this study mainly highlighted linguistic features, for example pauses, participants whispering, sarcasm and hesitancy when discussing a topic. This gave clues regarding the nature of the participants' description, for example where a participant struggles to speak about the pain she endured prior to surgery. Metaphors and similes were also noted.

iii. **Conceptual comments:** Focused on engaging at a more conceptual level. The conceptual comments were facilitated by the linguistic and descriptive comments made (110). This involved taking what participants talked about, as well as how they were talking about it.

This led to interrogation of the data and abstract thinking, in an attempt to engage in an analytic dialogue.

4.5.3 **Stage 3:** Developing emergent themes

This stage involved attempts to reduce volume while retaining detail. This was carried out by making concise statements to summarise important parts of the transcript and notes from the previous steps.

4.5.4 **Stage 4:** Connecting the themes

I began by making a chronological list of themes as they appeared in the transcript. To condense the themes, prior to thinking about how they fit together, a frequency chart was developed. The frequency was not to indicate the importance of the theme rather it helped conceptualise the themes identified (110). On completion of condensing the themes, consideration began on how they might fit together. A combination of abstraction and subsumption dominated the analysis process. Subsequently, the analysis moved to a theoretical ordering. This involved making sense of the relationships between themes and clustering themes together. Thus, as links were identified between emerging themes, they were linked together through abstraction [where all the themes gained a representative title], or through subsumption [where one of the emerging themes became the title of a group of themes] (110). Attention was paid to contrasts between themes and the contextual factors.

On completion of grouping the themes, a table was developed to represent the emergent themes. This then evolved into a larger table incorporating the superordinate theme, subordinate theme, and quotes representing the theme [Appendix 10]. At this point of analysis and for each transcript, I made notes and commentaries in a reflective diary to help reflect on the decisions made.

4.5.5 **Stage 5:** Moving on

Whilst the completion of one transcript led to the next, I was open for new themes to develop from the new data by endeavouring not to reach data saturation as this is inconsistent with the aims of IPA (110).

4.5.6 **Stage 6:** Patterns across transcripts

On completion of each individual transcript, the search for emerging patterns across the participants began. To do this, each emergent theme table was laid out and so began the questioning process. This led to the separation of all superordinate themes and a creative process of grouping themes according to their content, potency, and support for one another. This enabled some of the themes to be reorganised in line with new information (110).

As part of the analysis, recurrent themes were also identified. Though this process is suggested as a useful task where samples are larger (110), it was implemented in this study given the patterns across the transcripts. This informed the presentation of themes that were recurrent in more than half of the participants (110).

In addition to this part of the analysis, I looked for patterns, subordinate and superordinate themes across transcripts and this way master themes emerge. I illustrated each master themes with interview quotation from at least half of the participants (110). At this stage, my supervisors were utilised to ensure they can see the rationality behind the combined themes.

4.5.7 **Stage 7:** Write up

The final step involved transforming the master table of themes into a written account, outlining the participant's experiences. The themes were explored and explained, whilst quotes from the transcripts used to illustrate the themes. My interpretation of the meaning of these are transparent throughout. This stage of analysis is provided in chapter 5.

Following the IPA guidelines described above, I began analysis with the detailed examination of case studies. This involved me immersing self in the data by reading the interview transcript from the first participant several times. Initial thoughts, such as descriptive comments, then linguistic comments, and finally conceptual comments were recorded in the right-hand margin of each transcript. I made notes on the transcript of important and interesting aspects of the data and developed these preliminary notes into more explicit phrases and themes as familiarity was gained with the data. Aiming to make connections between these ideas in order to establish superordinate themes for the case, I would return to the transcript to check them against the data.

The transcript of the first interview was put to one side and the transcript from subsequent interview with the second participant was then analysed in the same way as the first. This pattern was repeated until all transcripts for the cases had been analysed. It was at this point that an attempt was made to identify patterns between the themes from different time points so as to establish the superordinate themes for the complete case. Once the table of superordinate themes had been compiled for a case, I began the analysis process for the next participant. Upon the process completion for each case, identification of patterns between cases was conducted which aided formulating a list of superordinate themes for the complete group.

The superordinate themes were then translated into a narrative account, drawing out the patterns in the women's experiences – discovering the similarities and differences in their stories. Taking this approach, I was able to illuminate the women's lived experiences of PA prior to onset of restricting symptoms for hip problem leading up to OA diagnosis, and their process of preparing

for, undergoing, and recovering from THR. In particular, it enabled me to discover and capture the meaning that changes in lifestyle that occur over years of living with pain and that impede a 'return to normal' (114) had on the women as they navigated this lived experience. In knee and hip OA, pain has been identified as a factor that makes PA an aversive experience leading to activity avoidance (85) and specifically related to activity limitations at both inception of symptoms and years later (211).

During the process of analysis, I remained mindful of the principle as suggested by Smith et al. (210) that themes should not be chosen only on how often they appear in accounts, but rather, should be influenced by additional factors. These factors include how well passages exemplify themes and the way in which the theme provides illumination of the account. Thus, I embraced the flexibility of IPA that allows unanticipated ideas and themes to emerge concerning the women's lived experience (131). Furthermore, during analysis and while writing the findings, I was mindful of the idea that a 'good IPA study' narrative will allow the reader to find out something about both the salient generic themes in the analysis, and also gain an insight into the 'narrative lifeworld' − the world as lived by each of the women (212).

Situating results and interpretations within current literature [study 1, chapter 3], comparing findings with existing work and triangulating the women's experiences during analysis all serve to increase the credibility of the overall findings [chapter 7].

4.6 Quality of the research study: assessing validity and trustworthiness

There is a significant discussion among qualitative researchers about how to ensure the quality of a qualitative research. In the case of IPA, Smith et al. (110) suggest applying Yardley's (213) criteria, which presents four principles for assessing the validity of a qualitative research. These comprises of 'sensitivity to the context', 'commitment and rigor', 'transparency and coherence' and 'impact and importance'. For practical purposes, the information in this section will focus on the specific strategies used within this study to ensure its quality, rather than on the criteria outlined above. Several strategies were used in an attempt to establish the quality of this research, including sensitivity to the context, commitment and rigour, audit trails, triangulation and ethical. A brief description of these strategies is presented next.

4.6.1 Sensitivity to context

'Sensitivity to the context' means the researcher should show sensitivity to the socio-cultural milieu in which the research is situated, the literature on the topic, and the data collected from the participants. Smith et al. (110) applied the criterion of sensitivity to context in terms of the recruitment of participants who share a particular lived experience. The participants in this study

all share the lived experience of undergoing THR for the treatment of OA and recovering from it. Sensitivity is said to be shown by a study having considerable number of verbatim extracts from the participants to support the arguments being made thereby giving voice and allowing interpretations to be checked by the reader (110). This study included such quantity as provided in support of the argument [described in the data analysis section of this chapter]. In addition, the relevant substantive literature is used to help orient the study and the findings it is argued should be related to relevant literature in the discussion (110), as shown in chapter 3 [study 1] and chapters 6 & 7 to come.

4.6.2 Commitment and rigour

Commitment means a personal commitment and investment by the researcher, ensuring participants feel comfortable and paying close attention to what they are saying. Rigour means appropriateness of the sample, the quality of the interview and consistency of the analysis. Attentiveness to the participant during data collection and the care in which the analysis of each case is carried out is said to meet this criterion according to Smith et al. (110). Each interview was audio recorded and transcription undertaken by me. Each theme was supported with quotes from more than half of the participants in chapter 5, thereby enabling the reader to understand where the interpretation has arisen. Importantly, the IPA framework discussed earlier in this chapter guided the analytical process.

4.6.3 Audit trail

The development of an audit trail during the data analysis process allowed for a clear description of the process of theme development used in this study. The process of IPA utilised [discussed earlier in this chapter] lends itself well to the development of an audit trail, ensuring that interpretations are traced back through the stages of analysis. This comprise the iterative process of emergent theme development in relation to new data i.e., the detailed description of the process such as an explanation of how the themes were developed, resulting in the final thematic structure. This process was useful for establishing the quality of the final analysis by providing a means of recounting and explaining the decisions made throughout the 'developing emergent themes' and 'search for emerging patterns across the participants' stage process (214). Furthermore, orienting findings from relevant literature on the topic [study 1] allowed for the comparison of interview data with themes or concepts from the literature, thereby enabling additional strategy for ensuring trustworthiness and triangulation, which is discussed next.

4.6.4 Triangulation

Both data triangulation and investigator triangulation were applied in this research to strengthen the trustworthiness of the data obtained. Data triangulation involved the use of a variety of data source of evidence (215) across the two studies. As previously mentioned, themes emerging from the data were compared with the literature both before and after the analysis process. Other data sources included audio transcripts, activity measure tool [UCLA activity level scale] and literature. Information from the semi-structured interviews and self-reported activity measure tool were audio recorded. The UCLA activity level scale served as prompt to encourage talking about the phenomenon, evaluate participants PA profiles before and after THR to determine recovery [the changes in PA in the course of time after THR i.e., whether postoperative score matches or exceeds the preoperative levels]. Supplementing the interview data with a second method, in this instance self-reporting PA levels was designed to further enable the revelation on how response and attitudes to PA changed over time (206). This provided a richer understanding of the data collected from the semi-structured interviews (216). Investigator triangulation involves more than one researcher engaging in the research process (217). Throughout this research, my supervisors were used as a means for reflecting on the research process. Two supervisors were involved at various stages, including the data collection and analysis process. This comprised reviewing the themes developed during data analysis. Furthermore, the exploration of the perceptions of both the general THR population [study 1] and specifically women aged 60 and over with OA in study 2 [described in more detail in chapter 5], allowed for multiple sources for the same topic (218), further impacting the quality of the data.

4.6.5 Ethical

According to Tracy (219), this is one criterion to help evaluate quality in qualitative research and comprise including procedural and exiting ethics. Procedural ethics involves ethical actions dictated by larger organisations and ethical review boards to protect the participants and the researcher. For this research, I gained ethical approval from the University of Cumbria, School Research Ethics Panel [Appendix 6]. Research was therefore conducted in adherence to the University's research guidelines. On the other hand, exiting ethics involves ethical practices beyond data collection stages, such as considerations of how the data will be displayed. I avoided using any information that leads to identifying the participants. Also, the language used within the write up of the findings reflects the language used by the participants to describe their account of the experience.

4.7 Chapter conclusion

This chapter focuses on the method and research design utilised based on IPA approach. The aim of IPA is to explore in detail the participant's lived experiences of a particular phenomenon and what that experience means to them. IPA was chosen as the most appropriate method to highlight historic physically active women aged 60 and over lived experiences of PA following THR for the treatment of OA. It is important to note that my interpretations may be different to others, and this is the reason why the guidelines discussed in this chapter were followed to evaluate the quality of this research. Demonstrated within this chapter was the reasoning behind the choice of specific methods, with regards to the research purpose, context, and my philosophical position.

CHAPTER 5

Study 2 — Findings

5 Chapter overview

The focus of the study is to gain insight into the lived experiences of PA in historic physically active women aged 60 and over to elucidate understanding of the factors influencing participation and/or return to preoperative levels following THR for the treatment OA. This chapter is concerned with presenting the interpretation of this phenomenon, utilising IPA.

5.1 Introduction to findings

Three super-ordinate themes were generated during data analyses. The sub-themes which made up the super-ordinate themes were mostly consistent across the women's accounts. These comprise further subordinate themes which developed from bringing together the emergent themes from the individual transcripts. A small number of sub-themes were unique to particular women. Where this occurred, it has been documented and discussed to ensure clarity for the reader. The theme structures are illustrated in Table 6 below whilst a detailed description and illustrative quotations of each theme is presented in Appendix 10. All quotations have been taken directly from the raw data. In the quotations, the use of em dash (—) indicates a pause, ellipsis (…) indicates the removal of some text that does not alter the meaning of the quote, and square brackets [ ] indicate the addition of some text to clarify meaning.

The presentation of the findings is followed by a summary report which illustrates a case [one of the women] highlighting how the biological, psychological, and social-environmental dimensions of the BPS model interact to influence participation and/or returning to preoperative levels of PA following THR.

5.2 Theme 1 - *"I should have had it almost a year before, I was in absolute agony"*: the long and painful path leading to surgery

Characterised by 3 sub-themes: consequences of pre-existing joint and other medical problems, delayed decision-making for surgery and recovery expectations, this theme illustrates the overwhelming long and painful path leading to THR. Peculiar to the women was the length of time they had to wait until diagnosis and eventually surgery. This was affected by at least one period of delay that served as antecedents to delayed definitive treatment due to their interference with diagnosis at the onset of symptoms and decision-making. The delay was consistently attributed to antecedents to surgery such as other pre-existing joint and other medical problems, and either personal or healthcare systems factors. Eventually at the time of diagnosis, physical functions/activity level had dwindled, and the intensity of pain increased consequently making surgery an inevitable need rather than a choice. This 'need' in turn influenced what surgery meant to the women and what they expected thereof.

Table 6. Overview of themes

s/n	Superordinate themes	Subordinate themes
5.2.	*"I should have had it almost a year before, I was in absolute agony"*: the long and painful path leading to surgery	5.2.1. *"It just got worse and worse and worse over the time"*: consequences of pre-existing joint and other medical problems 5.2.2. Delayed decision-making for surgery 5.2.2.1. *"I couldn't decide"*: personal perspective 5.2.2.2. *"We've got people out there in the waiting room who are in a far worse state than you are"*: healthcare system perspective 5.2.2.3. *"I was been able to do less and less and less"*: poor/worsen functional state at time of surgery 5.2.3. *"My biggest expectations was to get rid of the pain"*: recovery expectations
5.3.	*"I would have liked much more information about longer term rehab and getting back to a pre problem level of fitness"*: support from healthcare professionals	5.3.1. Information received about recovery and returning to PA 5.3.1.1. *"It was very much about managing"*: limited information about longer term recovery 5.3.1.2. *"I don't think the hip will prevent me"*: medical advice received for other joint problems 5.3.1.3. *"I got conflicting advice"*: lack of interprofessional collaborative and care coordination 5.3.2. Knowledge of OA, joint replacements, and the recovery process 5.3.2.1. *"People haven't got time to discuss it with you really"*: lack of knowledge 5.3.2.2. *"I'm more aware of, of physical activities that um that are going to help"*: adequate knowledge 5.3.3. Limited supervision in recovery

s/n	Superordinate themes	Subordinate themes
5.4.	Reasons and deterrents to participating in PA	5.4.1. *"You've got age deterioration that you have to take into account"*: beliefs 5.4.1.1. Age beliefs 5.4.1.2. Perception of age and/or other joint problems impact on PA 5.4.2. The meaning of PA 5.4.2.1. Keeping active to sustain independence in old age 5.4.2.2. *"I've got to enjoy doing it"*: something liked and enjoyable 5.4.2.3. *"Got my commitments to my dogs"*: something committed to 5.4.3. To foster a positive self-body image 5.4.3.1. *"Before I looked like an old woman, I was bent forward"*: how others see them 5.4.3.2. Regaining the old abled self 5.4.4. *"Having the courage to go back"*: facilitators of recovery 5.4.4.1. The role of weather plays 5.4.4.2. *"Your hip's different"*: acceptance 5.4.4.3. *"It helped having some background in physio"*: fore knowledge of the recovery process 5.4.4.4. *"It's really mainly my desire to improve and my desire to return"*: motivation to return 5.4.4.5. *"It did give me an enormous boost"*: fulfilment of recovery expectations [i.e., confidence booster, informing new goal setting postop]

5.2.1 *"It just got worse and worse and worse over the time"*: consequences of pre-existing joint and other medical problems

The women all had pre-existing medical conditions − other joint problems or/and medical problems, some having more than one.

Grace: *I've never been able to sit cross-legged on the floor even as a child, I've never had that range of movement because I've got this slight anomaly in the anatomy of my hip joints… Um, um, and all my life I'd noticed, I didn't have quite the same ability to sit cross-legs as everybody else did. So, and I go to Yoga when they've tried me on several blocks to get my knees down the same height as my hips, but it was a struggle.*

Rose: *I used to be able to briskly walk and do all sorts and do longer walks, it's possibly before my knee. My knee was done in 2012, so that is possibly pre-knee. I couldn't do [long walks] that after my knee really.*

As shown above, participation in certain PA had always either been a 'struggle' or something they 'couldn't' participate in for reasons not even related to study hip condition. The meaning been that their physical functions had already started to decline even prior to OA hip diagnosis and eventual surgery.

From the narration, it became apparent that the onset of the women hip OA masqueraded as symptoms of pre-existing comorbidities. For instance, Grace's leg pain caused by the medication for her high blood pressure.

Grace: *It's [high blood pressure] been very difficult to get my blood pressure, to be controlled by medication and for me to tolerate most of the medications. When I took one of the medications called Irbesartan over about two years, I started to get leg pain… And then it just got worse and worse and worse over the time.*

The consequences of the interference of these other medical problems were the long span of time the women endured in pain. As Grace highlighted above, it only got worse over time and began to affect her participation in PA.

Grace: *And I just started to notice that it was locking, that the range of movement was decreasing and then, the locking was quite painful… Um, and it's, it just started to be more painful at different times or if I was riding um my horses.*

Unfortunately, all the discomfort experienced had been misinterpreted as having to do with pre-existing musculoskeletal problems, one that would impact getting an accurate and timely diagnosis.

Rose: *In 2012, I had a knee, it's on the same side so I didn't really notice the hip, but we [herself and doctor] didn't put it down to being my hip when it was first noticed…so they thought it was a muscle here [points to hip] that I'd had.*

Grace: *It just got worse [reason for going to the GP]. And I think they said, well, it's likely to be arthritis in the hips, but we'll send you for an x-ray and we'll send you to the physio….and they said, well, there is not real change from before…that is 30 years before, I'd had some problems with the same hip when it had just been really painful… they've done x-rays then and told me that I had got a slight abnormality around my hip joint.*

For both Rose and Grace, it was observed that what added to the complexities of their condition and challenge in diagnosis was the fact that the study hip problem was on the same side as prior joint problems. Grace's condition happens to even be more complicated given that she had started experiencing pain on same joint 30 years prior. Similarly, it did not help that Mary had already been diagnosed with OA in both knees, meaning that like Grace, her current hip problem is on the same side as one of her knees.

Mary: *It took quite a while for the, for it for the, for the diagnosis of the quite a significant hip problem to come to light. It was maybe a year, 18 months after I first went to the physio about the limp…We thought it was knees and, then you know, we went through all that long protracted process. Um, before we realised it was knees [hips] and I was thinking more blimey.*

On eventually getting an accurate diagnosis, Mary's use of the expression *blimey* to describe her thoughts could be interpreted in two ways: surprise as to how it could have stayed hidden this long or excitement that relief is imminent at long last.

5.2.2 Delayed decision-making for surgery

One would expect that given the peculiarity and complexities of the women's condition and the pain factor, decision-making for surgery would be easy and straight-forward. This was not the case as diverse experience of decision-making was shown, characterised as personal and healthcare system perspectives with implications for further decline in functional state and deterioration in condition at time of surgery.

5.2.2.1 "I couldn't decide": personal perspective

Following the hip OA diagnosis, the effect of having other medical problems still somehow snuck in, delaying the decision for surgery as experienced by one of the women. Lilian the only one who had her diagnosis without any hassle became terminally ill following diagnosis. As a result, undergoing THR was the last thing on her mind and so not the priority then.

Lilian: *So, I hung on and then I became ill with non-Hodgkin's lymphoma, which is a blood cancer. So, I had a lot of chemotherapy and wasn't really expecting to live very long um, so the, I don't want to waste any of the time I've got left recuperating from hip surgery. Um, So I was avoiding it really.*

Lilian avoidance of surgery at that time seems very understandable given her ailment. However, following her successful treatment she still was avoiding surgery which made it quite questionable. It has been a long gap between her OA diagnosis in 1995 and eventual THR in 2017 so she was sort of *disabled* at the time. The real reason came to bare as she narrated below.

Lilian: *And also, my mother, sorry, had, um, a hip replacement, she's had both hips replaced, but the second one went a bit wrong, and she was left with a paralysed leg from the knee down. Um, so I was well aware that it could go wrong, and I might end up worse off… So, I kept putting it off and putting off, got used to being disabled in a way um.*

Here Lilian gives the picture of been caught between the devil and deep blue sea − having to choose between the possibility of going paralysed or remaining disabled. The latter happen to overpower the former which highlight the influence the experience of others who have undergone surgery had on those considering it. Also highlighted is the importance of fostering a positive self-body image discussed in theme 3. A paralysed figure appear to be something she may not find desirable especially with the thought of ending worse off than her mother. There is a sense of comparison between what an outcome like that would be for her compared to her mother i.e., she being younger. This kind of hinted on the need to foster a positive self-body image described in theme 3.

One thing was clear from Lilian's experience that there was a fear avoidance for surgery in varying proportion amongst the women. This was quite interesting coming from two women who had particularly recorded prolonged osteoarthritic pain for both study hip and other joints.

Grace: *And so, I got referred to the consultant in mid-September. I saw him, um, and he just said, "it's entirely reasonable that we do a replacement"….Um, well, I couldn't decide. I was a bit surprised that he, about what he said, so I didn't, I didn't give an answer straight away. I think I just expected him to say. Yeah, you've got a problem, but it's not severe enough. And so, um, I was a bit taken by surprise.*

Mary: *Ah, yes, because what happened when I went for the first, uh, appointment down at [name of place], uh, he said, "well, the options are, we can either give you an, uh, cortisone, cortisone injection in the hip. Um, and or we can go for replacement so, and it's your choice".*

The sense that could be drawn from both women's indecisiveness is a possible reliance on the recommendation of their consultant. Presumably, if the choice was made for them, the burden of making the decision might have been lifted. Apparently, there is a perceived fear to either make the *choice* or *decide*. This is the only reason that makes sense especially for Grace who had previously complained of leg pain and her condition getting worse over the time.

Mary: *And I said, well, let's go for the injection first of all. So, I went down again for the injection. Uh, first time that made a massive difference… Uh, but, but after a couple of months it had worn off. Um, and then it went down for a second injection and it, it, it ha it only had an impact for, for a matter of days. So that was when we realised it, obviously the replacement was the thing to do.*

For Mary, opting first for the injection further portrayed a delaying tactic inspired by fear. Apparently, if there was another option, she would have chosen that before surgery, in the absence of that, surgery became the last resort.

Grace: *And he said, "well, have a think about it, let me know if it's within three weeks, then you can just ring my secretary up". Um, and he said the waiting list was about three months… So, I did ring them up but by then, the waiting list was, was going to be a bit longer…So, five months, four and a half months I was trying to say.*

Whilst the decision was eventually made by Grace as shown above, it was with the repercussion of avoidable delays, adding to the already prolonged painful wait and deteriorated state.

Rose was the only one who did not have to decide on surgery. Following her muscle misdiagnosis and placed under a physiotherapist, she was away for 5 months in the hospital with her sick grandchild.

Rose: *It was bad—I just could hardly walk—It was going downhill—this is getting worse [thinking to herself], and I was struggling to walk and everything, but I was just keeping it to myself, yeah, yeah. I was only as active as I was because of um personal situation of a grandchild being in the hospital — Looking after the other grandson…The physiotherapist used to fit me in when I used to come home to collect clean clothes and things in [name of town of residence]. She then realised it was my hip going not the muscle. I couldn't get up, I couldn't get up out of chairs and she'd watched me getting up out of the chair but she [physiotherapist] didn't tell me that until [name of grandson] was fine because…—you know — we were all worried…but again, that wasn't our priority at the time, wasn't me.*

The emphasis and description of her poor functions makes it quite questionable as to whether had she been informed by her physiotherapist; would she have opted for surgery immediately or not. There appear to be a subtle disappointment at not been told by her physiotherapist earlier on, but she seems to make sense of it using the excuse of not been the *priority* then.

Rose: *And as soon as we knew my grandson was out of the hospital would be okay, that was when I was sent straight away for x-rays, I was booked in. By the time when they were going to give me the hip replacement, it actually deteriorated badly and then um — it became urgent.*

However, like the other women, there is always a repercussion for any action or inaction. In this instance, this led to Rose condition getting worse off.

5.2.2.2 "We've got people out there in the waiting room who are in a far worse state than you are": healthcare system perspective

The healthcare system factor encompassed the women's perception of its contribution to delayed surgical decision and also evidenced the fact that attempts made at prompt delivery of surgery do not always go as planned. One factor that was fundamental in increasing the length of time Lilian had to wait from her diagnosis through to decision-making was the perceived 'discouragement' from her surgeon for 'not being old enough' to have hip replacement. This was informed by the NHS at that time, whether or not that policy still stands is unclear.

Lilian: *Well, um, I'm not sure if it's still is NHS policy, but, uh, then when I was first having problems, the policy was to try and get people to wait until they're 60 years old….Um, although the surgeon said that the deterioration in the hip looked bad enough to do a hip replacement, that his advice was to keep going with my own hip as long as I possibly could, because it might go wrong and I'd be worse off, um, or it might need doing a second time. You know, it wouldn't last me the rest of my natural life possibly, so and it gets more difficult and less of a chance of success the second time you do it on the same leg…because, um, the risk that, you know, somebody with a normal life expectancy would need a second hip replacement that, you know, they would wear out.*

In addition to other issues along the way i.e., falling terminally ill, Lilian waiting until she was supposedly 'old enough' led to 22 years wait from time of diagnosis until surgery − by which time she had got used to being disabled. From her narration above, the repeated use of the word *because* and sound *um* appear to be her trying to make sense of her surgeon's advice, one she seems to struggle with.

An apparent clarity to Mary's perceived fear avoidance and further proving how impactful a surgeon's opinion or advice is with regards to decision making was brought to light as she narrated her *awful* encounter with a consultant.

Mary: *And then I was referred to uh, uh, a consultant in [name of Town], um, and I was thinking, oh, thank goodness. I'm going to get through the you know, going to get through the process at last and that, uh, consultation was absolutely awful…I had this terrible experience where, uh, you know, he's staring at his computer screen and shouts out a lot of different questions.… And at one point he said in a, quite an aggressive tone, um, "we've got people out there in the waiting room who are in a far worse state than you are". And he said, "I think you'd be very disappointed at the result of, uh, your, you know, your expectations of an operation of a hip replacement would not be fulfilled"…. He had no, he had never asked me what my expectations were, so, he was making a bit of an assumption there.…Um, you know, I can't suddenly, I don't see why I should suddenly have much lower expectation…But I do have quite high expectations of what I can do physically. Um, but that, but that's just who I am and that's what my past is…. Um, and you know, he [consultant] was basically, he made me feel as though*

I should have known that I shouldn't have been there because I'd be taking up space that there are other people in a far worse state than me, you know, require.

Not only was her relief and excitement about getting help at last cut short, two very interesting points were observed from her narration of this event. One, being told she would be very disappointed at the result of surgery and that her expectations would not be fulfilled. Second, the manner of the communication style - the consultant staring at his computer screen shouting out a lot of different questions, and in an aggressive tone told her there were others in the waiting room in far worse state. Whilst the former was strange to her given that he did not even know what her expectations were, the latter made her feel she should not have been there and literally downplayed her condition. One thing was evident, this encounter left Mary questioning what she should expect from surgery as someone who had led a physically active past, this presumably impacted her decision to go for the injection first.

Mary: *And I was really upset about it… And when he took his eyes away from the computer screen, he saw that I was upset. I was almost in tears at that point. And he said, "Oh, Oh, Oh, well, how about another appointment in three months"? And I did not, uh, I didn't answer because, um, I thought, well, what's the point? What is the point of that? You know, nothing much is going to change in three months anyway. Because I did not answer, he shouted out at shouted at me, "another appointment in three months, is that all right"? Uh, and I, I had no option, but to say yes, okay. And, and then I left, and I was really upset.*

As shown in her thought to the consultant's query for another appointment, Mary further confirms the fact that her expectations for surgery had already been impaired by this encounter. Obviously upset, feeling unsupported and literally bullied into another appointment unfortunately meant further delay and deterioration to her condition.

Contrary to Mary, as Rose experience revealed, attempts made at prompt delivery of surgery do not always go as planned.

Rose: *Everybody was trying the hardest because they knew what I'd been through and everybody was trying their hardest and to get it [surgery] done…it's just the place that books all the appointments hasn't seen it as supposed to be urgent, they messed it up…So, it should have been done, should have been done by November but it wasn't… So, in the end, my doctor — I was in so much pain, my doctor actually rangs, because I couldn't get through because when they got through, they apologised and then gave me a date for day surgery.*

From the above, the state of Rose condition is made clear, much so as she again emphasised on how much pain she was in. One can only but imagine having to endure an additional wait in pain until the appointment gets rectified. Unfortunately, her personal attempt to sort things out proved

abortive highlighting how little or no support was available to patients as described in theme 2 below.

5.2.2.3 "I was been able to do less and less and less": poor/worsen functional state at time of surgery

Synonymous to all the women was their poor/worsen functional state at the time of surgery. Following her long-awaited decision for surgery, Lilian did not have to wait long after referral because her hip *was so bad*. Grace unfortunately had additional pain to contend with caused by her high blood pressure drug. Similar to Rose, they both also had to wait to have surgery over the holiday period which must have had a psychosocial effect on them.

Grace: *Um, but then the drug that this different consultant have given me around Christmas time before my hip was actually operated on, started to produce some similar leg pains…It was supposedly about my blood pressure, very definitely produced an additional pain around my hip and pelvic region, but on both sides…I couldn't take it, I couldn't…I thought it was–initially I thought it's my hip getting really worse cause it was in that same region. Um, and so I thought I can't wait to have my hip done.*

Rose: *Just before I had it done, no, I wasn't doing very much at all. I couldn't do very much at all, that last part and that Christmas before, I was in agony, absolute agony, it was really very painful. And I was been able to do less and less and less, yeah um, in theory, I should have had it almost a year before, I was in absolute agony, yea, it was really hard… They gave me tramadol, my brain went just very, very low, hardly moving. My feet was bad well, I could use the loo and still get around but painful, is very painful, hips can be very painful, I now realise [in low tone].*

As shown above, the similar choice of words used by both women kind of mirror the similarity in their pain experience. This can be seen in their repeated use of *couldn't*, cutting a figure of one in excruciating and unbearable pain probably left alone as others were busy with the festivities of the holidays. Rose pain experience left her with the realisation that hip OA is very painful. This assertion was made in a low tone which implies that even in recollection, the thoughts brought back painful memories. Grace on the other hand could not wait to have her surgery done, obviously to get relief from the pain. Rose condition had deteriorated so much that she was *using a stick* as she went to the hospital in January to have her surgery.

5.2.3 *"My biggest expectations was to get rid of the pain"*: recovery expectations

Impaired and modified by the intrusion of OA, prolonged years of living with a painful hip, other joint/medical problems, and associated restrictions, the women's recovery expectation was thus a

reflection of the functional state they found themselves at that time. As a result of this, the consistent expectation amongst them was pain relief, this was *mainly* and the *biggest* expectations.

Rose: *My biggest expectations was to get rid of the pain—I think, yeah. Um—I didn't know what to expect after that but yeah, it was just get rid of the pain really cos that was stopping me walking I think so, that was horrible. I wanted more mobility, yeah. I wasn't expecting much but be able to walk freely and walk.*

With the choice of words used by Rose to describe *how bad it was before the operation,* such as been in *absolute agony* and even admitting that *hips can be very painful,* it is not surprising what her expectations turned out to be. Her condition had deteriorated so bad that she was using either a stick or crutches at the time. Therefore, she appeared desperate to be pain free that any other outcome besides the perks that came with that expectation been fulfilled would just be an added bonus. This appears to explain the use of the word *biggest* to qualify that expectation.

For Lilian, years of enduring a painful arthritic hip had led to activity avoidance and exclusion from people. The psychosocial consequences of her pain experience came with debilitation and isolation that affected her activity level due to avoidance especially as she happen to prefer group activities.

Lilian: *Um, so mainly I wanted to be free of pain and a bit of re-joining things with other people…I could no longer remember what it was like to have that range of movement… I was avoiding it [PA] as much as possible. Yeah, too, it was just too painful…because of pain and because I couldn't keep up with other people. Um, so that disincentivise me to join in with any group activities and, um, I couldn't find anything that I could enjoy doing by myself really. So, I just got more and more isolated and debilitated really.*

In addition to pain and inability to keep up with people, there seemed to be more to Lilian's activity avoidance. From her narration about her shopping trips with her nieces, it became clear it was a strategy to avoid *embarrassing* herself. There is the sense that she found her physical limitations embarrassing and would rather be excluded in isolation.

Lilian: *Uh, you know, I felt like I was excluded from a lot of things….and even going on shopping trips with my nieces got very difficult, you know, because I felt like I was holding them back all the time and having to sit down and ask them to wait for me. It's embarrassing.*

There is also the suggestion that her nieces may have sensed the trips were becoming *very difficult* for her and so started to exclude her. As a result, she would rather prefer to be in isolation to save herself and others the embarrassment of keeping up with her or vice versa.

Thus, for the women, being pain free will potentially facilitate going back to the type of PA enjoyed and doing that freely without any restriction − a possibility years of living with pain had robbed them of.

Expectations happened to further be either positively or negatively impacted by the opinion and experience of others as shown by Mary and Grace. There appear to be a similarity between Rose and Mary's expectations of 'walking freely' and their opinion about it. As described above, the former termed this as 'not expecting much' whilst as shown below, the latter referred to it as *hoping for*. It implies that they both sensed their expectations was low. Mary however seem to give an indication why this was the case.

Mary: *I wasn't sure [expectation] because when I went to see that consultant in [name of place], I was told very firmly that I would be my, I would be disappointed with the results of the, uh, of hip replacement…Um, but I mean, I just hoped that, I would assume that I would be able to get back to walking without a limp and walking freely without being conscious of walking if that makes sense, so that you can just move around the, walking can flow uh, and you are not having to worry about, uh, discomfort or, um, fatigue in particular areas of the body. And I think that's what I was hoping for.*

As narrated above, her awful encounter with the consultant apparently altered her expectations so much so that she was left with not being sure of what to expect. It could be that prior to that encounter she had higher expectations [given her athletic past] but that changed based on the opinion of the consultant. Consequently, she was left with the choice of merely *hoping* that surgery is able to recover her basic need and nothing more. The use of the word *hoping for* seems to be a deliberate choice of word as it appears less definite. The impact of the opinion of others, especially HCPs is re-emphasised by Mary, this time the influence on informing expectations.

Contrarily, Grace had high expectations as informed by the experience of others. Here again, the importance of the experience of others who have had THR on those undergoing surgery is highlighted.

Grace: *Um, and so yeah, my expectation was that I will be able to ride horses again, and it be pain-free um, that I would be able to walk. I know that people do these things again um, without limitations… I've got experience of other people, family, and friends, having hip surgery and all and patients that I saw and some patients that I used to get up to mobilise post-operatively as well. Um, so over the years I've seen quite a few people have hip replacements, one or two have had incidents with them. Um, but on the whole, people do really well.*

From the excerpt above, the positive outcome of these people shaped her expectations for surgery and gave her the boost needed to go through with it. This appeared to have formed the mindset that if others can *do really well* with surgery, she too can.

5.3 Theme 2 - *"I would have liked much more information about longer term rehab and getting back to a pre problem level of fitness"*: support from healthcare professionals

The joint arthroplasty clinical pathways address preoperative education, postoperative rehabilitation, and continuous follow-up. Therefore, many professionals such as surgeons, nursing staff, OTs, and physiotherapists [PTs] guide patients to manage the physical changes after surgery. From the women's narratives, this was not the case as reports of insufficient knowledge and admission of care marred their surgical experience. This implied a potential systemic lack of support in aiding return to higher physical functions and activity levels. Whether this is deliberate or based on the assumption that the women due to their age were merely interested in minimal level of functioning after surgery as indicated is unclear. It took prior/personal knowledge gained from own experience or other sources, self-determination, motivation, and a positive mind-set towards recovery for the women to pull through. The sub-themes: information received about recovery and returning to PA, knowledge of OA, joint replacements, and the recovery process, and limited supervision in recovery describes this theme.

5.3.1 Information received about recovery and returning to PA

This was a consistent sub-theme detailing the women's narratives about lack of detailed information regarding rehabilitation and longer-term recovery. No individual guidelines or milestones were given, specific instructions and support on returning to PA was sparse. PA instructions centred around activity avoidance as influenced by other joint problems.

5.3.1.1 "It was very much about managing": limited information about longer term recovery

One woman's report described a lack of detailed information regarding rehabilitation and longer-term recovery. Mary specifically was very vocal about her view on the information received during the routine preoperative assessment. She gave the impression that whilst HCPs may think the information been provided was sufficient or adequate, this may not be the case as highlighted below.

Mary: *We did a, we did a training thing…They give you a huge amount of information. I had a load of leaflets about different do's and don'ts post-surgery and all the rest of it…But as I say, they didn't give any information about the longer-term recovery process…I think it was limited [information received] …and it was very much about managing, you know, the do's and don'ts immediately after post-op which is quite important and, uh, that was well done—one thing they didn't do was actually said, say anything: a very construct—or anything at all about the recovery process.*

Apparently, she had her mind set to achieve enhanced recovery, but the information provided did not seem to align with that goal and this made it appear irrelevant to her. It should be noted that Mary had previously mentioned having *quite high expectations of what I can do physically* owing to her past as a former Olympic athlete and so understands the importance of rehabilitation in the recovery process.

Mary: *The whole rehab process is something that they don't seem to, it doesn't seem to come into their purview if that's the right word, they don't seem to consider it.*

Thus, having to go through recovery without the option of rehabilitation and the longer-term recovery process was concerning to her as can be seen below in her use of the word *fraught*. There was the sense that she could not understand why this was sort of omitted. The fact that the training was centred around management sort of aroused a suspicion that it has got to do with her age.

Mary: *It's been, um, a bit fraught, I would say simply because of a lack of straightforward information of do's and don'ts, and of course the hospital would assume somebody my age, um, they would not assume that that person was thinking about getting back to a level of fitness once they've recovered from the physical effects of the operation. They wouldn't be thinking in those terms and very, probably the NHS doesn't think in those terms either, you know, it took, it probably thinks in terms of sort of a minimal level of functioning, but day-to-day living. Yeah, so, uh, I, uh, as I say, I have found that difficult, quite that process, quite difficult.*

Mary was convinced that the hospital and the NHS probably think that given her age, she was not keen about getting back to being physically active following surgery. Apparently for this reason, information about the longer-term recovery process was deemed irrelevant. Again, she expressed how this bothered her, presumably given the fact that she perceived it may be age discriminatory. Her encounter with the consultant who told her outrightly that she would be disappointed with surgery discussed in theme 1, likely had also fueled this perception. So, even though she 'understands' that information about rehabilitation might be a total waste of time for others her age, Mary identifies differently from women her age because of her athletic past.

Mary: *I'm very far from typical of a 76-year-old woman, uh, physically because of my past. Um, and, and so, uh, you know, what, what would have suited me in terms of information about rehab might've been total waste of time for a lot of people. So, you know, you have to put what I'm saying within that context, but, but for me, I would have liked much more information about longer term rehab and getting back to a pre problem level of fitness.*

There was also the sense that not only has her expectations been impaired by the consultant's opinion, even that i.e., hoping *to be able to get back to walking without a limp and walking freely* seems even threatened. So, it appeared really *difficult* for Mary to make sense as to why HCPs would think that older patients in general only think of recovering only minimal functioning. She considers this

generalised assumption as flawed, bringing to light how important it is that information provided be personalised to the individual patient needs and goals. She seems to imply that had this been the case for her, the information provided for her would have focused more on *longer term rehab* which she seems to reckon as the required channel to meet her recovery goal.

5.3.1.2 "I don't think the hip will prevent me": medical advice received for other joint problems

A recurring factor that appeared to interfere with the PA specific information received was the medical advice for their other joint problems. The impression given was that had it not been for other joint problems, the study hip/THR would not prevent returning to certain PA but for the adherence to advise received for those.

Lilian: *I was just taking it slowly, building up my strength, but I didn't want to put extra pressure on the second hip too much at that time because the surgeon said, "you know, it really might collapse completely um, you know, you felt it, the arthritis has got very advanced", and I should be careful.*

Rose: *I can't [jog], um, I mustn't because um, I have been told not to because of my knee. Yea, they [consultants] wouldn't like me to jog, they may have changed it since I had my knee done, but he [consultant] said certainly, if you go to the gym, just don't get on the tread mill. Yeah, is not the hip, I don't think the hip will prevent me.*

In addition to the bid to adhere to medical advice, a perceived need to preserve the pre-existing joint problem to avoid total joint replacement could be sensed. This is because, as already highlighted in theme 1, decision-making for surgery was not easy for the women. Lilian by now have had her THR so is very cautious about having the other hip done as the OA on that one is advanced. Rose on the other hand has already had a partial knee replacement so would do anything to preserve it from escalating to needing it totally replaced.

Further revealed was the lack of clarity with regards to the advice given for not participating in certain PA prior to surgery.

Rose: *The consultant who consulted with the knee replacement not to pound the streets, not to pound for your knee but I couldn't do that [long walks] after my knee really… I started to be very careful about the terrain.*

As shown above, Rose had stopped long walks even before her hip was a problem owing to her consultant advise. Various connotation could be drawn from the advice, as *pound* could mean various things. Here the need for clarity is evidenced with *pound* better explained to mean for example long, taxing walks but shorter paced ones are fine. This way, the outright discontinuation of long walks could have been remedied.

Following surgery, it was unclear as to what advise was due to the study hip, pre-existing joint problems, or a combination of both.

Rose: *Well, before my knee, yeah, I can crawl on my back, but I would always just do breaststroke. I was advised not to do breaststroke but again that could be hip and knee you see…but I've got in the water and done it automatically, yeah…but I think that's because I think the muscle on the side of my hip are quite strong now and that must have been, I don't know…The chap [surgeon] who did my hip said, "be careful", he said "when you get in and out of things, don't bend forward when you go to Yoga", he said don't do, you know what I mean, what it is, when you sit down, your legs are like that, it could go crossed legs…Whether that's to do with the surgery, I don't know.*

Apparently Rose loves doing breaststrokes and experiences no discomfort when she mistakenly does it under water as she admits that her hip is now strong. This explains the note of frustration felt in her repeated use of the statement *I don't know* as she decried the ambiguity of the advice. It must be frustrating to be told not to engage in an activity that is obviously enjoyed and perceives as harmless. This in turn has great implication on that activity, as it places a restriction on participation as shown below.

Rose: *I actually feel I can do breaststroke legs, when I've gone in the water, you just stopped automatically but that's cut my swimming lying down.*

The need for clarified information is highlighted here to help patients clearly understand why a supposed valued activity they perceive as doable should be stopped as it not only aids adherence but curtails any potential demotivation for PA.

5.3.1.3 "I got conflicting advice": lack of interprofessional collaborative and care coordination

The information with regards to when to return to PA was also not properly communicated as Mary experienced, revealing a lack of interprofessional collaborative and care coordination between her hospital and local rehabilitation team.

Mary: *I got conflicting advice when I got back home uh, the contact rehab team, uh, who were saying, "we'd give you exercises to do". And I said, oh fine uh, but [name of place] hospital, uh, when I spoke to them about it, were saying, "no, no, no, no exercises uh, because of the risk of dislocation of the hip prior to the soft tissue being fully, um, fully healed". Not realising that you've got this three-month period um…before you can start thinking about physical rehabilitation and getting your basic strength back. I mean, I did walk quite early um, and I probably know there's a, uh, um, uh, about a mile walk around this village that includes quite a steep hill, which I did, I*

think three weeks after coming out of hospital. Um, but I actually now looking back on it, I think, well, maybe I shouldn't have done that, maybe I was actually, um, slowing down the soft tissue recovery.

Mary has demonstrated her desire to achieve enhanced recovery and that she would adhere to instructions to achieve this. This is the reason she started walking quite early in adherence to the exercise routine given to her. So, having to find out from the hospital that this was a risk to her highly desired recovery goal must have been hard. As shown from the excerpt above, she even had to look back in time recalling the walk she did in what seem like regret, and her beating herself up for doing that.

Mary: *So that whole situation and a lack of clarity about the recovery process and physical rehabilitation, um, I have found, uh, quite difficult to deal with…up until now and I'm doing exercises I'm thinking, or maybe I shouldn't be doing this, maybe this is doing damage, similarly, when I'm walking.*

This experience has left her extremely cautious about participating in PA and a sense of mistrust for the information about PA received. She seems conflicted as to whose advice is accurate – the hospital or her local rehabilitation team. The fear of doing damage overwhelming her, it appears avoidance seems the reasonable thing to do.

Mary: *Now that I have found that very difficult to deal with, um, because I have a partner, um, who is very into physical activity, he is saying, "come on [first initial of her name], you need to get out and walk", you need to be doing this, you need to be doing that. And I'm having to say "no, no, the hospital I've told, have told me, um, that I shouldn't be doing that because there's a risk of more damage".*

For someone as highly motivated like Mary, the time spent inactive in activity avoidance could be a cause for worry which psychologically could impact recovery. Her recommendations to HCPs therefore does not come as a surprise.

Mary: *My recommendation, it would be that we, the people are given an overview of the recovery process. And so that patients are left very clear as to what they could do to help themselves in terms of exercises and things like that and when it's appropriate to do that.*

She seem to imply that if HCPs cannot be trusted enough to support patients through the recovery process with the appropriate information, then the least they can do is to better inform them about the recovery process so that they are knowledgeable enough to do it *themselves.*

5.3.2 Knowledge of OA, joint replacements, and the recovery process

Managing and organising of the recovery process reflected the women's knowledge of the condition and joint replacements [knee and hip]. The lack of these often led to misconceptions

that had the potential to impact returning to PA whereas being well informed, enhanced recovery and ultimately facilitating PA.

5.3.2.1 "People haven't got time to discuss it with you really": lack of knowledge

Lilian considers the NHS age policy as a strategy to mitigate future revisions irrelevant to her. According to her, wear out is caused by engaging in high impact activities. Apparently, she was implying that the policy should therefore not apply to everyone.

Lilian: *This blanket thing of people should wait till they are 60, if they can, it's wrong because people's needs are different even. You can make a hip last longer by modifying your activities, I don't see why [the hip would] actually wear out unless you're a long-distance runner or something like that, normal day to day activities.*

Described in theme 1, the perceived 'discouragement' from her surgeon for 'not being old enough' to have hip replacement sensed by Lilian could be seen here. Obviously, Lilian identifies with the *people* who she finds the policy irrelevant to. Whether or not this supposedly would have been a strategy to make her *hip last longer* or a recovery goal, it however revealed a deficiency in her knowledge of hip replacement i.e., life expectancy and the cause of revision. The resultant effect of this is that rather than aiming to achieve optimal recovery, her recovery goal would become to 'preserve' hip. It is worthy to note that though Lilian's assertions may not be entirely true but like previously highlighted by Mary [discussed in 5.3.1.1], raised the importance of information tailored to individual's need because people's needs are 'different'.

Diagnosed with OA in 1995, Lilian's decision for surgery had been initially impacted by the NHS policy. Apparently, there was no discussion around this which explained why she not only believed that hips can be made to last longer by modifying activities but also her initial thought that she could correct her condition with exercise.

Lilian: *Now, I'm not sure what the life expectancy of the current generation of hip replacement is. I think it is longer, um, that all needs to be discussed really. Um, and it never was, you know, people haven't got time to discuss it with you really…Even when I first was diagnosed, I thought I must be able to correct this myself if I get the right exercise.*

Interestingly, her use of *people* to reference HCPs gave a sense of how she rated their value towards her. What comes to mind is the saying that people tend to make *time* for things that matter to them and presumably she did not. Here again, as highlighted by Mary, the issue of a non-existent provider-patient relationship comes to bare.

Like Lilian, Rose intention to 'modify' her walking activity appears like a strategy to protect her hip. This was founded by what she belief led to her knee deteriorating quicker resulting in a partial replacement.

Rose: *So, I can walk quite long distances, I wouldn't walk briskly now — as briskly as I could, yeah, but then I think that is walking briskly and wearing shoes that are too flat because of my height that has actually led to my knee deteriorating quicker I think, that might have done it, yeah, yeah.*

As shown above, this belief about the cause of her knee OA seems farfetched but unfortunately had great implication for her recovery as suggested by her resolve to not *walk briskly now*. The origin of this belief was not probed but again points to an area of deficient knowledge about OA and joint replacement that could have been corrected during consultation with HCPs or preoperative assessment. Whilst it could be argued that Rose may not have brought this up, the reason for that may likely be due to the provider-patient relationship that has so far been portrayed as non-existent.

It was also interestingly observed that the women, Mary, and Grace specifically appear to accept needing a hip more than a knee replacement.

Grace: *I don't want a knee replacement, which is what they've told me I would need next. Um, if I don't do that, you know, some of the higher impact stuff, I'm careful with it, it settles down again, it's all right.*

As shown above, in a bid to avoid getting her knee replaced, Grace is willing to let go of certain activities which corroborates with the previous sub-theme [section 5.3.1.2] that returning to PA is not influenced by THR alone. As a matter of fact, the knee is a major barrier.

Grace: *Not that I have anything against knee replacements, they can be very good, but I know they are not as easy to do as hips, or the rehab is not quite as easy as hip is. If it was offered, if it was bad enough and it was offered then yes, I would be foolish to just suffer with it but I think it's not got bad enough yet. It's not like I mind having that one [other hip] operated on as well, but you know, I'd rather have that—my right hip done than my left knee if it came to that.*

Mary: *Well, um, nobody's ever suggested knee replacements. Uh, my understanding is that knee replaced—hip replacements are much easier than knees. Uh, and that's, um, objectively that the arthritis damage to my hip was much worse than the problem with my knees.*

The conviction shared by Grace and Mary that knee replacements are not as easy compared to hip is quite interesting since the basis for this was not given. For Grace, it could be assumed this was formed from her prior experience working as a physiotherapist. This conviction was so profound that it left the women contradicting themselves in a supposed bid to rationalise it. For instance,

claiming it has not been offered and damage not yet severe came across like an excuse to mask the truth − fear of knee replacement, one that was more intense than the one they had for their hip. Furthermore, Grace would rather have her right hip replaced instead. This highlighted the void in quality information and advice via patient education desperately needed by these women to enable informed decision-making and enhanced recovery. Here, the importance of surgeon's opinion or advice with regards to decision making and appropriate knowledge about OA and joint replacement is re-emphasised. The former serving as encouragement and the latter a change in perception.

5.3.2.2 "I'm more aware of, of physical activities that um that are going to help": adequate knowledge

For the women who were more knowledgeable about their condition and the recovery process i.e., Mary [a former athlete and now an athletic coach] who brings the fore knowledge that pushing oneself to the limit brings success and Lilian via attendance of a continuing learning group, a demonstrated determination to achieve optimal recovery was observed.

Lilian: *I've been doing this, um, continuing learning group at [name of Town]. We've heard a lot of people talking about ageing, uh, and what makes successful ageing. Um, so was very aware that exercise is key really to being healthy in old age. Um, and I knew that some of the muscles in my legs would have um become very weak because of the way that I was walking and the restriction. I'd lost all, but about 2 or 3% of my rotation that I should have and um sort of trying to build myself up before the operation… I did go see a personal trainer and do some exercises, want to build up my muscles around here and around my core so that I would have a better recovery…I did have to pay for some private sessions with a physiotherapist. That was about six months afterwards. Yeah. I felt like I wasn't making that adjustment myself and that needed a bit of help. I think I had three [sessions].*

As shown above, knowing the adjustment that ought to be made highlighted Lilian's comprehension of the recovery process and based on this, determination to achieve enhanced recovery not minding the financial implications. For someone less informed, this could even serve as de-motivation and a cause for worry thereby negatively impacting recovery. The decision to seek help demonstrated the motivation to achieve goal – have *better recovery* necessary for *successful ageing* as she had learnt.

Lilian also evidenced the fact that an understanding of the functional benefits of an activity can serve as both a motivation and facilitator to participating in it as demonstrated by her *I can do it* resolve for bike riding and paddling.

Lilian: *I've got my bike out was here, paid for a few bike rides, a bit wobbly, but yeah, I can do it. So that's really good for the back of the legs…I've taken up paddling, um, in a dragon boat, so that's upper body strength and don't matter if your legs are a bit weak when you're doing that.*

This goes to show that if people understand the functional benefits of certain activities, they are unlikely to let go because of an initial discomfort but more likely to exercise a little patience by been more resilient. Unfortunately, that initial weakness experience could easily be misinterpreted as an indication they were hindering their recovery or that activity was damaging for a patient who lacks this understanding or fore-knowledge.

It was observed that knowledge of the recovery process was a key factor that helped the women make sense of their current activity level. It appeared as though without this, there is the potential to get discouraged and dissatisfied with progress.

Lilian: *Yeah. Um, I wouldn't put it as a 9 [current UCLA activity levels] because I can't jump, and I can't run yet. Um, not sure why, I think I've just not got enough strength yet in my lower legs. Um, so I'm going to go back to a personal trainer and do some one-to-one sessions and see if they can get me a bit stronger in the legs.*

Mary: *It's moving in the right direction, but I still don't know whether I'm going to be able to achieve that [preop walking ability]. I think that is dependent on a further rehab, um, process, which will rectify uh, the effects of being relatively inactive in that part of the body for four or five years… it's not surprising that, and there'll be a huge loss loss of, uh, conditioning in the muscles…obviously at least four years of limping and not using those muscles, uh, properly. So, there'll be lots of conditioning, lots of strengths and lots of flexibility as well, which, uh, I presume I now need to work on, but I'm probably going to go to a physio and say, "look, what do I need to do"?*

From their narration, Lilian and Mary are yet to return to certain activities. Lilian rated her activity level as a UCLA score of 6, not up to her historic levels of 9. Mary is not yet sure of being able to return to walking. However, they both did not demonstrate any discouragement and it was obvious this was because of their knowledge of the reason why. Importantly, they were willing to go seek further help to support recovery despite it going to be out of pocket. Here, the fact that adequate knowledge births a positive mindset towards recovery was clearly evident and further portrayed by Lilian's use of the word *yet* to state that her current activity level could go higher. For Mary particularly, her positivity was fascinating, but it soon became clear why as she explained further below.

Mary: *I put it in the same context of, uh, as being an athlete in the sense that you have a physical problem, you get the treatment, you can recover from it, and then you do rehab, and you try to return to a previous level of fitness. So that's how I'm thinking about it…So, I don't think it's psycho...I don't think it's made any impact on me psychologically.*

Obviously, years and experience garnered as a competitive athlete and now a coach seemed to have shaped Mary's knowledge, and perception of her condition, surgery and ultimately mindset towards recovery. She is of the belief that there is nothing psychological about physical problems – *you can recover* apparently if *you do rehab*. This throws more light into why she was very particular about wanting more information about longer term rehabilitation which seems to her as the only means to recover from surgery. This could imply that any support provided that is devoid of this information potentially places her in a 'psychological' state where she beliefs she cannot recover.

5.3.3 Limited supervision in recovery

Post-operative care programmes after joint replacement surgery tend to include strategies for mobilisation such as PT and for individuals with THR, OT is routinely provided as part of the rehabilitation service. Both the PT and OT services provided to the women was not designed to facilitate return to PA.

Grace: *I had to get the house ready, and the occupational therapist because of my height, had to have adjustment made so I could be independent and go home…You take the measurement of your chair, the bed you're going to sleep on, the height etcetera and then I took all these measurements in and that alerted them to the fact that nothing was high enough for me and if I was going to go home and be on my own, this had to be looked into. They just delivered all these surgical things…On my stick, they had to mark the height everything had to be at.*

The OT services provided happen to only focus on facilitating a smooth transition from hospital to home. This merely involved getting the homes of the women ready upon discharge as described by Grace above.

Thus, the PT services was seemingly considered as inefficient, unsatisfactory, and aimed at improving physical functions. Grace *didn't have any form of physiotherapy*, the closest to PT offered was the instructions provided in the CD/leaflet she was given as part of her preop assessment. This contained exercises which appeared to be aimed at improving physical functions.

Grace: *Um, I didn't do any specific exercises or anything like that um, I didn't have any form of physiotherapy, no, but I did do some exercises. I think they gave us, they gave us a CD or a booklet with exercises in, I am not sure if it was a video or just a booklet, um but it was tone and collect exercises, quadriceps exercises, crunching your buttocks, I think and doing, um, bending, strengthening your knee which is fine, and I followed those and I knew them anyway because it was one of the areas I used to work in as a physio as well.*

The fact she is unable to remember whether it was a CD or booklet showed how forgettable it was. She appeared to have been left alone to her own devices. However, the saving grace was her familiarity with the exercises as it was one of the areas she used to work in as a physiotherapist,

and so was able to follow them. This is concerning because as previously revealed by Mary, uncertainty, and lack of clarity about exercises have the potential to cause avoidance for fear of *doing any damage* thereby impeding recovery.

Rose description of the PT received revealed a hint of dissatisfaction with the delivery. For instance, the use of the word *just.*

Rose: *The physiotherapist in the hospital just comes, shows you the exercise to do and then gets you going up and down the stairs and to check you can do the stairs.*

Perhaps she expected more guidance and exercises and not just going up and down the stairs. Apparently, the check was merely conducted to certify her fit to go home and again like Grace, left to her own devices. When asked if PT was offered after discharge, her answer was no.

Rose: *It wasn't just there [PT], it wasn't offered.*

Again, she uses the word *just* this time in a dismissive manner which clearly reveals her perception of the supposed PT offered at the hospital.

Lilian was the only one with a positive PT experience, what seemingly differentiated hers as compared to the others was that she had her surgery at a private hospital. Compared to Rose, Lilian's narrative of her inpatient PT experience was well detailed and conducted in three days all of which highlighted her satisfaction with the delivery.

Lilian: *Yes [PT provided]. So, um, the day after the surgery, physiotherapist came, got me out of bed and got me to walk to the bathroom, I think back to the bed, uh, going to sit in a chair. Um, yeah, and watched me get in and out of bed with both legs. And then the second day they got me up, walked me down the corridor, and then the third day, we walked up and down some steps using the crutches and I could do that. So that meant I could go home*.

As seen, the physiotherapist was actively involved and did not just stand to watch her do the exercises herself. This was reflected in the statements *got me out of bed, we walked up* and *they got me up* with the latter suggesting more than one physiotherapist was involved. On discharge, as part of the hospital package, Lilian also had PT for six weeks. Similar to her inpatient description, she gave a comprehensive detail of what it entailed.

Lilian: *It was part of the package [private hospital package]…Um, for about six weeks, I think I had physiotherapy appointments, um, and they watched me walking and, uh, gave me different type of exercises to do. Um, I walked every day outside my house…Um Um, so it was laying down flat and raising the leg, moving out to the side and back to the center and back down. Um, sitting and raising the leg from a sitting position. Um, there was a walking thing that we did, I think he was just making sure that I was putting my foot down correctly. Um, and moving off one foot onto the other correctly*.

The exercises entailed walking which apparently motivated her doing so everyday outside her house. This shows that if more PA facilitating exercises were provided it has the potential to support timely and enhanced recovery. Her ability to recall in detail the exercises and even give a vivid description of them again reveal her feeling of satisfaction and how memorable it was.

5.4 Theme 3 - Reasons and deterrents to participating in PA

Four sub-themes emerged that served as either a reason or deterrent to engaging in PA following surgery. This encompassed the women's attitude towards participation and/or returning to preoperative levels of PA as it pertained to their beliefs of the level attainable following surgery, what PA meant to them, it's potential to foster a positive self-body image and having the courage to return.

5.4.1 *"You've got age deterioration that you have to take into account"*: beliefs

This comprised of the women's attitude towards recovery [i.e., returning to preoperative PA levels] as it pertained to their beliefs of the level attainable following surgery. Beliefs appeared to have stemmed from what was perceived as [1] an age triggered *slow down* and *deterioration* which seemed to be considered as a natural phenomenon [2] the timepoint at which recovery was assessed by as influenced by what recovery meant [3] perceived actual activity level [4] impact of other joint problems.

5.4.1.1 Age beliefs

Whilst the women's inability to either return or participate in certain activities could easily be attributed to the effect of undergoing surgery, this was not the case. Both Lilian and Rose described an age-related restriction instead.

Lilian: *Um, well, I used to like walking uphills, um, when it was at my fittest, when I was younger, um, I worked in the Lake district, in a hotel for the summer holidays one year. And I used to finish work at two o'clock and then walk uphill Helvellyn every day. …because I was a tennis player when I was younger person.*

Rose: *For instance, my Pilates class, there are people that are much younger than me and there are some things they can do quite easily that I can't do quite easily as them and the same in Yoga really, there are some things I can't do that I would have done when I was younger.*

They both appear to ascribe age to fitness level and attribute this to influencing participation in certain activities. Peculiar to these activities was their impact level which was on the higher side. They seem to imply that the ability to participate in the highlighted activities was as a result of their younger age at that time, a timepoint identified as been their fittest [Lilian]. There is the sense that this phase was in the past and is unattainable as portrayed also by Rose who believes that *you slow*

down anyway don't you, cause as you get older. This appears to be the sense that she has made out of this and have come to terms with it. This is evident by her conviction of an age-related disadvantage i.e., *scrambling around* and 'panting' associated to certain activities, implying that such are thus better off when younger.

Rose: *It would be nice to do the long walks again but that's probably the only thing I really miss. Going for long walks in the countryside and scrambling around and things but I don't know whether I'd be like that— as I get older anyway, you know, yeah, I'm in my 70s now, so it's kind of like — [laughing], you know [laughing]. Yeah, you don't know do you.*

Rose: *I do Tai Chi on a —early Monday morning, and I go to [name of park] and I still go up, like I'm used to the slope coming up here [venue of interview], get parked and go up to the top to the memorial, you know, sometimes I'm going huh and phoo [describing panting sounds and laughing] cos it's only early in the morning. They do park runs on a Saturday and you know that might've been something that I did years ago but I won't be able to do park run now, and I think that's my age even more than my [referring to her hip replacement] you know, I will get out of breath.*

Interestingly, whilst Rose *really miss* going for long walks, the actions associated with the activity may not be desirable for someone her age she admitted. This suggests that she considers certain activities as age friendly, something that an older person might find 'enjoyable'. This goes to show that the value placed on certain activities has the potential to change overtime with age and therefore a determinant to returning or not. The mentioning of her age and my [researcher] inability to relate suggest an attempt at emphasising how old she is. Noticeably, she has been able to return to Tai Chi, a more relaxing and lower impact activity.

5.4.1.2 Perception of age and/or other joint problems impact on PA

Mary's narration below, echoes the women's perception of the impact of having other joint problems [including knee surgeries] on their level of activity pre-surgery.

Mary: *I want to get back to a level of fitness that I would have had given that you've got age deterioration that you have to take into account…I want to get it back to a level, the best level of fitness that I can given all my circumstances…that was what I was concerned about because, um, it, it's not only the problem with the knee, the specific problems with the knee and the hip, but it's also the huge contribution to them that, that, that those problems make to your general level of fitness and, and mobility.*

This appears to be her way of highlighting being in an *enhanced deterioration mode,* when only a certain *level of fitness* is 'logically' attainable. As the women described further their postoperative recovery in line with their expectations, it was revealed that the timepoint they assessed their recovery by,

and level of fitness thought attainable were influenced by beliefs − age and/or other joint problems impact on PA levels. Thus, recovery assessment timepoint comparator inferred to different time points other than historically i.e., none of the women recovery assessment had an historic PA level comparator. This ranged preoperatively, defined as *four or five years ago* before hip problem [Grace] and post pre-existing knee activity level defined as *before I had my hip* [Rose] described below.

Rose: *Being able to do, take up the activities I was doing, not obviously before my knee but —but certain things that I was doing before — before I had my hip…And, have have before my hip, I have started to do Tai chi as well.*

Grace: *So, I'm pretty much back to doing what I was before my hip was a problem. Um, so doing what I was doing four or five years ago.*

Similar to both women are their pre-existing knee surgeries; Grace [keyhole surgery for left knee] and partial left knee replacement [Rose] both carried out on same side as study hip. Apparently, this informed the recovery comparator assessment timepoint to the post-knee activity phase level. Whilst other factors such as medical advice received for the knee [discussed in section 5.3.1.2] may have contributed to this, further probe identified a possible unconscious self-ageism.

Grace: *I've seen a lot of people have hip replacements that if you're reasonably young and fit and active, then you should get a pretty good recovery from it and you should almost go back to being able to do things and nobody would know you've had a hip replacement… I didn't particularly feel my age—it [pain] was just limiting so much.*

Rose: *I mean, you slowdown anyway don't you, cause as you get older, I know some people don't.*

For instance, as shown above, Rose belief about an age-related *slow down* but admitting to knowing *some people don't.* Some people presumably referring to those like Grace. It could be that the positive experience of the subset of people Grace was referring to likely shaped her expectations for surgery, implying that she sees herself same way but for the pain experience. Whilst this may be perceived as a strategy employed to see herself as *young* to spur a good recovery, it highlights the vital role positive ageing attitudes have on the recovery process. In addition to the apparent misconception about what was responsible for the quick deterioration of her knee [discussed in section 5.3.2.1], Rose further showcased negative ageing belief as she refers to being in a state of *wear and tear* as shown below.

Rose: *So, I can walk quite long distances, I wouldn't walk briskly now — as briskly as I could, yeah, but then I think that is walking briskly and wearing shoes that are too flat because of my height that has actually led to my knee deteriorating quicker I think, that might have done it, yeah, yeah—it's all wear and tear with me, yeah.*

This reference is often used to describe damage that naturally and inevitably occurs as a result of normal wear or ageing. However, going by the revelation that her other hip is beginning to be symptomatic, this perception of self is unsurprising and may have contributed to her age beliefs also.

Rose: *I do occasionally um I'd do something, and I will just have a twitch on the other hip so I keep thinking um and then at least that will go cos very often you have one side done.*

Following surgery, both women have been able to return to the activities they were doing before their hip problems and not to pre-knee [i.e., historic] activities.

Grace: *So, I'm pretty much back to doing what I was before my hip was a problem. Um, so doing what I was doing four or five years ago….I never tried going back to the climbing but also the other factors were this knee, which I didn't want to aggravate.*

Rose: *Being able to do, take up the activities I was doing, not obviously before my knee but —but certain things that I was doing before — before I had my hip…And, have have before my hip, I have started to do Tai chi as well.*

This means that the possibility of recovering the activities or levels beyond the set assessment comparator is less likely as that appear to be the pre-set recovery goal. It appears as though attempts are not even made at engaging beyond this set limits − pre-knees activities.

For Lilian, recovery assessment inferred to a postoperative timepoint. Using a specific activity i.e., dancing, she assessed her recovery by doing a comparison of the improvement made from when she took it up post-surgery and 12 months later. She described how she went from being unable to dance due to problem with her balance to getting better to the point no one could tell she had her hip replaced.

Lilian: *Um, I think it's taken about 12 months [to get better with dance steps]. Yeah. I think anybody dancing with me now probably couldn't tell…And at first, we were in a class [salsa dance] and one of the girls who is very good, was being a man and she's been a professional dancer in the past. And she said to me, "you got a problem with your balance?", "Yes I am actually" but now I can tell that I am getting better.*

Lilian: *I only had six months in between them [both hip replacements] so, I didn't have long before I had the second one [hip] done.*

Two explanations could be given for her choice of a postoperative recovery comparator. One, she was in a *disabled* state prior to surgery, following a 22 years' delay. Secondly, as shown above, she had the other hip replaced shortly after the first which potentially had an impact on her balance and recovery process. The former explanation re-emphasises the huge impact a person's functional

levels prior to surgery has on recovery as it not only informs expectations [section 5.2] but now show to influence the timepoint recovery is assessed from.

5.4.2 The meaning of PA

Following the women's narratives, there appeared to be an association with what PA meant, expectation and returning to/or participating in PA following THR. PA consistently meant keeping active and involves something liked and enjoyable. Central to these meanings is the concept of commitment.

5.4.2.1 Keeping active to sustain independence in old age

PA as a means to keeping active so as to sustain independence in old age described the desire to maintain being independent as motivation for PA even if it warrants engaging in activities not 'liked' or 'enjoyed'. This meaning of PA was firmly rooted on the need to be independent in old age.

Lilian: *Um, no, I didn't appreciate it before. I nearly lost it all. Um, I was a bit lazy, I would not put as much effort in this as I am doing now…Well, as I've got older and because of being ill, um, I've realised that it's key to happiness in later life. It's keeping active, um keeping all your joints working, can loose, um, so that you can do the things that you want to do and so you can look after yourself…Because of the time that I spent having chemotherapy, mine legs went very weak cause um, I just rested for two years, really while I was having that um, didn't do any exercise and lost a lot of muscle strength.*

Apparently, the circumstances that led to her delayed surgery together with getting older changed Lilian's perspective of PA. She had decided to now be intentional with the effort she puts into it given the realisation of what it now meant to her. The ability to look after herself and do the things she wants to do appeared to be a motivation for PA as she highlighted the importance of remaining independent in old age. She now sees PA as a means to achieve this especially by staying functionally active now understanding the need to keep her joints working. The repeated use of the word *do* emphasise the necessity of being active.

Due to her hip and knee experience, Rose had become more knowledgeable and intentional about PA especially in old age. Apparently from the information gotten from HCPs for each of the experience.

Rose: *No [surgery has not changed what PA means to her], except I think with the knee and my hip, I'm more aware of, of physical activities that um that are going to help, you know, sustain physical activeness, I'm more aware of that really, yeah, yeah…Also, aware that as I get older, like many of my friends, if you sit too long, you stiffen up. You have to keep going, or if your back feels bad, you are better moving than resting and that's changed overtime*

hasn't it? So, there some things I'm aware you should do because of change. People, things change isn't it? When I was younger, you hurt your back, you rested.

According to Rose, ageing comes with certain functional constraints and changes, it appeared that *moving* even if it involves activities not 'liked' was seen as a strategy to *sustain physical activeness*. Just like people change overtime with age, Rose highlighted how the hospital discharge protocol too have changed.

Rose: *You went in for an operation and you are in like a week or two weeks you know. Now you are in two days, three days because they want you up out of bed and moving. So, things have changed. I mean, to think you go in and have a knee done, you go in on a Monday and out on a Wednesday. You know, years ago, that would have been unheard of, you know. I had a hysterectomy years ago, I think we were in hospital for, how long? I think my first child I had in hospital like 10 days, the first child. Now, people are in and out 24 hours, you know, having babies. Things have changed, have moved on, you know, one you are out of bed, one you are moving, you know.*

As she described the changes it became evident it was to emphasise the need to *keeping active*. Staying active was implied by Rose as a strategy to avoid unnecessary hospital visit given changes in times. Consequently, being physically active is seen as necessary to keep fit and out of hospital as there is no more the luxury of longer stays.

Interestingly, all through Mary's narration of her lived PA experience, it was observed PA was often referred to as fitness or mentioned interchangeably. Whilst this was first seen as suggesting that they were intertwined, it became apparent that was not the case as there appeared to be a remarkable distinction as shown in the excerpt below.

Mary: *I, uh, going, going back a half a million years to 1964. [name of city] [name of city] Olympics…I had, my, my oldest son was born in 1968. Uh, I got back to fitness after that. Uh, so I stopped competing in the early 70s. Um, um, probably didn't do very much physical activity for quite a long time. Um, anyway, fast forward, a couple of decades…I, I actually started running. So, fitness before we moved up here, uh, when was that...uh, 20, just over 20 years ago, I was still running. I started jogging and, uh, I got really very fit during that. I also started teaching aerobics in my village hall, down in [name of town] and so um on, and I did get very, very fit at that time. And I would have been sort of late thirties…So it would have been, uh, yeah, um, probably early forties when I got back into that. So, I did in my forties, I did get very, very fit in a, in a different kind of way than I was when I was competing athlete.*

PA was mentioned once and in reference to her athletic days. According to her, she *didn't do very much* of it after she *stopped competing* which suggested an association of PA with sports activity i.e., more high impact. Her interpretation of fitness was based on the impact level of the activity reason she felt *very fit* at the timepoints she was a *competing athlete* and still participated in *jogging*, *running*,

teaching aerobics. However, her perception of her fitness level shifted following this period, apparently due to a decline in the impact level of PA engaged in. The cause of this change having to do with her other joint problems. The complexities of the combination of both hip and knee problems were a concern she acknowledges especially the negative impact these have on her *level of fitness*. It is for this reason she hoped that recovery would get her back to the point she is able to *keep a level of fitness*, most of which have already declined.

Mary: *I'm hoping that the recovery process will obviously um—and particularly if you've had a very active past uh, that recovery process will get me back to a point where I can, um, you know, keep, keep a level of fitness up rather than just going into an enhanced deterioration mode. That was what I was concerned about because, um, it, it's not only the problem with the knee, the specific problems with the knee and the hip, but it's also the huge contribution to them that, that, that those problems make to your general level of fitness and, and mobility.*

There appear to be a sense of fear *going into an enhanced deterioration mode* when what is left of her fitness level is threatened. Consequently, 'keeping at least a level of fitness' appear to be what PA now meant to her. This comes as no surprise given that Mary had led a very active lifestyle right from childhood as a ballet dancer, an athlete competing at the Olympics and teaching aerobics in her village hall. Currently retired from employment, she now coaches' athletes whilst doing a PhD in coaching. She also highlighted how her family dynamics revolves around PA.

Mary: *Um, so, uh, you know, one way or another, I've always, you know, I've remained involved in the sport. Um, I've never really come away from it. Um, my son was a very good athlete as well, so that, that brought us back into athletics… My late husband, uh, was press officer for the British athletics, so that, that kept me very much in touch with what was going on, um, which was great… I've only coached since my husband died, he died in 2010 and then my job disappeared from underneath me. Um, and I was nearing retirement age anyway, or past retirement age. So, Um, I didn't get back into work, but, uh, you know, I thought what, you know, what do I do with myself now? So, I went down the track and got sort of sucked into coaching… Um, currently I'm doing a PhD on I'm researching into, into the application of mental skills in coaching for the sort of, um, adolescents.*

Mary's life revolves around sports both in theory and practice so much so that she would not know what to do with herself if there was nothing to keep her active. Note how following retirement, she fell back to athletics via coaching. Here, Mary's identity as *far from typical of a 76-year-old woman*, reason she stated needing information about longer term recovery process [section 5.3.1.1] is highlighted.

To Grace, the ability to be *able to keep moving*, look after herself and home are responsibilities that highlighted independence, suggesting this was important. The quest to sustain this level of

independence seems to serve as motivation to engage in PA even those not liked and also to facilitate *being able to keep moving* as she gets older given her awareness of the importance.

Grace: *Physical activity, um physical activity means to me, um being able to keep moving as I get older. It means, and so there's things that you have to do that are physical activities and keep those going…It is exercise, something you do deliberately and looking after yourself and looking after your home, it is that kind of physical activity um possibly why I don't like doing housework as well, but you have to do it [laughing] and gardening and things.*

The use of the word *deliberately* seemed to emphasise the conscious effort put into partaking in this sort of activities because they are usually not enjoyed but solely to sustain active ageing. Similar to Mary, Grace noticeably used 'exercise' interchangeably with PA and in a context that portrayed exercise as the *kind of physical activity* not liked but done deliberately. This implies that how an activity is termed is vital – exercise perceived as not enjoyable.

5.4.2.2 "I've got to enjoy doing it": something liked and enjoyable

The idea of PA being something liked and enjoyable was very well emphasised by the women. There was a feeling of pleasure through movement repeated throughout Mary's narration as she described her experience and what PA meant to her.

Mary: *The ability to get a feeling of flow gracefulness through moving, whether that's walking, running, Pilates or whatever, or Yoga or whatever you happen to be doing. You've got to enjoy these things, haven't you? I've obviously always been a physically, I suppose, you know, not to pull my punches, a physically gifted person moving has always felt a pleasure. Running, sprinting was always a pleasure, you get great pleasure in movement. When I was a child, I did ballet classes, you get a physical pleasure out of moving. Now I want to be able to get to the point where I, back to the point where I get a feeling of physical pleasure out of walking and flowing.*

Her reference to ballet gave a graphic representation of the sensation derived from movement, a *feeling of flow gracefulness*. This description vividly highlighted the *great pleasure* Mary derives from unrestricted movement and doing something she enjoys. Reminiscing on those times when she got *a physical pleasure out of moving* appear to serve as a motivation – she wanted to get back to that point.

Mary: *Um, but I mean, I just hoped that I would assume that I would be able to get back to walking without a limp and walking freely without being conscious of walking if that makes sense, so that you can just move around the walking can flow uh, and you are not having to worry about, uh, discomfort or, um, fatigue in particular areas of the body. And I think that's what I was hoping for.*

It is therefore unsurprising that she hoped that surgery will get rid of her limp, a condition impeding the pleasure she gets out of walking freely and the *ability to enjoy* moving. She also

highlighted hopes of having not to worry about discomfort and fatigue *in particular areas of the body* as this obstruct the *flow* of walking. Whilst no probe of the areas of the body been referred, it seems to imply her knees and hip which are the problem areas.

Corroborating Mary that PA has to be something enjoyed, Rose described the sort of PA that she enjoys as those that *felt good*. Apparently, the enjoyment feature of these activities involves *other people* presumably offering the opportunity to make friends— something liked.

Rose: *Well, I think when I used to work um being active, so physical activity apart from living and housework and shopping, bringing up children, working full-time and all that sort of thing would have had to be something that I enjoyed. I used to do aqua-aerobics, I loved swimming, I loved um because I used to, it felt good, it was nice to just, you know, not think about work, and do something with other people, make friends, enjoy it. So, it's got to be something I like.*

The use of the word 'love' also emphasised how much she enjoys swimming. It could explain why despite being told by the consultants for both her joint replacements not to engage in the crawling technique, it always came naturally to her when swimming.

Rose: *I was told and being told swimming, I do, I can't crawl except on my back, and I was told by consultants both for my knee and my hip not to do breaststroke legs, I actually feel I can do breaststroke legs, when I've gone in the water, you just stopped automatically but that's cut my swimming lying down.*

She gave the visualisation of someone who gets caught up in the enjoyment she derives from doing what she loves. Unfortunately, due to medical advice [section 5.3.1.2], this activity is now restricted.

Interestingly from Rose narratives, there is the sense that PA has got to either be *something I like* or comes *highly recommended* otherwise the possibility of participation is low. Here, the emphasis of preferred activity came to light, and it was revealed to differ for each woman. For Grace, this comprised solo activities like swimming, walking her dogs, horse riding or kayaking which she described as *doing so to be independently active* and *what she wants to do*.

Grace: *Um, it means it would mean really, but it depends what an individual wants to do. For me, it would mean being able to take my dogs out for a decent walk, without pain. And I suppose that's the main thing, is to be able to do those things for an hour or two hours, without getting any pain or limitation…Um, it means being able to have a choice of things you like do as well. So, for me going swimming or horse riding, maybe getting out in a kayak, um, being able to walk around a town or maybe home or whatever, but it was doing so to be independently active, but I know for some people it would mean they could go back to marathon running.*

Furthermore, the use of the term *individual* rather than herself comes across as an attempt to emphasise the need to view PA based on a person's preferences. This was highlighted in the

distinction made between her i.e., *for me* expectations and those of others i.e., *for some people.* Grace appears to have used this description to draw attention to the fact that significance should not only be attached to *what is been done* i.e., type or level of activity but extended to whether that is what the individual *wants to do.*

Contrary to Grace, the idea of PA being 'something enjoyed' was activities with other people which for Lilian was *mainly* her recovery expectation apart from being pain free…*and a bit of re-joining things with other people*. Infact, this was perceived as a motivation for undergoing THR and happen to have been accomplished. Following surgery, she was able to 'join' a salsa dance class.

Lilian: *Um, and then I've taken up dancing – um, this dance class – um, found that really difficult to start with, it's salsa dancing. So, you got to learn a routine of steps, keep them in your head, work with a partner, um, and do a lot of turning… Um, I think it's taken about 12 months [to get better with dance steps]. Yeah. I think anybody dancing with me now probably couldn't tell.*

Though she admitted to finding it difficult at first, Lilian portrayed how much she valued and enjoyed *group activities* by not giving up.

Grace on the other hand is back to horse riding and dog walking.

Grace: *I'm back to riding one of my horses, so I'd say that was a fairly active activity, even though you're actually sitting on a horse, you still got to be quite active. It's not exactly the, um, not weight bearing activity of cycling, but it's, you know, if you are, I think much more actively involved and doing some weight bearing as well when you're riding. Um, I don't do so much looking after the horse, he's in livery, but I'm walking my dog still.*

Not only are these the activities she 'likes' and *want to do,* but she also seems to imply that even though horse riding is actually sitting on a horse and *not weight bearing activity* which she reckons may be considered a low-level activity, it is her preferred. Importantly, she is *doing so to be independently active,* an important attribute of what PA means to her. She seems to suggest that whilst both activities may be of low impact levels, they require active involvement which is implied as paramount for 'keeping active'.

It is interesting to note that Lilian and Grace returned to their preferred activities. Here, an association with what PA means, expectation and returning to/or participating in PA post-surgery can be seen. Furthermore, both women have demonstrated the need to view returning to PA based on a person's preferences, the emphasis being on *what an individual wants to do* [Grace] *because people's needs are different* [Lilian]. These assertions have previously been highlighted by Lilian and Mary regarding postoperative recovery information needs [discussed in 5.3.1.1 and 5.3.2.1].

5.4.2.3 "Got my commitments to my dogs": something committed to

It was observed that for activities not 'liked' or 'enjoyed', the women came up with reasons [more like excuses] as to the restrictions in participation i.e., stopping or reduction. The reasons will eventually reveal itself as pointing to commitment. The common excuse raised by both Mary and Grace was time.

Mary: *There are so many different, uh, contributions, uh, including the amount of time I've gotten, or you know and what I would actually want to do. I mean, if it gets to the stage where going to the gym is a pain, you know, probably I won't, I probably won't do it.*

Grace: *The only thing I do at the moment that really aggravates it [her knee] is if I've got to do some decorating and I'm up and down the ladder or I'm, um, cause we've been decorating our house to get it ready to sell. So, I've been trying to do paintings, if I'm kneeling on the floor painting, skirting board or up and down ladders or in awkward positions, weirdly it's made my knee more sore.*

However, the interpretation drawn from both narratives seem to suggest otherwise based on the following hints. For example, Mary's reason for not going back to her gym activities appears to be due to not *what I would actually want to do* than lack of time. The real reason pointed to 'commitment' as Grace report on the decoration of her house revealed. It became clear that the decision to participate in an activity is influenced by the commitment level held towards it. She was committed to getting her house *ready to sell* which explains why even though it gave her sore knee, she did not relent. This activity apparently falls into the category of *something you do deliberately* as she previously reported [section 5.4.2.1]. She put it into clearer perspectives as she explained why she stopped certain activities.

Grace: *I haven't gone back to swimming so much, but that's more my time than my physical ability. I haven't really gone back to doing anything bigger on the fells uh, but that's more to do with time than my hip. It's because, um, I, and I've not got the sort of dogs that I could really take on the fell, they chase sheep too much. That's not safe to take them. So, it means I still have to walk them out then go and walk on the fells or something like that. I do backpacking and I just wouldn't do that. So got my commitments to my dogs. So, so I'd say I'm not doing the more high impact things, but I'm back to doing a lot more active stuff than I was doing before.*

Her commitment to her dogs appeared to take preeminence as she seemed to streamline her activities around them. This is highlighted in both reasons she gave for not going back on the fells — the desire to keep them safe which consequentially make them not suitable to take on the fells and lack of time. There is a sense that she would let go of any activity for her dog's sake. The lack of time cited as reason for not *swimming so much* and not *doing anything bigger on the fells* could arguably be due to her lack of commitment to those activities likewise backpacking. Furthermore, these

activities which she admits to not doing are of higher impact levels, meaning she really do not fancy doing them as hinted by her ability to backpack but *just wouldn't* which suggest an attempt to avoid such. The statement, making time for the things that matter also came to mind here.

A factor that could possibly be interacting with commitment is joint preservation, the emphasis been the knee. This is because Mary and Grace have been shown to exhibit an almost phobia-like fear for knee replacement [section 5.3.2.1]. And now here is Grace revealing she *never tried* going back to climbing because she *didn't want to aggravate* her knee and other hip.

Grace: *So, I never tried going back to the climbing but also the other factors were this knee, which I didn't want to aggravate, um, this hip [other hip], which I'd also rather not aggravate. It's not like I mind having that one operated on as well, but you know, I'd rather have that, my right hip done than my left knee if it came to that. But—if I didn't have other problems with other joints like my knee that might not like it too much unlikely the hip then yeah, it might have—there is no—I don't feel there is any reason this hip would stop me going back to it.*

From Grace narrative, whilst not wanting to aggravate either her knee or other hip was the reason for not going back to climbing, it became obvious that it was mainly her knee which *might not like it too much.* For some reasons, she did not want to have a knee replacement which came across like she would do anything to avoid that happening.

Similarly, when asked why she is yet to have her knee replaced, Mary said it was never suggested or came up.

Mary: *Um, uh, I, um, it's never, never been come up, never come up and, uh, I don't think my knees are bad enough probably to, um, to, to ask, uh, my GP about that.*

The repeated use of the exclamation *um* and *uh* in her explanation made it obvious she was trying hard to give out the reason. Another action that gave her away was her sudden decision to 'probably ask' her GP now.

Mary: *And, uh, uh, I was very irritated when the response came back, um, minor, a minor osteoarthritis in the left knee…Um, no, no, it's not, it doesn't require any treatment. And I was really quite angry because I thought, well, I've got all these problems. How do you say it doesn't require treatment?*

Furthermore, the fact that Mary was of the opinion her knees are not *bad enough* was interesting given that she specifically reported being angry with the diagnosis of her knee OA not needing any treatment despite a marked discomfort. This was prior to the diagnosis for her hip OA.

5.4.3 To foster a positive self-body image

The primary recovery expectations for the women were pain relief and improved physical functions. Following surgery fulfilling these expectations [section 5.4.4.5], it became apparent that the women craved for an improved body image. However, this may seem to have been suppressed most likely to either avoid being perceived as vain, considered an unrealistic expectation at that time, or simply because functional improvement took precedence given their 'state' prior to surgery [section 5.2.2.3]. Consequently, this arguably became a secondary goal birthed by the fulfilment of their recovery expectations. The women revealed how extremely conscious they were of their body image so much so that it had a strong effect on not only how they see self but also how others see them. A common perception was being 'old' which was often seen in a negative light. For the women who experienced positive changes in their body image, it created a confidence boost and satisfaction with surgery. Positive body image emerged as a determinant to PA participation and return post-surgery. With the exception of one woman [Mary], the others did not want anything to do with their former body image as it reminded them of the person they do not want to be or seen as.

5.4.3.1 "Before I looked like an old woman, I was bent forward": how others see them

It was observed that the women did not want to have anything with the old disabled 'self' and this in turn served as a motivation to return to PA. The old self for Lilian and Grace was the disabled person, associated with negative self-image – the common perception was that of looking 'old' in appearance.

Lilian had a negative self-image prior to surgery, *I looked like an old woman*. Her perception not only bothered her but also how she might have looked to others. The description of her former self as an old woman, one who looked both *terrible* and *ridiculous* highlighted her perception of what it was to be old which was an image she seems not to like.

Lilian: *Um, when I see my reflection now, um, it takes me aback really because before I looked like an old woman, I was bent forward. Um, I couldn't wear skirts because the skirts went right down at the front and they look ridiculous, you know, cause my bum was sticking out at the back. Um, I must look terrible really and now people look at me and they, well what's happened to you*.

For surgery to have been able to correct that to the extend people took notice of the difference between her former and new appearance was *amazing* to her. For Lilian, it boosted her sex appeal and gave her a feeling of being desirable.

Lilian: *Yeah [would you say the surgery has affected the way you see yourself?], it's made me feel 20 years younger. I've even got a boyfriend, have had sex…Yes, I thought all that was finished…Not at all [before surgery, she has had no boyfriend or sex], amazing.*

Referring to surgery as making her *feel younger* emphasises her desire to look younger and equating younger age with positive body image, one that landed her a boyfriend and participating in an activity she once thought *was finished*. There is a sense that how she perceives to be seen by others is important to her. Consequently, following her improved body image came the quest for others to also *see* and confirm progress.

Lilian: *Infact, I was working with a knee surgeon, who's doing some research with our older learners' group, and I said to him couple of weeks ago. "So, can you tell that I've had surgery?" [to surgeon]. "Sit down, you look like you walking normal" [surgeon replies].*

She was determined to ensure that there was no *tell* tale of her having had surgery either from the way she walks or her *dancing*.

Lilian: *Um, I think it's taken about 12 months [to get better with dance steps]. Yeah. I think anybody dancing with me now probably couldn't tell. I must ask her to have a dance with me and see what she thinks now.*

'Her' here refers to…*one of the girls [in her salsa dance class] who is very good…a professional dancer in the past* that once asked during dance, *"you got a problem with your balance?"*. Whilst this re-emphasises her wanting to be seen as young, it also positively seems to influence her recovery as shown by the determination to better her dance steps. It shows her willingness to keep active if not for anything but to maintain a positive body image different from the *old woman* who was *bent forward* and must have looked *terrible*.

Like Lilian, an association between the former self and looking old was formed by Rose. It took her undergoing surgery and her children noticing the changes in her to realise that *pain ages you* and make you *be grumpy*.

Rose: *That was horrible, the mobility thing, cos um and it ages you, pain ages you, you kind of feel your brows all the time and stuff…My son and daughter, the first time they saw me after the op, they said "oh mom, now that've thought about it, you look younger" because I was going around with this little [describing the folds on her fore-head that comes with mimicking being in pain]. I just had this [touching the folds on her forehead] I hadn't realised the pain was making me— be grumpy. So I was, the pain was making me go on looking, you know, just really, and — and be grumpy really, I think.*

The fact that following surgery her children now saw her as looking *younger* seemed to reaffirm her unflattering perception and image of an old woman, one that she would rather not want to be seen as.

For Grace, there were two instances pre- and post-surgery that highlighted the impact of body image self-consciousness and its potential impact on the recovery process. Prior to surgery, her hips were in a *funny shape*, admitting to not walking well due to it locking. This she likened as almost being *disabled* which *drew a bit more attention* to her, one she obviously resented.

Grace: *Um, at the time of the the surgery, well, and leading up to the surgery I'd had, um, my hips were a funny shape…Apart from somebody who's actually less disabled, whereas I used to maybe not walk so well at all, my hip would lock then that drew a bit more attention to yourself potentially than if you, when your hip is not locking all the time when you are walking around.*

Whilst she may not have categorically mentioned improved body image as an expectation, it was obviously something that concerned her. As a result, it is not surprising that one of her expectations was for surgery to facilitate her being *able to walk*. The ability to walk will not draw any unnecessary attention to her. Furthermore, the surgery left her with a wound that initially affected her self-body image and consequently her swimming activity. In fact, this was the one thing that influenced her self-perception and highlighted the importance of body image with regards to how others 'see' her. For instance, her reference to the wound being less visible now suggests she could now confidently go swimming without the self-consciousness or 'worry' that people are starring at her and/or the wound.

Grace: *Well, there is a wound where they, you know so, it was, yeah, just, but you don't really see now at all. So, no. Um, no, I don't think, apart from that, it's really affected how I see myself…I was a bit uncomfortable with having a wound when I went swimming initially, but you don't see it very much at all now. Um, and if it's that or having the pain in the hip, then I'd have the wound.*

This apparently was another *payoff* as she would rather have a wound than the pain in the hip. Interestingly, apart from the wound, she did not think the surgery really affected how she *see* self. This goes to show she sees herself from the lens of her body image and people's perception of it.

5.4.3.2 Regaining the old abled self

Only Mary had a positive old self-image, setting the comparation to her historic self. Obviously due to her athletic past, Mary sees herself as *a physically gifted person* – one who walked without having to think about it.

Mary: *Yeah [factors helping with recovery], my, my desire to get better and my—you know, probably fairly high expectations of what I, uh, hopes should I say about what I want to be able to get back to…I want to get to a point where I can physically feel like I am the same person that I was before, I can walk about without, without thinking about the problems of walking. Um, and, and get, I mean, I've obviously always been a physically, I suppose, you know, not to pull my punches, a physically gifted person*.

The self-image of her old self is one *walking without a limp and walking freely* and not this 'new' self that is hunched over at the hip. Her athlete mindset sets her expectations quite high regarding her physical capabilities, postoperative recovery not an exception.

Mary: *I still am inclined to hunch over at the hip. Um, and it's, you know, it becomes kind of habitual. So, I have to consciously say to myself and come on, stand up straight, and there's also a tendency to keep the knees bent as well to protect them. And I'm saying to my hip "come on, you've got to stand up straight"! And when I stand up straight, I can walk without a limp*.

Following surgery, Mary was able to come off her crutches and walk independently after about a fortnight.

Mary: *I came, I was off crutches, walking independently after, well, after about a fortnight actually. And there were times where I could walk with you know, and it felt, "oh God, it feels like the old me" and that, um, the, the discomfort and the pain would come back, but there were windows whereby I could see, uh, yes, I can see this the way this is going, this is going to be an improvement. Yeah, that was about after a fortnight*.

A sense of achievement can be perceived from her repetition of *after a fortnight*. The times she could walk made her feel like her old self, serving as *windows* whereby she could see the possibility of *improvement*. This again highlights how important it is for her to get back to *the old me*. Consequently, even when *the discomfort and the pain would come back*, she remained positive.

5.4.4 *"Having the courage to go back"*: facilitators of recovery

From the women's narrative, returning to PA required courage and likened to taking a limp of faith. To achieve this, confidence had to be built and this involves a sequential number of phases and influences.

5.4.4.1 The role weather plays

For Rose, it *wasn't straight back* to PA. It was a process that actually began with first *having the courage* which she admits may seem *to take a while,* but this was due to the fact that she had to build *it up*. This took a *bit of concentration* and *faith* and highlighted the need for intentionality and commitment.

Rose: *It seemed to take a while to be able to lift your legs and do all sorts of things. I think it was, it wasn't straight back into being able to do what I can do before, but I just built it up. It took a bit of concentration, a bit of faith really [laughing] and also knowing and not pushing yourself too much.*

A factor that appears to influence courage building was the weather.

Rose: *I think I must have gone back to Pilates about June. I think, because during the summer, I went to Pilates up again. I think I must have gone back to Pilates about June, so that was quite a while wasn't it. Yeah, it was having the courage to go back and do things like that I think, yeah. I don't know why I or chose to go back then.*

Although she was unable to precisely pinpoint the exact time she resumed Pilates, she however was convinced about the month apparently because it was *during the summer*. The time of the year seemed marked in her memory since summer is the perfect season to enjoy outdoor activities or *do things like that* and so may have served as a motivation to go back. This presumption was made even true given her description of the challenges she faced during the winter to prevent falling.

Rose: *By the time six weeks was up, I certainly wasn't on crutches anymore, I still used —took my sticks with me when I went to hospital only because I was still supposed to watch how low things were where I had a marker on it because it was the winter, it was more security blanket using a stick because I was trying to slip in, it was wet and everything. The weather was bad, it was that security because obviously you don't want to fall, fall on it…probably would have been able to shed the stick sooner.*

From Rose's narrative of the influence of the two seasons in her recovery process, it became apparent that weather plays two interchanging roles when it came to recovery – a courage builder during the summertime i.e., an enabler, and a barrier at winter.

5.4.4.2 "Your hip's different": acceptance

Before the courage to go back to a PA is built, there appears to be the need for acceptance to be gained. For Rose, this meant acknowledging the fact that she would not be able to do certain things again. For instance, with regards to her grandchildren, coming to terms that *I will never catch them up again.*

Rose: *I've got [number] grandchildren, I couldn't keep up with some of them and that worried me. Now I've just realised that — you know um, somethings that I go off and do things, I'm not going to be able to. Uh, I couldn't initially um, when the younger ones come, they like to go on [name of beach] but getting them down off the sand and things, and you know, I was told to sit on the chair [laughing], I couldn't do it. Now I can get up and down and everything, but they've got so much energy, I will never catch them up again, yeah. But I can do much more now you know.*

Even whilst she tried to mask it with laughing, the sadness in her voice could be heard. However, there is the sense that this is something she needs to admit thus enabling progress with her recovery process.

Rose: *It's actually being aware because some of the movement you do, do feel different because your hip's different.*

With this acceptance came the awareness that her *hip's different* consequently, somethings she could conveniently do before her hip condition will not be possible now.

Gaining acceptance is an important milestone phase which assists with either opting to finding a new activity or concentrate on getting back to those participated in prior to surgery so as not to be put off or demotivated respectively. Rose concentrating on the PA she *might have done* appeared to be a strategy to help her gain acceptance of the possibility of not being able to either take up new activities, a precautionary measure knowing the hip is *different* or based on familiarity for easy navigation i.e., knowing the side that is easier.

Rose: *So, it's actually about concentrating on —on —on an exercise that you might have done, you know that you can do one side more easier than the other.*

Finding a new sport for Lilian as advised by her personal trainer was a strategy to help curb any demotivation that might arise from not being able to return to things she could do before i.e., playing tennis, an activity she admitted doing because she was a younger person then.

Lilian: *Um, but I've taken some different activities. The personal trainer, when I worked with him, he said, um, "you might get upset if you try and do the things that you did before" because I was a tennis player when I was younger person and, uh, he said, "if you can't get back to being as good as you were, it might put you off and de-motivate you", he said "find a new sport". So, I've taken up paddling, um, in a dragon boat…I do Pilates now and, um, this dance class… I've taken up dancing.*

Apparently, finding a new activity that she could do gave her both the courage and motivation to sustain PA.

5.4.4.3 "It helped having some background in physio": fore knowledge of the recovery process

Grace explored diverse strategies to ensure her recovery was successful. This ranged from not trying to get things done at once, doing things slowly and *building up things gradually*. The awareness of the time it took for her soft tissues to be healed appear to have come handy especially regarding facilitating enhanced recovery.

Grace: *Uh, it was, it was quite early on [notice significant improvement]. It was, it was even perhaps within the first month because I was, my progress felt like it was quite good. I was able to walk around pain-free, I was building up things gradually. I wasn't, I certainly haven't had any locking in that hip. Um, so, yeah, I would say is in the first month I knew that it was, it felt like it was going to be a good outcome and that it was well on the way to being okay. It wasn't at that point totally fully healed around all soft tissues, I know that takes a lot longer than just 4 weeks.*

She admits that her experience and knowledge as a former PT helped in aiding her approach of the recovery process specially not 'biting more than she can chew' as the saying goes.

Grace: *I'd like to think it [background in physio] helped because it it's, um, it try, I think mostly out, but by thinking about pacing myself, is what I thought I could do, or some, thinking about how things were affecting me or not. And so, like walking around my field with my wheelbarrow 'don't try and get all of this at once', my field is on a slight slope, 'do not try and get to all at once' and then wonder why you can't push something uphill, and the hip is hurting. Just do a small amount, take it down to the plough, repeat it, and take the wheelbarrow empty over the hill and walk back down with it and pick things up. I don't know whether that's common sense or physio knowledge, really, um, but doing that kind of thing, yes, I think it helped having some background in physio, of not trying to do more than I could or should.*

For someone with no knowledge of the timeframe it takes the soft tissue to heal, this may cause anxiety and disappointment especially if they expect improvement at a particular time and is not forthcoming. This in turn has the potential to hinder participation in any form of PA. This was exactly the case with Mary [section 5.3.1.3] i.e., lack of clarity about when it takes the soft tissue to recover. Subsequently, resuming activity earlier due to conflicting advice received left her confused and staying off activity for fear of *slowing down* her recovery or *doing damage*. Here the benefits of been adequately educated about the recovery process is evidenced.

5.4.4.4 "It's really mainly my desire to improve and my desire to return": the desire to return

The level of support the women received from significant others were implied as a coping mechanism for some and a source of encouragement and motivation for others. Extended system of support was received from both dogs and the environment. However, whether or not the women lived alone without support, it was observed that recovery takes self-determination and commitment from the individual.

For Mary, her son and partner had great impact on her recovery. Having them around seemingly served as a source of encouragement. For example, her son [a former athlete as well] she believes

is better placed to understand her. Also, her physically active partner who kept *nudging* her to engage in PA.

Mary: *Yes, Yes, [partner and son facilitating recovery] Um, especially my partner, because he's heavily into fitness and he's um, keeps nudging me about things I ought to be doing. Um, and my son was a very good athlete as well. So, you know, he understands what I'm going through.*

They both were able to touch on both the psychological and physical attributes needed to support recovery. Having people around who can relate to the psychological effect of undergoing surgery and spur her back to PA appear to be quite important especially as they share same historic PA experience. Presumably, they are better placed to empathise more as they could easily put themselves in her situation and imagine how it feels thereby offering more impactful support.

Mary: *So yeah, they, they have, but it's, it's really mainly my desire to improve and my desire to return to, um, some level of fitness and this, and an ability to enjoy being–enjoying, moving.*

The support from a PA conscious family network notwithstanding, Mary interestingly revealed that her *desire* to return to the level when moving becomes 'enjoyable' is the main motivation for recovery. This goes to show that at the end of the day, recovery is an individual prerogative regardless of the support and encouragement available as Rose would also demonstrate.

Living alone, Rose had no one to support her whilst awaiting surgery and so performed all activities herself albeit using sticks or crutches. In the absence of any 'human support' the use of sticks or crutches were implied as a coping mechanism to ultimately manage self and to help manage recovery.

Rose: *And of course I'm on my own, so there wasn't—I'd no one to support me, so I think — I — I plied on through it all and I was doing all the activities I was, but I was having to use a stick or crutches, that was how bad it was before the operation but if they'd been another adult living with me, they would probably have done some of the things that I had to do. I'm sure if there was somebody around, a capable adult around, I would let them do it all [laughing].*

However, she admits that had there was a capable adult around, she would have allowed them to do it all. From her 'laughing', this appeared as something she would have appreciated, the laugh here seemed used to water down the disappointment.

Rose: *I think the saving grace was living on my own and having to go up and down the steps and having to walk on very long corridor to get to the kitchen and everything.…See housework, I've got a uh 2 storey house with a lot of 5 bedrooms, lot of stairs and I'm running down the stairs all the time…It makes you get up, makes you move it [laughing], if you see what I mean. Um a friend of mine um her husband looked after her and her scar…If I had someone ran around after me, I would probably let them as well but hmm, I had to get up and do it.*

Rose did not allow the lack of support to get to her and even viewed living alone as the *saving grace* that kept her moving. By describing her house, she appears to highlight the extent of activity it involved to move around. This could be seen as an attempt to explain that staying alone did not make her less active or live a sedentary lifestyle but on the contrary made her more active. She uses 'laughing' here again to disguise her emotions confirming the interpretation above of truly desiring help like her friend. Rose experience illustrates how the support from HCPs diminishes during the postoperative period thus subsequently leaving the patient or family and friends instead to fulfil support needs. In the absence of this support, patients like Rose are left alone to their own devices which could potentially be a barrier to recovery for people not as motivated as her.

Humans are not the only support system as Grace described the important role having dogs and a field around her house played. At the time leading up to surgery, she was still able to walk thanks to her dogs but that was only possible because of the fields around her house.

Grace: *I could still walk my dogs but then that was partly because I've got fields at my house so I could get around them. Um, um, so yeah, it was, it became quite limited in what I could do… I walked initially with a frame in the hospital, and I was then sent home with two walking sticks, I think, I think it was Albert crutches. I was taking the dogs out in the garden almost from the sort of third day, but I definitely need to be on leads, um, for that. So, I could just wander around the garden with the two walking sticks and the dogs, um, being careful because they're quite big, I suppose that I didn't get knocked over by them and just being careful with the ground was a bit more slippery because it was in the winter.*

Walking around the fields sort of became a coping strategy which she used to maintain self and curbed going entirely sedentary. Grace recalled dog walking in the garden 3 days post-discharge but had to be on leads for both support and precautionary means to avoid been knocked over by her dogs or falling given it was wintertime. Here, the importance of dog, and the environment as potential facilitators of recovery was revealed.

Grace: *But I, Oh, I can't remember [shedding the sticks], it's probably only after a couple of weeks, I would walk around the house without any sticks, but I would always take, I was taking one out with me and I'd take one out if I went in the car, just so that I've got something….If only because, if I was walking around a shop or some centre, having walking stick meant that people might take a bit more notice of the fact that you , cause they wouldn't know I'd had hip surgery three weeks before or something. Um, and they might not barge into you so much. I don't know that always works, but that was what I was doing. Um, so it was pretty good.*

Furthermore, her description of the process taken to shedding the stick revealed that, the use of one stick had become a sort of security blanket when she goes out so that *I've got something.* According to Grace, having a stick whilst walking around outside creates a consciousness for

people to be careful around her. Apparently, the services of the walking stick stretched beyond support but also as a strategy to avoid being barged into. Whilst this avoidance could as well serve as an excuse to not go out, what it highlights is Grace determination for recovery. Her narration shows the methodological and precautionary approaches taken to facilitate this which again illustrates that recovery takes individual effort and commitment to the process – albeit known.

5.4.4.5 "It did give me an enormous boost": fulfilment of recovery expectations

The success of THR in fulfilling the women's recovery expectations influenced the recovery process positively as it instilled a positive attitude towards recovery and inspired setting postoperative expectations. For Lilian, THR had surpassed her recovery expectations by not only fulfilling her recovery expectations but gave her the *range of movement* she did not expect which she likened to a *total new life*.

Lilian: *Um. Yeah [expectation was just to be free of pain?], and I didn't think I would get the range of movement that I have, it's just brilliant. I can ride a bike, couldn't even get my foot to go around on the pedal…And, and now I can, I can climb over a gate. I can dance. It's just like total new life.*

For someone who could not lift up or bend her leg to get in the back of a car before surgery, this assertion does not seem far-fetched reason she is very proud of her recovery. The success of the surgery in fulfilling recovery expectations appear to be like a confidence booster, one that involved setting new expectations. Seeing how much progress the hip has made, Lilian now feels *like* if she keeps *going,* she could reach the *limits*.

Lilian: *Um, well, because, um, because it made such a lot of progress, you know, I feel like I'm going to keep going to, have reached the limits…So, I'm gonna go uphill Helvellyn again one day, start with some small hills, then get up there.*

A postoperative expectation is now anticipated, one more daring and ambitious for instance participating in an historic activity *again one day*. Here, Lilian shows that returning to any level of PA is possible if an individual sets their mind at it and are committed to doing so.

Similarly, confirming being back to doing the activities she could before her hip problem, Grace would want to go back to Yoga, an historic activity she struggled with before surgery.

Grace: *Yeah, I've gone back to that [horse riding]. Um, I've gone back to, I have gone back to swimming, although not so much recently. I would want to go back to doing something like Yoga, which I used to do some years ago, but I really couldn't do before the surgery…Um, I have cycled a bit and I still feel I could cycle a bit if I wanted to.*

Evidently, the positive outcome of surgery on her physical functions especially her now *better range of movement* might have awakened this desire. This was surprising because of the complication with her surgery which left one leg longer.

Grace: *On the whole, unfortunately, um, my left leg has been left very, very slightly longer then the right leg, maybe half an inch which doesn't sound very much, but it causes my pelvis to not be quite so well aligned....They had to leave that leg slightly longer.*

She however considered this unfortunate outcome as *the payoff* for the pain and locking in the hip, meaning she would rather have a longer left leg than the discomfort that came with her OA hip problems. Here, Grace confirmed the fact that the fulfilment of her pre-surgical expectations took precedence over any other outcome. The idiomatic expression 'something's got to give' comes to mind here, and in this context, it was having a longer left leg for a pain free mobility.

Grace: *Yeah. It's uh, yeah, it is...I'd rather have that than have the pain that I had got and the locking in the hip… But apparently that was the payoff.*

This clearly highlights the fact that THR effectiveness in having recovery expectations met instils or births a positive attitude towards recovery as further portrayed by Lilian and Mary.

Lilian: *Um, no [would you say you feel you have recovered], I feel like it's still an ongoing process, I've got some more potential to reach…Anyway, um, so I'm just walking at the moment and walking up hills, walking upstairs. But I think I really need somebody to push me along to the next phase, I think it could get back to that [historic activity level].*

Mary: *No [not totally recovered] …I mean, I'm settling until I've, till I've gone through a total recovery process, which after three months, I haven't, um, that, uh, you know, it won't be possible to make a judgment anyway.*

They both are convinced that full recovery is a possibility, a journey that is 'still ongoing' [Lilian] and so not *possible to make a judgment* [Mary] 'yet'. Mary's mention of the number of months post-surgery appears to be her way of pointing out that it is still early days. The fact that she is not hasty to draw any conclusion shows her positive attitude towards her recovery. Lilian even believes that with a push, getting back to her historic activity level was possible.

Finally, Lilian and Grace belief that they could get back to their historic levels of PA i.e., *go uphill Helvellyn again one day* and back to Yoga respectively echoes the fact that recovery outcome is an individual prerogative. It was obvious that determination, desire, and willingness to commit to returning were the key character qualities possessed by both women.

5.5 Summary

The findings detailed above are summarised using the BPS model to offer a multi-dimensional perspective of how biological [genetic, biochemical, etc.], psychological [mood, beliefs, personality, behaviours, etc.] and social [cultural, familial, socioeconomic, environmental, medical, etc.] factors delicately interlock to impact postoperative recovery. Using Rose as a case study, this section considers the biological aspects leading up to her THR, the psychological factors from which she suffered, and the social influences acting on her ability to participate and/or return to preoperative levels of PA post-surgery. For instance, as will be described in more details below, prior to her symptom onset/diagnosis for THR, Rose had being advised by her consultant not to 'pound the streets', a recommendation following her partial knee replacement. This advice resulted in her becoming very careful about the terrain and consequently affecting participation in long walks, a much valued historic PA [Biological + Social + Psychological impacts]. Following surgery, she admits to miss going for long walks like in the countryside and attributes not being able to do this anymore to getting older [Psychological + Social impact].

5.5.1 A BPS representation of findings: Rose as the case-study

Biological impact: As demonstrated by Rose, postoperative recovery is all of the BPS aspects interlocking − beginning even slightly before the condition leading up to surgery. The first time she knew something was wrong with her was in 2013. A year before, she had undergone a partial knee replacement on the same side which made her not really 'notice the hip'. Following an x-ray, her doctor gave the diagnosis of a damaged muscle, ruling out OA. According to the doctor, if it were to be OA, she would not be as supple, and it would hurt when he moved her hip around during examination. Consequently, she was sent to physiotherapy for treatment. However, at that time, there were some activities that she had become a bit cautious of doing because of medical advice received for her knee replacement and so she avoided them. For example, she was advised by her consultant not to 'pound the streets', a recommendation that resulted in her becoming very careful about the terrain consequently affecting participation in long walks. Similarly, she was not allowed to jog or use the treadmill and told to be careful how she sits with her legs during Yoga.

Psychological states: The surgical delays experienced [i.e., getting an accurate diagnosis and going away for 5 months to look after a sick grandchild in another city] meant becoming far less active and incapacitated due to being in prolonged intense pain. Rose's hip had become so bad she could hardly walk especially going downhill. She stopped being able to walk very far and had to stop Tai Chi an activity she had only recently started because of pain. Though she continued driving, her left leg hurt just lifting it up. At the time of surgery, she was already disabled with pain,

could not walk unaided and was using either a stick or crutches for support. At this point, her UCLA activity levels plummeted to 3 from the historic rate of 9. Consequently, she hoped that with THR, she could get rid of the pain, regain her mobility, and perhaps get back to doing the activities she could do prior to her arthritic hip [post-knee replacement] such as Tai Chi but not to 'historic' levels i.e. before her knee replacement. However, her biggest expectation was to get rid of the pain because it was stopping her walking.

Following surgery, Rose was convinced that some of the movement will feel different and one side easier than the other because the 'hip is different'. Based on this belief, she was wary of not pushing herself too much and so concentrated on familiar activities. However, Rose's narratives showed that her perception of PA further played a significant role regarding resuming certain activities. She classified PA into two groups − activities [such as housework and gardening] engaged in not because she liked doing them but to 'keep moving' and stay active as she gets older whilst the other are activities aimed not only at keeping active but that she enjoys. Rose has been able to resume aqua-aerobics and swimming; two activities she had always loved and enjoyed historically. She recalled how participating in these activities usually took her mind off work years ago before retirement and was a means to mingle and make friends. In essence, there are some activities she would not enjoy doing even if she could do them. For example, cycling was an activity she did historically but never really enjoyed. Even if she could cycle now, it is not an activity she would enjoy especially on a slope because she will not find it easy. This speculation is supported by the inconsistency observed in Rose reaction to the medical advice received that 'driving not allowed' during early recovery. Although her surgeons had told her that cycling was a good activity for her hip, Rose would not go to the gym to cycle because she could not drive. However, few weeks after surgery, she was willing to catch a bus and go out when fed up with being indoors.

Rose is convinced that the change in her activity levels has to do with the replaced knee. Most of the activities she will not engage in now is because of her knee and not necessarily due to the hip. Though she admits the knee is better, it has caught her out a couple of times she admitted. She recalled how she participated in a 6 mile walk 3 years post-surgery but could not make it to the end because her 'knee just felt it too much'. She ended up with Baker's cyst behind her knee and so had to call a halt on doing long walks like that. Currently [4 years post-surgery], she would not walk as briskly as she could, she thinks walking briskly and wearing shoes that are too flat because of her tall frame led to her knee deteriorating quicker. Although certain she would never have been able to return to her historic activity level [UCLA activity level score 9], Rose believes achieving a closer score compared to her current score [UCLA activity level score 5-6] would have been attainable but for having two joints replaced on same side.

Rose feelings about aging also played a significant role in getting back to doing certain valued activities. From pre-surgery, she believed that return to her historic activity levels would not be possible because getting older means slowing down. Post-surgery, she talked about how she now sometimes runs out of breath coming down the slope when she goes to the park whereas, park runs would have been something she did years ago. The reason for these changes she thinks has more to do with her age rather than her THR. Currently, whilst doing something, she still occasionally has a twinge on the other hip and concludes it is all 'wear and tear' with her. In Pilates class for instance, there are moves she cannot do but reckon she would have been able to if younger. Importantly, the only activity she probably really misses is going for long walks like in the countryside and attributes not being able to do this anymore to getting older.

Four years following her THR, Rose preoperative expectations have been met. This outcome translates to full recovery to her irrespective of not achieving her historic activity level. Considering how low her activity level was at the time of surgery and barely able to walk unaided, without THR, Rose admits not even sure walking would be a possibility now and questions how long she could have even continued driving. For this reason, she is satisfied with surgery and would recommend it to others. There will be no hesitation to have her right hip done if the need arises as she is already beginning to feel a twinge there.

Social influences: Following the misdiagnosis of a damaged muscle and subsequently referred to physiotherapist, Rose could not commence treatment because she was to be away for 5 months in another city looking after her grandchildren, one of whom was sick and hospitalised. Over this period, her hip condition was declining, but she kept it to herself because the priority then was her grandchild getting well according to her. By the time she started PT, though still 'kind of flexible', she has started to find it hard to 'get up out of chairs'. She initially thought it was normal given that she had noticed older people in the hospital 'tweaked' as well when getting up. However, her physiotherapist noticed and realised it was her hip so sent her for another x-ray. The physiotherapist did not tell her the OA hip diagnosis until her grandchild was better so as not to add to her worries, prompting further delays. When she found out it was her hip, she had no worries undergoing THR. She was ready for it and would have gone for it immediately if she had been able to. At this time, her condition had deteriorated badly that her surgeon had marked her surgery as urgent—to be done November 2014.

In preparation for surgery, she had a preoperative assessment, a standard procedure for people undergoing joint replacement. The assessment comprised of measurement of her leg, chair and bed taken which alerted the medical team to the fact that due to her tall frame, nothing was high

enough for her. Thus, if she was going to go home and be on her own, this had to be looked into. Consequently, an OT was sent to her house to have some adjustment made so she could be independent when she returned home. Retired from working, she lived alone in a 2-storey house with stairways inside and outside. She had no one to support her and plied on through it all having to use a stick or crutches − that was how bad it was before surgery, Rose revealed. Comparing herself to a friend who had a husband looked after her and her scar following surgery, she reckoned had there been someone to look after her, she would probably let them as well, but she had none so had to get up and do stuff herself. She was accepting about this as she considered her living alone the 'saving grace' that kept her moving otherwise she probably would have gone sedentary.

The surgery did not happen at the scheduled time due to administrative oversight regarding the urgent status. Following the intervention of her doctor, her surgery was scheduled for the first week of January 2015. The Christmas and New year holidays were 'really hard', it was at that time she fully came to the realisation of how painful an arthritic hip can be. Her feet were bad and though she could use the loo and still get around, it had become 'very painful'. She was constantly given different pain killers; the tramadol she took made her very slow and hardly moving. However, she did not spend the holidays worrying over the upcoming surgery as would be anticipated−at this point, she 'just wanted it'. Her biggest worry was the possibility of even further delays given that she had exceeded the routine six weeks preoperative assessment timeline before surgery. There was no information whether this was a possibility, neither was sufficient information provided regarding the recovery process. She claimed the lack of information received did not bother her as she 'googled it anyway' − all she wanted was to have the surgery done. It turned out that another assessment was not necessary, so Rose eventually had her surgery in January and was discharged the third day.

She recalled being free of pain almost immediately after surgery. At six weeks post-surgery which she remembered because there was an hospital check, she was not on crutches anymore but took the stick to the hospital only because she was still supposed to watch the ground. Also, it was winter, and so more of a 'safety blanket' using a stick due to wetness to avoid falling on it. She presumed that had it not been winter, she probably would have been able to shed the stick sooner. She however did away with her crutches and went for the stick as quickly as possible, a decision informed by the experiences of her neighbour and friend who have had knee replacements. They both used crutches for too long which supposedly affected their shoulders, consequently, her friend advised she stopped using the crutch. She was not allowed to drive by her surgeon for quite a while because of her long legs [difficulty adjusting to sitting position] and not due to her inability to drive.

Following surgery, she did not know what to expect and PT was not offered. According to Rose, in hospital, the physiotherapist just came, showed her the exercise to do, gets her going up and down the stairs and check she can do it. On discharge from hospital, she was left alone, scared, and unsure of what to do until time for the routine check-up six weeks post-surgery. There was no link to any medical personnel, nobody or contact to reach out to for support or query regarding concerns about the wound or her discomfort. Based on her friend's experience, she envisaged how a little physio group would have been of great benefit considering the impossibility of ringing for help all the time as nobody is ever going to come around to the house. Her friend had joined a physio group of about 6-7 people who all had knee replacements and testified of how good it was as it offered the opportunity to talk to others as well as the physiotherapist. She reckoned that an opportunity like that would have served as an avenue to see how everyone is progressing. Importantly, little but vital information not provided or unforeseen by the medical team could be shared with the physiotherapist and others in a group setting such as 'should the hip still be swollen or has anyone had any problems'? For instance, it was unclear as to what medical advice was due to the study hip, pre-existing joint problems, or a combination of both consequently interfering with PA participation. Thus, whilst swimming now, she always just does the breaststroke legs which is her favourite style but following both hip and knee replacements, she was told by consultants not to. The crawling style was recommended but when she gets in the water, she often will unconsciously do the breaststroke but stops automatically – this restriction has cut down her swimming. Similarly, she is cautious of practicing Yoga, the surgeon for her hip surgery specifically advised against doing the crossed legs poses. Though she can sit crossed legs now, it was initially uncomfortable to do. However, she still finds it difficult to sit on the block or with her back straight because when she does, she feels the pain on her hip she reportedly was told about. Pilates happen to be the only activity not impacted by medical advice from both joint replacements and even hinted by her hip surgeon as one of the best things to do to help the hip.

It was not straight back into being able to do what she could do before, she admitted to having to 'build it up' which took 'a bit of faith'. She recalled going back to Pilates 5 months post-surgery because it was during the summer [at about June] and that it was hard doing both the turns and leg lifts for a long time. The day she eventually was able to lift her legs appeared to have been a pivotal moment as she vividly described how she was doing something in class and suddenly was able to lift up her legs. On realisation, she screamed out in excitement, and everybody turned around to give her a clap. To her, it is not huge things sometimes, just being able to lay down on the floor and lift her leg right up was brilliant.

5.6 Chapter conclusion

This chapter has presented insight into the lived experiences of PA in four historic physically active women aged 60 and over. Written descriptions of interpretations and quotes from each woman were presented to illuminate the findings. These findings were subsequently summarised using one of the women as a case study to showcase how the biological, psychological, and social-environmental dimensions of the BPS model interact to influence participation and/or returning to preoperative levels of PA following THR. The next chapter discusses these findings alongside existing research and theory.

CHAPTER 6

Study 2 – Discussion

6 Discussion

This study aim is to answer RQ 2: "what are the key factors influencing participation and/or return to preoperative levels of PA following THR for the treatment of OA as experienced by historic physically active women aged 60 and over"? In chapter 5, utilising IPA, the interpretation of this phenomenon was presented together with a case representation of the BPS model summarising findings. Results identified three key factors answering the RQ. First, worsen/poor preoperative functional level as a consequence of long and painful path leading to surgery thus informing low recovery expectations. Second, unsatisfactory support from HCPs, one that was perceived as ageist. Thirdly, individual factors such as beliefs held about other joint problems [pre-existing/recent] and older age, what PA meant, the desire to either foster a positive self-body image or return to PA and fulfilment of recovery expectations. The discussion to findings is categorised into three themes: (1) the impact of the length of time until surgery (2) age context and the provision of better preoperative education on the recovery process (3) rehabilitation programs designed to facilitate return to PA. These are presented below.

6.1 The impact of the length of time until surgery

The findings of the study not only confirms that of Ferguson et al. (220) who demonstrated that in current practice in the UK, pre-existing health problems do influence the likelihood and timing of THR in elderly patients but answered the question which arose as to whether this impact on acceptance for surgery. The participants in this study proved that it impacts on both acceptance for surgery and recovery expectations. Factors influencing acceptance like the interference of pre-existing problems on getting accurate/timely diagnosis, negative experience of others and healthcare system influence i.e., age policy had consequentially led to worsen functional condition and pain which made improvement such as pain relief the 'main' recovery expectations. The participants all had pre-existing/historic joint and health problems which for some had led to joint surgeries on the same leg that they eventually had their hip replaced. This finding is consistent with that of MacKay et al. (221) who reported that pre-surgery, 48% of their participants had three or more symptomatic joints [excluding the index hip] and 68% had at least one comorbidity − hypertension being the predominant. The mean age of the participants was 64 years, with more than half being women (221). In this study, because of the interference of these other health conditions, hip OA was not initially seen for what it was therefore leading to misdiagnosis, prolong pain and consequently already declining physical functions even before diagnosis. Following the hip OA diagnosis, these underlying health conditions still somehow snuck in further delaying surgery and causing further functional decline due to prolong pain. Unfortunately, pain has

important consequences on the quality of life [QoL] for people with hip OA. It generates numerous limitations in functional, psychological, and social dimensions (222). Hawker et al. (223) identified two distinct pain experience in hip and knee OA — intermittent intense pain which has the greatest impact on QoL whilst emotionally draining pain which results in significant avoidance of social and recreational activities. The latter pain experience was demonstrated by one participant [Lilian], this led to activity avoidance and exclusion from people. Pain in the affected hip and activity of daily living restrictions has also been previously reported as resulting to feelings of being a burden on others (224) which explains further why Lilian would rather just keep to herself in isolation.

Another factor that was fundamental in increasing the length of time the participants had to wait from initial onset of their problems through to receiving a referral to secondary care for assessment was other priorities. For Rose [the case studied], this entailed caring for a sick grandchild. Previous literature have also found that participants themselves initially delayed seeking advice and support from GPs for their hip problems due to other priorities like caring for an ill spouse (225), completing a doctorate (226) or to avoid disrupting caregiving roles for dependent spouses and others (227). Unfortunately, this implied that by the time Rose was diagnosed, her hip had worsened that surgery became urgent. This coupled with an oversight on getting her surgery booked, meant that her condition deteriorated even more to the extent of using a stick at the time of surgery. Like this study findings, previous literature investigating the impact of preoperative waiting time on the perioperative experience of older persons undergoing joint replacement surgery have also shown that the longer the waiting time, the worse the deterioration (228). Prolonged waiting time for both THR and TKR was detrimental to patients' HRQOL causing reduced functional condition and pain (228,229). This also had serious psychosocial effect as exhibited by Lilian [activity avoidance and exclusion from people] and Rose [agonising pain, surgery re-scheduled over the Christmas holiday]. Cheng et al. (230) literature review reported a 25% prevalence of psychological distress in older persons waiting for THR and TKR surgery. This raises concerns about the readiness of the participants for surgery. The factors associated with readiness for joint replacement surgery as described by Conner-Spady et al. (231) comprised pain, mental/physical preparation, and the optimal timing of surgery. Pain refers to its severity, the ability to cope with it, and how it affects QoL. Mental and physical preparation/readiness comprises of the internal state or feeling of being ready or prepared for the former and being physically fit and in good shape for surgery for the latter. The optimal timing of surgery includes age, anticipated rate of deterioration, prosthesis lifespan and the length of the waiting list. Thus, with the exception of pain, the critical question therefore is whether the participants were 'ready'

for surgery. More importantly, is the effect their level of 'readiness' had on their participation and/or return to preoperative levels of PA following THR. Expectations for PA have been shown to be higher in those who were more active pre-surgery and reported better general health (232). Unfortunately for the participants in this study, the negative impact of the length of time until surgery consequentially made THR an inevitable need rather than a choice − the need to be free of pain which appeared to have formed the basis of this been their 'main' recovery expectation. Findings therefore contrasts with Gustafsson et al. (233), McHugh & Luker (139) and Tilbury et al. (138) who found that patients were falsely optimistic with their expectations of THR. False optimism with unrealistic recovery expectations according to authors referred to patients who expected to be as able-bodied as their premorbid state (233), regain normal functioning (138), achieve recovery quickly and return to work and leisure pursuits again (139). This was despite the fact that some leisure activities, e.g., fell walking, may have not been undertaken for a while prior to having surgery because of OA symptoms (139).

Whilst the participants worsen/poor preoperative functional levels appear to have informed low recovery expectations, it seemed to have had positive implications for body image. Some of the participants were either bent forward from being unable to straighten the hip [Mary; Lilian], hips were a funny shape [Lilian] or limping and unable to stand up straight as an attempt to keep the knees bent to protect them [Mary]. All of these drew attention to them, which they apparently did not like. An association of old age with negative body image such as looking like an 'old woman' and 'terrible' was also shown. This revealed the importance of their perception of self and how others see them. For some, it was to be seen as desirable enough to have a boyfriend [Lilian], men wanting to dance with them in dance class [Lilian] or the attention the funny shaped hip drew to them when walking [Grace]. For others it was the desire to feel like the old self, and not this new self who is hunched over at the hip or unable to confidently go swimming without the self-consciousness or 'worry' that people are starring at the scar left by surgery [Rose]. All of these potentially served as a drive to achieve enhanced recovery. Similar findings have also been reported by prior qualitative studies that investigated body image and the perioperative experience of older persons undergoing THR. The authors reported that during the preoperative period, body image or constant thoughts of disabled body was a central concern to patients as they placed high importance on how others perceived them (233,234). They were distressed about the difficulty in mobilising and their limping appearance (233,234). As these older patients became connected to their deteriorating and disabled body, they continued to anticipate an abled body after surgery (233,234). Similarly, a study in Japan, Fujita et al. (65) found that the older women experienced an 'inferiority complex' as they were concerned about how others perceived them due to their

disability and isolation at home. An important addition to these findings by this study is that the participants were not only concerned about how others perceived them, but this also extended to their perception of self.

6.2 The age context: patient and healthcare system perspectives

6.2.1 Healthcare system perspectives

Age was a consistent factor seemingly interacting with other factors to influence participation and/or return to preoperative levels of PA following THR. From the healthcare system perspectives, there appeared to be a systemic lack of support for participants in returning to higher physical functions and activity levels due to what some perceived to be ageist. In preparation for surgery, the joint arthroplasty clinical pathways should address pre-admission education [including exercises, assessment and testing, admission, and surgical procedure], postoperative rehabilitation, symptoms and discharge management, primary caregiver involvement, home-based PT, and continuous follow-up (235). Many professionals such as surgeons, nursing staff and physiotherapists should guide patients to manage with the physical changes after surgery (224). In older persons undergoing joint replacement surgery, a study by Montin et al. (236) which examined the effectiveness of nurse-led preoperative pain management clinics, found that the information on surgical preparation and rehabilitation aids provided during the preadmission assessment was seen to positively influence postoperative outcomes. Unfortunately, this was not the case in this study as reports of insufficient knowledge and admission of care marred the participant's surgical experience. Whether this is deliberate or based on the assumption that older women are merely interested in minimal level of functioning after surgery as insinuated by a participant [Mary] is unclear. The consensus amongst the participants was that the information received tend to focus on the do's and don'ts immediately post-op. There was no information about the longer-term recovery process which is supposed to facilitate return to PA. This 'omission' seemed suggestive of a potential age discrimination with one participant [Mary] even convinced that the hospital and the NHS probably think that given her age, she was only thinking of a minimal level of functioning and not keen about getting back to being physically active. This assertion was further put into perspective by the fact that though knee OA was prominent amongst the participants [n=3/4], TKR was sparsely offered. This is quite concerning because the pre-existing OA knee problems suffered by the participants fundamentally contributed to their poor/worsen preoperative functional levels. Thus, having their knee replaced would have improved the level of their physical limitations prior to surgery and by extension aiding higher recovery expectations. It is therefore questionable why it was yet to be offered and whether it has anything to do with the participants

age. A possible explanation for the former could be the findings suggesting that patients' decision-making is influenced by the opinion of orthopedic specialists for individuals considering a joint replacement. According to McHugh & Luker (228), when the orthopedic surgeon recommended a joint replacement, 14 of the 21 (67%) of individuals in their study appeared to accept the decision. However, for the latter, it has been reported that discrimination based on age may be reflected in clinical practice and decision-making among health care providers (237). Studies from various fields of medicine including cardiology, oncology, and stroke treatment using both hypothetical decision-making scenarios and patient record review have demonstrated age-based disparities in diagnostic procedures as well as in the types of treatment offered to patients. In the UK for example, among lung cancer patients, the likelihood of being referred for surgery was lower for older people despite clinical evidence that postoperative recovery outcomes are not dependent on age (237). The same trend has been found in coronary heart disease in older patients, specifically older women who are more likely to be treated pharmacologically rather than surgically (237). This narrative of 'perceived' ageism is further highlighted by the experience of two participants [Lilian; Mary]. One factor that was fundamental in increasing the length of time Lilian had to wait from her diagnosis through to decision-making was the perceived 'discouragement' from her surgeon for 'not being old enough' to have a hip replacement. According to Lilian, this was informed by the UK's NHS policy aimed at trying to get people to wait until they are 60 years old; whether or not that policy still stands is unclear. It becomes more convincing because THR is not the only treatment affected by age related policy. In many publicly funded health care systems, there is an ongoing debate about how to manage the financial 'burden' related to the care of older persons (237). These authors report that surveys within such countries reveal public opinion supporting the idea of an age cut-off for medical services. For example, until recently, the NHS breast cancer screening program offered regular mammography only to women under the age of 65 − this has recently been extended up to age 70. Also, vascular disease screening invitations are also age-based, despite the high prevalence of cardiovascular disease among older adults (238). A performance indicator sets the undesirable outcome 'premature death' as occurring at or below age 75. What this means is that the policy does not differentiate patients based on comorbidities or clinical presentation, but on age alone. The policy also implies that human life after age 75 has less inherent worth compared to life at a younger age (239). The implication of this for Lilian was 22 years wait from time of diagnosis until surgery by which time she had got used to being disabled thus accepting to have surgery became difficult. Similarly, following an 18-month delay that led to Mary's hip diagnosis, it was expected she would be offered THR with no further delay. This was not the case as she was given the option of injection in the hip or going for replacement, the

surgeon told her the choice was hers to make. By opting to go for the injection, Mary further proves how valuable a surgeon's opinion or recommendation is with regards to decision making (228). Had surgery been outrightly recommended, it is very likely that she would have gone for it from the get-go. That not been the case again corroborates Wyman et al. (237) report that older people are likely to be treated pharmacologically rather than surgically. In the process of deciding on surgery following the outcome of her failed injection treatment, Mary had an awful encounter with a consultant. The manner of the communication style: consultant staring at his computer screen, shouting questions in an aggressive tone, being told there were people out in the waiting room who are in a far worse state than she was and that her expectations would not be fulfilled are all suggestive. Interestingly, the consultant did not even know what her expectations were. Another aspect of age discrimination identified by Wyman et al. (237) relates to the way healthcare providers communicate with older adults. Like this study findings, other studies have also provided evidence that patronising and ineffective communication can characterise discourse between providers and older patients (240). Greene et al. (241) reported that physicians tend to be less patient, respectful, involved, and optimistic with older patients compared to younger patients. The appointment ended with the participant [Mary] almost in tears and an additional 3-month delay for another appointment she was sort of 'compelled' to agree to.

6.2.2 Patients' perspectives

The concept of ageing from the perspectives of the participants in this study was found to have been firmly rooted on their beliefs of the level of PA attainable post-surgery. As they described their postoperative recovery in line with their expectations, an interesting association was identified – the interplay of belief about older age and other joint problems i.e., pre-existing/recent. This association with and acceptance of reduced functional level as a normal part of the ageing process raises concerns that their ability or desire to undertake certain activities post-surgery may be compromised. This belief ranged from an age-related slow down and so only expecting to take up the activities they were participating in before the OA hip problem and not historically i.e., pre-knee surgery [prior surgery] or just being able to go to the gym albeit to engage in fitness sessions that are 'age' and 'stage' appropriate. Age and stage here was used by a participant [Mary] in reference to the progression of her knees and hip problem as she described herself as being in an enhanced deterioration mode, one that impaired her general level of fitness and mobility. However, a note of possible unconscious self-ageism could be deduced from two participants [Rose; Grace] narrative. For example, Rose admitting to an age-related slow down for self, whilst acknowledging some people do not. Grace choosing to identify as young is possibly because it was one attribute of the people, she knew had successful recovery. Self-ageism i.e., ageist biases or assumptions held

by older adults themselves is the development of negative attitudes toward ageing identified as inevitable in an ageist society (242). These biases may lead to irrational illness perceptions, for example, that pain and suffering are to be expected in old age. One recent qualitative study on back pain, which is one of the most common medical conditions among older adults around the globe, found that many older patients believe that pain is a normal part of old age (243). This is akin to same perceptions held by the participants in this study. Contrarily, positive subjective ageing, defined as positive ageing attitudes and youthful identities, contributes to better health and increased longevity in later life (244). The timepoint the participants assessed their recovery by was also influenced by the aforementioned interplay. The recovery assessment timepoint comparator inferred to the post-knee phase [prior surgery] and not historic i.e., returning to activities they engaged in prior to their OA hip problems. This was informed by the belief about the contribution ageing and pre-existing knee problems [including a partial knee replacement and keyhole surgery] have on general level of fitness and the collective impact on what they consider attainable thereof. Interesting, none of the participants had returned to their preoperative levels of PA which implies that the set assessment comparator was the pre-set recovery goal and how impactful this was. Whether devoid of their pre-existing knee problems and just the age beliefs that this perception would still stand is unclear. However, going by prior evidence by Harding et al. (67), this will make no difference as they reported that some patients set limitations on their activities post-surgery owing to old age. This means that negative age belief is potentially a standalone factor influencing postoperative recovery.

For all the participants, PA was seen as a means to keeping active so as to sustain independence in old age. This was described as the desire/motivation to sustain a level of physical fitness necessary for active ageing as informed by either surviving a terminal illness [Lilian] or understanding that ageing comes with certain functional constraints and changes [Rose]. The latter emphasising the value of proper patient education, and the former, knowledge reportedly gotten from attending a continuing learning group. The quest to sustain independence was so important that the participants were willing to partake in activities neither liked nor enjoyed solely for the purpose of keeping active, highlighting how vital independence meant. This gives clear perspectives to Tay Swee Cheng et al. (230) study. These authors reported that patients experienced frustration and demoralisation as they believed that their continued dependence on family support placed a heavy burden on their loved ones and carers due to continued dependency. Keeping active therefore seems like a strategy to avoid such dependence in old age. Here, an association between ageing, what PA means and returning to/or participating in PA post-surgery albeit not to preoperative levels but to keep active is highlighted.

6.3 The provision of better preoperative education about the recovery process, and rehabilitation programs designed to facilitate return to PA

The only similitude of PA information provided had to do with the 'don'ts'. A recurrent factor that interfered with this was other joint problems and this was shrouded in lack of clarity as to the medical advice that was due to the index/study hip, other joints, or a combination of both. The issue of ambiguous information appear to be fuelled by a poorly coordinated care and access to aftercare services, also previously reported by See MTA et al. (245). Corroborated by these authors too, support and guidance upon discharge from hospital was sparse. For instance, exercises were recommended to one participant [Mary] by her local rehabilitation team after discharge which she adhered to but at the routine 6 weeks postoperative checkup, the hospital told her that exercises should not be done until after 3 months which is the time it took the soft tissue to recover. This new information not only left her distraught but also uncertain about participating in PA so as to avoid any risk of causing damage or hindering recovery. Similarly, McHugh & Luker (139) reported that other than returning to the hospital for the routine follow-up appointment usually between 6- and 12-weeks post-surgery, there was little contact or support for their participants. Support from HCPs have been previously reported to give much needed reassurance to patients during this period (139) with those who were actively involved in the care continuity more likely to exhibit a sense of involvement, well-being, and courage towards independence (246). This study therefore echoes the participant's [Mary] recommendation that: *we, the people are given an overview of the recovery process. And so that patients are left very clear as to what they could do to help themselves in terms of exercises and things like that and when it's appropriate to do that*.

According to Makimoto et al. (247) review and synthesis of the experience of patients following total joint replacement in the era of rapidly decreasing hospital length of stay, following discharge home, rehabilitation exercise program managed by HCPs in the hospital became the patients responsibility. Unfortunately, these patients were mostly unprepared and undereducated as to the recovery process (247). Poor knowledge of the recovery process has the potential to not only hinder and delay recovery but cause activity avoidance for fear of doing any damage as highlighted above by Mary. For individuals with THR, OT is routinely provided as part of the rehabilitation service. The OT services provided to participants in this study only focused on facilitating a smooth transition from hospital to home. This finding corroborates previous studies that most rehabilitation interventions post-THR are not designed with the goal of returning patients to PA (27–29). Furthermore, for the courage to go back to PA to be built, it was observed that 'acceptance' needed to be gained. For the participants, this required coming to terms with the fact that the hip is different which in turn meant finding a new activity [Lilian] or concentrate on getting

back to those participated in prior to surgery [Rose]. Failure to make this acknowledgement appeared to potentially either stall recovery or cause demotivation. One of the participants [Lilian] had to seek the services of a personal trainer who encouraged her to find a new activity to avoid demotivation in the advent that she is unable to return to her preoperative activities. In the absence of adequate patient education and support from HCPs to provide such counsel, this is therefore a huge concern as to who takes up this responsibility and the risk involved. An example of this is shown by the case studied [Rose] who was left with no choice but to seek information/recommendation from google and non-clinicians [friends]. It was also noted that having the requisite knowledge of the recovery process was very important in managing expectations to avoid disappointment with progress. For instance, the knowledge of the time it takes the soft tissue to heal and to gradually build things up to avoid damage gained via prior job as a PT was reported by a participant [Grace] as aiding her recovery. Contrarily for another [Mary], lack of clarity on the former left her staying off PA for fear of slowing down her recovery or doing damage. Here the importance of patient education is emphasised.

In this study, and previously reported by Parsons et al. (234), lack of patient education on the management of osteoarthritic symptoms, surgical expectations as it pertains to the interplay of age beliefs and other joint problems, uncertainty about the recovery process during the preoperative waiting period led to misconceptions that impacted participation and/or returning to preoperative levels of PA post-surgery. These include that engaging in high impact activities reduces the life expectancy of hip replacement [Lilian], walking briskly caused knee to deteriorate quicker [Rose] and TKRs not as easy to do as hips [Grace]. Interestingly, recent studies have proven that high PA 2 years following THR, with participating in sports like jogging several times a week did not increase the risk of revision surgery (248) and at 5 to 10 years, revision rates were similar in active and inactive patients (134). Chief of the misconceptions was that held about TKRs, it was almost phobia-like. Although the basis for this conviction was not stated, it was so profound that a participant [Grace] would rather have her right hip replaced instead, a preference that has previously been uncovered by another qualitative study (228). These authors reported that their study participants appeared to accept needing a THR more than TKR, with more individuals [five out of seven] unwilling to undergo a TKR. The need for the provision of quality information and advice to enable informed decision-making as the knee joint was a recurring factor that influenced participation and/or returning to preoperative levels of PA became evident. Noteworthily, being knowledgeable about OA, joint replacements, and the recovery process was shown to have spurred self-determination, motivation, and a positive mind-set towards recovery. Two very important findings regarding the benefit of knowledge were revealed also. This comprised understanding the

functional benefits of an activity and fore-knowledge about recovery. The former was demonstrated by one of the participant [Lilian] who tarried on her biking and paddling activities despite her legs getting weak, a determination that stemmed from her understanding that her legs getting a bit weak was okay and that both activities were good for upper body strength. Apparently informed by knowledge/experience gained as a former athlete and now an athletic coach, one of the participants [Mary] perceptions about her OA was that it is not psychological but a physical problem which one can recover from. This shows that how an individual views their condition matters, with the chances of recovery higher if perceived as a physical problem.

6.3.1 The case for information personalised to the individual patient needs and goals

A justification for individually tailored information and education programs needed for the recovery process was identified by an interesting study finding which revealed that regardless of the support and encouragement available, recovery is an individual's prerogative. Thus, this finding contrasts with prior evidence that lack of social support may serve as a barrier to joint replacement surgery i.e., affects both the pace and extent of recovery (224), moving outdoor (230) and improved physical functions (11) post-surgery. As a matter of fact, the case studied [Rose] even viewed living alone as the 'saving grace' that kept her moving as she had no choice but to get up and do chores herself. This differs from prior reports that people who lived alone tend to find recovery more difficult (224,230). Whilst good social support from family or friends should not be downplayed but as revealed, it will not mean much without the individual actually having the determination, desire, and willingness to commit to returning to PA. As a matter of fact, these were the key character qualities possessed by the two participants [Lilian; Grace] who believed that they could get back to some of their historic PA one day [Lilian]. The issue of building up confidence which reportedly is major for people who undergone THR (139) happen to have been mitigated by the effectiveness of THR fulfilling and exceeding the participant's [Lilian; Mary; Grace] recovery expectations. Thus, giving them both the confidence boost and even the audacity to anticipate returning to certain pre-symptomatic [or historic] activities such as Yoga [Grace] and walking uphill Helvellyn again one day [Lilian]. Additionally, the desire to return to pre-pain levels when activity becomes 'enjoyable' and possibly the motivation to keep active so as to facilitate healthy ageing devoid of dependence on others seem to serve as drivers. An interesting finding is that non-human support systems such as dog, the environment i.e., weather, fields around the house, wheelbarrows/sticks played very vital support roles in facilitating early return to walking. Wheelbarrows and sticks served as security blanket for supporting weightbearing when walking at the fields [Grace] and going out of the house during winter to watch how low things were to avoid falling [Rose] or being barged [Grace] into respectively. These precautionary approaches taken

clearly illustrates that recovery takes individual effort, commitment and self-determination fuelled by the desire to return to PA. Weather also appear to influence time to return to PA with the participants [Grace; Rose] observed as going back to activities during summertime. This finding supports others that have previously reported that outdoor temperature is associated with higher levels of PA in people with hip OA. These studies revealed that participants who engaged in more PA were those exposed to warmer temperatures (84) whilst cold weather were barriers to PA (85). Another demonstration of recovery being an individual prerogative was by two participants [Mary; Lilian]. The first [Mary] was convinced that information about longer-term recovery process and rehabilitation may have been deemed irrelevant by the hospital and the NHS who think that probably because of her age she was only thinking of a minimal level of functioning and not about getting back to being active following surgery. Whilst she 'understands' that such information might be a total waste of time for others but because she identifies as 'very far from the typical 76-year-old woman' due to her athletic past, she therefore considers the 'generalised assumption' according to her as flawed. Her assertion in fact brought to light how important it is that information needs be personalised to the individual patient needs and goals. For the second participant [Lilian], though her assertions that the NHS age policy on THR should not apply to people who do not engage in higher impact activities or who intend to modify their activities to lower impact activities may not be entirely true, it however raised the importance of information being tailored to individual's need because people's needs are different. The concept of individualism when it comes to participation and/or returning to preoperative levels of PA was also highlighted as some participants [Rose; Grace; Lilian] described what PA meant to them. PA being something liked and enjoyable happen to also refer to preferred activity. It was such a big deal that for Rose, unless it came highly recommended there were certain activities that she probably will not participate in. Preference in activity was shown to differ amongst the women. For instance, whilst Lilian enjoyed group activities, Grace preferred solo ones; for the former, this was an additional recovery expectation i.e., 're-joining things with other people'. With regards to PA being something committed to, the women clearly demonstrated that recovery is always in an individual's own unique context, with the things that matter urging the person on (249). Thus, like the participants in this study, a person will set limitations i.e., lack of time on activities not 'liked' or 'enjoyed' over something they are committed to. An example is Grace who chose dog walking over going back to the fells because her commitment was to her dogs who she could not leave behind as it was not safe to take them along. A key study finding further justifying the need for individualism is the definition of preoperative PA level. This brings more clarity to Witjes et al. (66) recommendation used in this study. They stated that preoperative PA level should be based

on the 'pre-symptomatic phase' when the patient was not yet restricted in participating in their preferred activity because of osteoarthritic joint complaints. This study adds to this by categorising the preoperative phase into four, applicable to individuals with pre-existing and/or multiple musculoskeletal joint problems. This comprises of the lifetime, historic or pre-symptomatic phase ["before the onset of first symptoms" as defined by Navas et al. (195)], onset of symptoms [the phase activity starts to decrease], before surgery [the phase activity decreases significantly following diagnosis and awaiting surgery] and at time of surgery. This evidence the fact that PA decreases over time and prolonged years of living with a painful hip, other joint/medical problems and associated restrictions can impair attitude towards PA. These challenges coupled with inadequate knowledge of their condition, recovery process and feeling less valued can negatively impact postoperative recovery, causing discouragement and demotivation.

Finally, it is important that this subset of THR patients are provided with adequate patient education and support to encourage participation, return and maintenance of PA. The uphold of an active lifestyle or being regularly physically active has several general health benefits as it helps to prevent and manage over 20 chronic conditions (38) and is linked to a reduction in all-cause mortality (38,39). For older people, like most THR patients, regular PA can delay the age-related decline in musculoskeletal fitness (39) and assists in chronic disease rehabilitation (38). The findings of this study thus provides understanding for future assessment and intervention development especially within the OT practice.

6.4 Chapter conclusion

Participation and/or returning to preoperative levels of PA following THR for the treatment of OA as experienced by historic physically active women aged 60 and over is found to be influenced by three key factors. First, worsen/poor preoperative functional level informing low recovery expectations. Second, unsatisfactory support from HCPs, one that was perceived as ageist. Third, individual factors; negative beliefs held about other joint problems [pre-existing/recent] and older age been the two persistent. Better interaction with the healthcare system via individually tailored preoperative education on the recovery process and rehabilitation programs designed to facilitate return to PA may help address these factors.

CHAPTER 7

Synthesis of research findings and conclusion

7 Introduction

This thesis proposed a BPS analysis of postoperative recovery in THR to elucidate understanding of the BPS characteristics influencing recovery. Thus, guided by the BPS lens, this research conducted a SLR along with a qualitative study to address the two RQs posed to fulfil this purpose.

The first RQ was addressed using the results from the SLR based on the available evidence on postoperative recovery, conceptualised as return to preoperative levels of PA following THR – the barriers and enablers. Results were organised and presented according to BPS domains answering the question: "what are the potential biological, psychological, and social outcomes predicting return to preoperative levels of PA following THR"? This allowed for the development of a BPS representation of all aspects of the patient's life that allows for postoperative recovery. The definition of 'preoperative PA level' in this thesis refers to the 'pre-symptomatic' [or historic] phase − when the patient was not yet restricted in participating in PA because of osteoarthritic complaints. However, limited by their quantitative nature, the SLR results revealed a lack of individualised experience in relation to the BPS outcomes influencing recovery. Consequently, detailed insights capable of exploring in-depth all of the BPS influences as they act on the recovery process from an individualised perspective was lacking. As a result, an IPA study was sought to gain deeper understanding from the perspective of women aged 60 and over – a subset of the THR population revealed as being at a disadvantage.

Thus, study 2 aimed at gaining insight into the lived experiences of PA in historic physically active women aged 60 and over to elucidate understanding of the factors influencing participation and/or returning to preoperative levels following THR for the treatment of OA. Results from the SLR indicated OA as the predominant diagnosis for THR amongst participants reason for the specific focus on condition.

This final chapter integrates and discusses the key findings from both phases of the research study to enable a richer understanding of the biological predispositions, psychological factors, and the social-environmental influences acting on postoperative recovery in THR. The research contributions to knowledge, and implications for future research and practice were discussed. The strengths and limitations were considered, and some recommendations for future research made.

7.1 Key findings

Within this research, the BPS model has served as a framework to help define the focus and goal of the research, resulting in identifying the potential biological, psychological, and social outcomes predicting return to preoperative levels of PA following THR. This aim was addressed in the first phase of this research through a SLR [study 1; chapter 3]. The results identified: being female,

older age [>60 years], personal experience with pain, comorbidities [including other musculoskeletal problems], beliefs relating to PA, fear, higher expectations, better functional ability [pre- and post-surgery] as well as medical advice/recommendation. Of the 30 studies [prior and updated literature search] that examined the diagnosis for THR, OA was the predominant [n=28] corroborating the NJR 19th annual reports that it is the major indication for primary surgery at a median age of 69 years (3). However, limited by their quantitative nature, the results revealed a lack of individualised experience and detailed insights that explore in-depth the 'how' and 'why' participation tend to decrease and return to PA not up to pre-symptomatic [or historic] levels. Instances include 'undefined reasons' and 'reasons unrelated to surgery' and therefore considered to be a gap.

With the goal of filling the gap identified by study 1, study 2 [chapter 5 & 6] aimed at generating detailed insights from exploring in-depth all of the BPS factors as they act on the recovery process from an individualised perspective. As a result, an IPA study was sought to gain a deeper understanding from the perspective of women aged 60 and over – a subset of the THR population revealed as being at a disadvantage. Therefore, following the recommendations highlighted in chapter 1 by Smith et al. (206), Lee et al. (26) and Allvin et al. (44), this is the first qualitative study to explore how response and attitudes to PA changes over time from pre to post-THR (206) in this population. This was done utilising a validated activity level rating measure [UCLA activity level scale] to describe PA levels and assess the recovery profiles (26,44) of participants. From the accounts of n=4 women, participation and/or return to preoperative levels of PA following THR was found to be influenced by three key factors. First, worsen/poor preoperative functional levels informing low recovery expectations as a result of delayed time until surgery. Second, unsatisfactory support from HCPs, one that was perceived as ageist. Thirdly, individual factors such as beliefs held about other joint problems [pre-existing/recent] and older age, what PA meant, the desire to either foster a positive self-body image or return to PA, and fulfilment of recovery expectations. Better interaction with the healthcare system via individually tailored preoperative education on the recovery process and rehabilitation programs designed to facilitate return to PA may help address these factors.

The synthesis and analysis of both the SLR and IPA study [including the case studied in section 5.5.1] enabled a richer understanding of the biological predispositions, psychological factors, and the social-environmental influences acting on postoperative recovery in THR [Figure 4]. It showed that the BPS framework can be used for assessment and interventions. This informed the proposition of theory driven, evidence-based principles to guide the development and implementation of targeted evaluation and interventions based on the combination of the BPS

dimensions that influence participation and/or return to preoperative levels of PA following THR [Table 7].

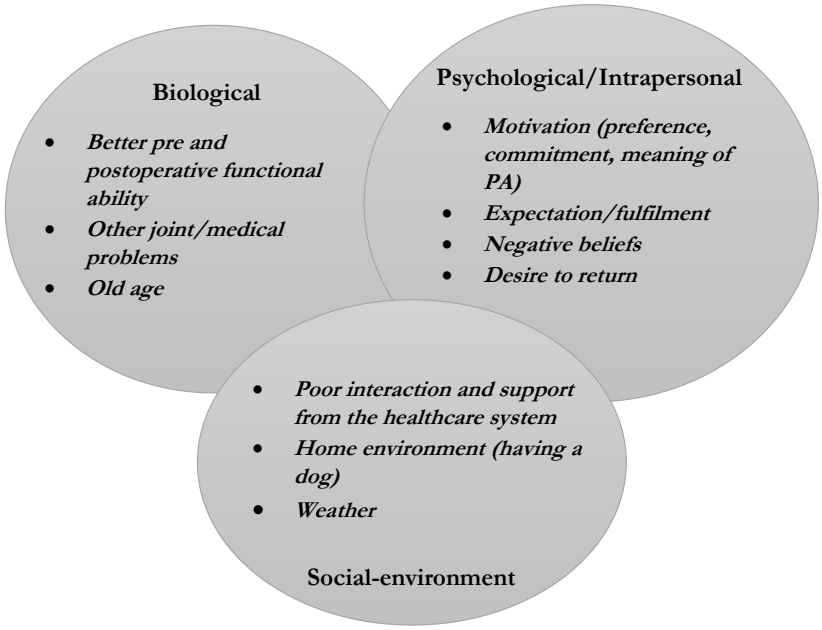


Figure 4: Biopsychosocial representation of the outcomes related to participation and/or return to preoperative levels of PA following THR

This result is key as rehabilitation after THR are not designed to return patients to high levels of PA, and so low levels of PA are common as reported by Pozzi et al. (27) and Almeida et al. (250). A possible explanation for this shortcoming could be because there are currently no guidelines pertaining to the rehabilitation of people following THR. However, the College of Occupational Therapists (30) practice guideline revised edition includes a new recommendation which suggest that return to physical and sporting activities be considered within an OT assessment and interventions. This guideline includes a new recommendation regarding return to physical and sporting activities albeit reflective of younger patients. This thesis findings therefore adds the perspectives of older patients to that body of knowledge.

7.2 The BPS framework for participation and/or returning to preoperative levels of PA following THR

The development of these proposed principles was based on study 2 results [IPA of historic physically active women aged 60 and over] in conjunction with study 1 [SLR], existing literature related to adherence with health interventions and guided by the BPS model. According to Akobeng (251) and Kristine (252), an evidence-based approach to practice should involve an understanding of the current literature or research evidence along consideration of the patient's needs and context. Kristine (252), further stated that lack of consideration of any of these areas

when designing an intervention decreases the chances of successful implementation. The principles developed in this current research are based on research evidence, patient involvement, and perspectives. Each of the principles [Table 7] is discussed next in relation to the published literature and study results.

Biological domain

Principle 1: *Employ strategies to increase function and decrease limitations/impairments related to other joint/medical problems*

Both quantitative and qualitative evidence consistently reported osteoarthritic pain, physical functions, and comorbidity as responsible for change in both PA participation and activity levels. This is in line with previous qualitative findings that in hip and knee OA, pain is a factor that makes PA an aversive experience leading to activity avoidance (85) before joint replacement. The participants in this research all had comorbidity including other symptomatic joints problems and high blood pressure. As a matter of fact, these pre-existing health problems delayed getting accurate diagnosis and acceptance for surgery. Meaning that at the time of surgery, functional condition and pain had worsen, making improvement such as pain relief the 'main' recovery expectations. Since expectations for PA have been shown to be higher in those who are more active pre-surgery and reported better general health (15), the need to mitigate the circumstances that led to the delayed time until surgery is of upmost importance and is discussed under principle 3. Patients' preoperative expectations of their recovery from THA or TKA have been shown to be modifiable by preoperative educational classes (253). Therefore, this can be utilised to boost recovery expectations beyond pain relief.

Psychological/intrapersonal domain

Principle 2: *Employ strategies that target self-efficacy/beliefs, minimise barriers and ensure individual patients needs are considered*

PA promotion requires behavioural interventions that aim to empower an individual to become more active by changing any negative PA beliefs held. The biological changes i.e., ageing, and other symptomatic joint problems experienced by the participants in study 2 impacted their self-efficacy or belief in their ability to return to their historic levels of PA or participate in certain activities. Similarly in study 1, participants believed they were too old to participate in regular PA citing age related loss of strength and reduced physical fitness as reasons for either quitting or changing sports disciplines respectively. Using Rose, the case studied as example, this belief ranged from an age-related slow down and so only expecting to take up the activities they were participating in before the onset of OA hip problem and not historically [i.e., pre-knee surgery] or just being able

to go to the gym albeit to engage in fitness sessions that are 'age' and 'stage' appropriate. Age and stage here was used by another participant [Mary] in reference to the progression of her knees [OA on both], bunions on both feet and other hip problem. Thus, describing herself as being in enhanced deterioration mode, one that impaired her general level of fitness and mobility. This is key research finding that corroborates with that of study 1 and Witjes et al. (66) as it relates to the appropriate time-point i.e., 'pre-symptomatic' [historic] or 'time of surgery' [before surgery] to access preoperative activity level by, especially when it comes to evaluating recovery. As revealed in both study 1 & 2, participants PA levels increased from 'time of surgery' to post-THR but not up to the 'pre-symptomatic' or historic levels.

This research thereby supports Witjes et al. (66) recommendation that preoperative PA level should be based on the 'pre-symptomatic phase' when the patient was not yet restricted in participating in their preferred activity because of osteoarthritic joint complaints. This definition was thereby adopted in this thesis. However, an important study 2 addition is that the decrease experienced at 'time of surgery' is not only due to restrictions caused by the onset of osteoarthritic hip complaints, but also the interplay of belief held about older age and the interference of other symptomatic joints including surgery underwent as a result. Some of the participants have had partial [Rose] and keyhole knee [Grace] surgeries prior to their THR, and one [Lilian] was still recovering at 6 months post-surgery when she had the second hip replaced. They all consistently agreed that if not for the other joint problems, the current hip surgery alone would not stop them returning to their historic PA levels, and had it not been for the interference, getting 'closer' to that level could have been a possibility. The key word been 'closer', confirming that there was already a pre-set mindset about the 'impossibility' of getting back to their historic activity levels. Therefore, expatiating on Witjes et al. (50) definition of preoperative PA level as the 'pre-symptomatic phase', albeit applicable to individuals with pre-existing and/or multiple musculoskeletal joint problems, this research categorises the preoperative phase into four. This encompasses of the phase "before the onset of first symptoms" as defined by Navas et al. (195), onset of symptoms, before surgery and at time of surgery.

Study 2 observed positive and negative subjective self-ageism from participants narrative. For the latter, it meant admitting to an age-related slow down for self, whilst acknowledging some people do not [Rose]. The former comprised of those who either identify as young or not the typical 76 years old woman [Mary]. It was asserted that positive subjective ageing is a state of mind that can be changed as corroborated in a prior qualitative study by Harding et al. (67). The authors reported that participants were contented knowing they can be physically active but had no intention to be active rather, they identified new limitations to a physically active lifestyle such as age and

comorbidities after surgery. Two vital points were highlighted here, first is that post-surgery, a person's perceptions about their age and comorbidities replaces the pre-surgery problem of pain or any other concern. Secondly, the participants had 'no intention' to be active bringing to fore the importance of getting insights into an individual's reasoning and motivations to be physically active identified as key factors associated with participation and/or returning to preoperative levels of PA in study 2. This ranged from what PA meant to them, the desire to either foster a positive self-body image or return to PA, all of which evidence the person-centric nature of outcome. With regards to body image, prior qualitative studies (65,137,234) have also reported that older persons undergoing THR placed high importance on how others perceived them, meaning it is a central concern to them thus served as a motivation for enhanced recovery. An important addition by this study is that the women were not only concerned about how others perceived them, but this also extended to how they 'see' self. So, they were motivated by the desire to look attractive, and not the person who is hunched over at the hip [Mary] or 'looking like an old woman' [Lilian]. Findings from this research therefore evidence the fact that positive subjective ageing is a mindset that can be channeled into believing that returning to historic activity levels is attainable.

For some of the participants in study 2, PA meant either something liked and enjoyable, or committed to, with things that matter urging the person on (249). Limitations i.e., lack of time were often set on activities not 'liked' or 'enjoyed' over something they are committed to. In their description of what PA meant to them, the concept of preferred activity was portrayed as such a big deal that for Rose [the case studied], unless it came highly recommended there were certain activities that she probably will not participate in. Preference in activity was shown to differ amongst the participants, whilst some enjoyed group activities, others preferred solo ones. As a matter of fact, rejoining things with other people was an additional recovery expectation for one participant [Lilian] who after surgery was able to take up salsa dancing. A key finding is that there is the possibility that a once 'preferred' or valued activity has the potential to change overtime. This again was demonstrated by Rose who no longer participate in long walks, a once valued activity though admitting to missing it was seen now questioning it's appropriateness and whether it is still something she would fancy doing. She implied that some aspects like scrambling around may no longer be appealing for her age. This goes to show that the value placed on certain activities has the potential to change overtime with age and therefore a determinant to participation and/or returning. This could arguably be the explanation for the "undefined reasons" and "reasons unrelated to surgery" reported for being forced to retire from golfing (170) or causing reduction in golfing for one significantly active golfer (179) respectively as reported in study 1. For all the participants [n=4 women] in study 2, PA was seen as a means to keep active so as to sustain

independence in old age. As a matter of fact, the desire to return to pre-pain levels when activity becomes 'enjoyable' and possibly the motivation to keep active so as to facilitate healthy ageing devoid of dependence on others seem to serve as activity boosters. This may arguably be the reason why in study 1, non-adherence to medical recommendation regarding returning to certain high impact activities was observed to be connected with participants motivation for undergoing surgery i.e., the desire to continue/return (167,168,188). Thus, making true the fact that patients will attempt to return to the activity that they are familiar with or have the desire to return to and as such, advice should be adjusted accordingly (148). As demonstrated by the case studied [Rose], concentrating on returning to prior PA appeared to be the strategy employed to help her gain acceptance of the possibility of not being able to take up new activities and so focused on returning to the familiar to keep active. However, one of the recommended components of PA promotion is assessing the patient's readiness to change (254). Research has shown that applying a behavioural intervention to individuals who are unwilling to or uninterested in change may result in failure to change behaviour despite the efforts put by the team involved in the process (255,256). An example is Grace [a participant in study 2], who though admitted to her ability to participate in backpacking but without any reason stated she "just would not" anymore. The sense made for her refusal was that it was something she no longer was committed to as her dogs were her priority and activities tend to center around them. Contrarily, another study 2 participant [Lilian] demonstrated the willingness to change by 'finding a new sport' as advised by her personal trainer. This was employed as a strategy to help curb any demotivation that might arise from not being able to return to things she could do before i.e., playing tennis, an activity she admitted doing because she was a younger person then. Apparently, finding a new activity that she could do gave her both the courage and motivation to 'keep active'. The issue of building up confidence which reportedly is major for people who undergone THR (139) happen to be mitigated by the effectiveness of THR in fulfilling and exceeding the women's recovery expectations. This gave two participants the confidence boost and even the audacity to anticipate returning to certain historic activities such as going back to Yoga [Grace] and uphill Helvellyn [Lilian] again one day. Similarly, fulfilment of expectations was shown in study 1 as correlating with better activity level i.e., UCLA activity scores and RTS. This can serve as a leverage for PA promotion.

Table 7. Principles supporting the BPS framework for participation and/or returning to preoperative levels of PA following THR

S/N	***Principle brief description strategy***	***Principle brief description strategy***
1	***Biological*** Employ strategies to increase function and decrease limitations/impairments related to other joint/medical problems.	• Match strategies with the impact they have on other health problems. • Provide meaningful and practical activity options while considering the interference of other joint/medical problems.
2	***Psychological/intrapersonal*** *[i.e., individual factors that influence behaviour such as knowledge, attitudes, beliefs, and personality]* Employ strategies that target self-efficacy/beliefs, minimise barriers and ensure individual patients needs are considered.	• Communicate knowledge and understanding of both OA, THR, other joint problems/surgery and ageing. • Highlight noticed improvements related to BPS outcomes with links to participate in everyday activities. • Use evaluation methods or outcome measures i.e., the UCLA activity level scale to provide individual with feedback. • Provide preoperative education/training with guidelines about the recovery process. • Base strategies on the individual's identified goal/motivation, preference, commitment, and priorities. • Benefits of the physical context i.e., staying active in old age

S/N	*Principle brief description strategy*	*Principle brief description strategy*
		should be highlighted to the individual.
3	***Social-Environmental*** Employ strategies to increase social/environmental interaction and connection.	• Communicate with stakeholders regarding the benefits of promoting PA in this sub-set of individuals in order to inform users, referring bodies and program developers. • Communicate knowledge and understanding of individual condition and impact of the BPS outcomes on postoperative recovery in a way that they understand. • Communicate with referring health professionals [GPs; Surgeons] regarding the BPS aspects to postoperative recovery to encourage referrals. • Promote summer-time activities and those suitable to individual's home environment. • Encourage optimal preoperative interaction between HCPs and patients to guide counselling, shared decision-making and to build trust.

Social-Environmental domain

Principle 3: *Employ strategies to increase social/environmental interaction and connection*

The barriers to participation and/or returning to preoperative levels of PA in the THR population can also manifest within the health care environment as study 2 showed. This is profound as PA

promotion requires a team-based approach, which may include primary care physician, nurse, orthopaedic surgeon, physical therapist, occupational therapist, or exercise counsellor. The PA information provided to participants appear to largely focus on the 'don'ts'. A recurrent factor that interfered with this was the biological predisposition of other symptomatic joints including surgery [prior knee surgeries and THR] underwent as a result. As demonstrated by the case studied [Rose], even prior to her hip problems she had stopped been able to do long walks due to her knee consultant advice not to pound the streets as she started to be very careful of the terrain. Here the need for clarity is evidenced with 'pound' better explained i.e., long, taxing walks discouraged and shorter paced ones okay. This way, the outright discontinuation of long walks could have been remedied. Furthermore, there was a lack of clarity as to what advise was due to the study hip, and other joint problems i.e., knee, or a combination of both. For example, Rose was also told by her surgeon to be careful with certain Yoga positions, and advised against breaststrokes which is her favorite swimming style however, the reason was not offered. This in turn had great implication on activity, as it placed a restriction on her participating in these activities.

Also identified was the lack of interprofessional collaborative and care coordination amongst HCPs. This was demonstrated by one of the participants [Mary] between her local rehabilitation team and the hospital she had her THR. Adhering to the exercises recommended by the former, she returned to walking 3 weeks post-discharge only to be told at the routine 6 weeks postop checkup that this was not allowed until 3 months post-THR. This news left her feeling she actually was 'slowing down' her recovery and even as at time of interview she still finds herself in a position of uncertainty about participating in certain PA due to fear of possibly doing damage. This cautious attitude towards PA may also generate fear of movement as already demonstrated. While activities that cause great stress on the hip or knee joints, such as jumping or running, should be discouraged, there is no evidence that high-level resistance training and low-impact aerobics activities such as swimming, brisk walking, and cycling decrease the life span of TJR (152). Infact, Ponzi et al. (134) study revealed that the mean time to revision was 2.5 and 3 years with the most frequently reported reason being 'all cause' for both inactive [n=46] and active [n=33] participants respectively. Furthermore, the trade-off between the harms of inactivity versus the benefits of PA, especially considering the age and associated comorbidities of the women in this study should be balanced. For older people, regular PA can delay the age-related decline in musculoskeletal fitness (39) and assists in chronic disease rehabilitation (257). However, health care providers do not always have sufficient time to educate patients about the recovery process, types of activities that can be performed safely and that are not detrimental to the prosthesis.

Both study 1 and 2 [including the case studied - Rose] confirm that OT routinely provided as part of the rehabilitation service for people with THR was sparsely provided and only focused on facilitating a smooth transition from hospital to home when available. Meanwhile, it was observed that for the courage to go back to PA to be built, 'acceptance' needed to be gained. For two participants in study 2, this required coming to terms that the hip is different which in turn meant finding a new activity [Lilian] or concentrate on getting back to those participated in prior to surgery [Rose]. In the absence of adequate patient education and support from HCPs to provide such counsel and encouragement, this is therefore a huge concern as to who takes up this responsibility. Lilian had to sought the counsel of her personal trainer, got encouraged to find a new activity to avoid demotivation in the advent that she is unable to return to her preop activities. Rose on the other hand resorted to google where anything goes with supposed 'health information' dished out by all and sundry especially without medical guideline or credence.

Having the requisite knowledge of the recovery process was shown to play an important role in the decision to participation and/or return to preoperative levels of PA. For instance, the knowledge of the time it takes the soft tissue to heal and to gradually build things up to avoid damage gained via prior job as a PT was reported by one participant [Grace] as aiding her recovery. Unfortunately, the reverse was the case for Mary as lack of clarity about the former left her staying off PA for fear of slowing down her recovery and to preserve the hip. This finding answers the question in study 1 as to whether participants who reported 'precautionary measures [including to preserve the prosthesis]' as reason for change in activity participation were just less motivated, merely adhering to the medical advice received or just lacked adequate knowledge of the recovery process. Based on the women's narratives, adherence to medical advice or lack of adequate knowledge of the recovery process seem the likely answer. This was portrayed by the women with some believing that engaging in high impact activities reduces the life expectancy of hip replacement [Lilian], walking briskly caused knee to deteriorate quicker [Rose] and TKRs not as easy to do as hips [Grace]. The latter forming the most common misconceptions and was so profound that Grace would rather have her right hip replaced instead of her knee, a preference that has previously been uncovered by another qualitative study (228). The implication of this is that she would do anything to preserve her knees including stopping PA, highlighting again the women's assertion that the current THR alone does not sustain the ability to restrict participation and/or returning to preoperative levels of PA. This is quite concerning because pre-existing OA knee problems suffered by the women fundamentally contributed to their poor functional levels' pre-surgery. Thus, having their knee replaced would have lessen the level of their physical limitations prior to surgery and by extension improving recovery expectations. Therefore, there is

a dire need to provide quality information and advice regarding TKR as the symptomatic knee joint was a recurring factor that influenced participation and/or returning to preoperative levels of PA. Contrarily, the importance of being knowledgeable about OA, joint replacements, and the recovery process was shown to have spurred self-determination, motivation, and a positive mind-set towards recovery. This was demonstrated by Grace and Mary − understanding the functional benefits of specific activities and fore-knowledge about postop recovery gained from prior PT job experience, and as a former athlete and now an athletic coach respectively. Clearer information about the recovery process, education about safe and recommended PA with regards to ageing and other joint problems/surgeries concerns may be beneficial and the first step in encouraging participation and/or returning to preoperative levels of PA in this population.

The lack of information about the longer-term recovery process and 'discouragement' from surgeon for 'not being old enough' to have a hip replacement, all played into the women's perceived age discrimination. For instance, Mary being told by her consultant that she would be very disappointed at the result of her THR as her expectations would not be fulfilled despite not even knowing what they were. All HCPs who manage people with THR have a key role in facilitating participation and/or returning to preoperative levels of PA through their advice or decision, this finding therefore evidence the need for an optimal pre-surgical interaction between them and patients. Better relationship with patients will win their trust and change the perceived age discrimination as it has shown as having the potential to hinder efforts made at attaining optimal recovery including expectations and decision-making.

An interesting research finding is the role non-human support systems such as dog, and the environment i.e., weather, fields around the house played in facilitating early return to walking activity and their potential for use in promoting PA. Two women [Rose; Grace] were observed as going back to activities during summertime, a finding similar to previous reports (84) that outdoor temperature is associated with higher levels of PA in people with hip OA − warmer temperatures been enablers and cold weather barriers to PA respectively. Grace recalled returning to dog walking 3 days post-discharge though having to be on leads for both support and as a means of precaution to avoid being knocked over by her dogs or falling given it was wintertime. This was made possible because of the fields around her house and having a dog. Here, the concept of commitment and preferred activity were re-emphasised. First, she prefers solo activities i.e., dog walking, horse riding, cycling, and swimming all of which she has returned to. Secondly, there were other activities i.e., fell walking she stopped that were based on where her commitments lie. Her commitment to her dogs appear to take pre-eminence as she seemed to streamline her activities around them and even bracing the winter and risk of falling quite earlier on in her recovery journey. There is a sense

that she would let go of any activity and do anything for her dog's sake as shown in her reason for not going back on the fells — her desire to keep them safe, so choosing to walk her dogs instead.

7.3 Research impact and implications for future research and practice

Coupled with the unique research focus on historic physically active women aged 60 and over, a novel aspect of this research is its exploration of PA pre- and post-THR using a subjective standard PA activity level scale. In addition to interviewing participants, a pre ['pre-symptomatic' i.e., historic phase and 'at time of surgery' i.e., before surgery] and post THR assessment of their PA levels was conducted. It was the assessment of participants PA levels at the preoperative timepoints ['historic' and 'before surgery'] that revealed significant decrease within these periods. Thus, providing evidence for study finding to not just corroborate Witjes et al. (66) recommendation that preoperative PA level should be based on the 'pre-symptomatic phase' but expatiating by identifying four categories that this should encompass. This allowed for a deeper understanding of the impact of OA on the lived PA experience of participants. This exploration explicated the deeper meaning and complexity associated with questions (205), capturing how response and attitudes to PA changed over time. To the best of my knowledge and based on the literature review, no existing qualitative study has investigated participation and/or returning to preoperative levels of PA following THR specifically in people aged 60 and over, using both interviews and activity assessment tool to elicit views. Not reporting on participants' activity levels is an oversight as it is an important outcome measure that provide a common language to assess the success or failure of surgery. Providing detailed assessment and evaluation of PA pre- and post-THR contribute to a better understanding of outcomes from the patient and/or practitioner perspectives. This is an important means to describe and examine the recovery profiles of people with THR. By adopting this method in my study, I hope to make a case for the use of standardised PA rating scales for application in the OT practice as a measure to assess recovery profiles. The use of standardised assessment and outcome measures to determine functional outcomes in rehabilitation settings [either inpatient or community based] has already been recommended by the College of Occupational Therapists (30). However, given the possible over-estimation of activity levels observed by participants in study 1 and study 2, likely due to the difficulty using the UCLA activity level scale reported in the latter [described in the strengths and limitations section below], a more objective measure may be more appropriate in clinical/rehabilitation setting. Defined as the discordance between objective and self-rated PA, overestimation may be an important barrier to healthy behaviour change (258) as those who fail to recognise their inactivity are unlikely to perceive a need to change and therefore be less susceptible to health promotion strategies.

Currently, there are no guidelines pertaining to the rehabilitation of people following THR. However, the College of Occupational Therapists (30) in their latest report suggest that return to physical and sporting activities be considered within an OT assessment and interventions. The findings of this study can be shared with practitioners and those working with people with THR to obtain their views. Comparing these different perspectives [that of the participants in this research and practitioners] will provide insights which have the capacity to inform clinical practice. The views of OTs and surgeons specifically whose role is to encourage PA in this population will be of great value. Importantly, findings have the potential to give insights into the role of OTs in enabling increased PA and/or return to sports following THR, a recommended research topic by the College of Occupational Therapists (30).

7.4 Strengths and limitations

There are a variety of strengths and limitations within this research study. I will discuss these issues in this section below.

Participant sample group and size: Given the developmental nature of this thesis, the sample group and RQ emerged from the gap identified by the SLR [discussed in section 3.5]. Consequently, the sample group was recruited specifically based on the methodological approach [IPA] deemed appropriate, and experiences of the phenomenon being investigated. The n=4 participants were female, aged 60 and over, white and from the same geographical location [Northwest England]. The homogeneity and sample size of the group could be a limitation, as the findings are context specific and therefore may not be applicable to other populations or settings. However, one would argue that generalising the findings is not a central focus or concern of phenomenological research inquiry; the main concern is to understand individual experiences and meanings of their experiences of the phenomenon under investigation. Subsequently, IPA works with small and homogenous sample size, enabling the examination of each case in great detail (110,117). A default sample size is 3-6 participants according to Smith et al. (117) is enough to discover similarities and differences across the cases as evidenced in this thesis.

The use of the UCLA activity rating score: With the exception of Lilian, the participants in study 2 did not find the UCLA activity rating questionnaire a helpful way of assessing their activity levels. The key criticisms highlighted were recall and categorisation. According to Mary, *it's quite a long time ago* and *these kinds of problems come on very gradually*. Secondly, she described the questionnaire as *sort of lumps diverse activities together* in regard to the activity description levels. Prior to the interview she rated her historic activity level as a UCLA score of 6. It took the opportunity provided by the interview for her to tell her story and further clarification on the description level to realise her

score is actually a 10 being a competitive athlete. Rose was left with the question, *where will you put the exercises that I do do? Cos they are not the same as those [UCLA activity questionnaire] aren't they?* This was as a result of most of the activities she engaged in not listed, leaving her torn between an activity score of 5 and 6 for her current level. For Grace, the questionnaire did not *necessarily pull out the precision of some of these activities* and so considered it *a bit of a limitation* resulting in making it hard to precisely rate her historic activity levels, so she was undecided between score 6 and 9. Possibly as a result of these experienced difficulties, a seeming over-estimation of activity levels was observed. For instance, the women all consistently reported poor/worsen physical function and inability to do any PA at time of surgery [section 4.4]. Going by this, their UCLA scores should range between 1-2 [inactive or restricted to minimum activities of daily living] as against the 3-4 [participating in mild activities] reported. A similar trend was observed postop specifically for Mary and Grace as the activities they reported participating in did not correlate with the score level chosen. This presumed over-estimation of activity level appear to have been confirmed as observed also by the participants in the updated literature search conducted on 11 January 2024 [section 3.4]. In this predominantly younger cohort of THR patients, findings revealed the two most popular PA engaged in pre-and post-surgery as walking and swimming. Interestingly, these are low impact activities and so do not corroborate with participants reported post-surgical activity levels [8/10] which according to the UCLA activity descriptive rating levels should comprise active events such as golf, bowling, or impact sports. Therefore, whilst the use of the UCLA activity questionnaire could be acknowledged as a limitation, this was mitigated by the qualitative interviews which provided the opportunity for clarity via the women's narratives in study 2. Furthermore, it should be noted that it is not possible for the questionnaire to list all existing activities in response to Rose query above. The UCLA activity level rating is a simple scale that aids the qualitative assessment of activity levels in joint replacement patients' (75,76) which made it suitable for this research. The evaluation has 10 descriptive activity levels ranging from wholly inactive and dependent on others (level 1), to moderate activities such as unlimited housework and shopping (level 6), and regular participation in impact sports such as jogging or tennis (level 10). The listed activities comply with Vail et al. (191) classification according to the levels of impact on the hip joint.

7.5 Recommendations for future research

Within this current study there is a lack of diversity in samples. An ethnically diverse population such as, black, Asian and minority ethnic [BAME] groups would offer more insight as different experiences may emerge. Also, given all the positive effects of an active lifestyle and the complexity of modifying individual habits, research findings can be used to identify patients who are

undergoing THR that may benefit from PA promotion [i.e., those motivated and desire to participate and/or return to preoperative levels of PA] and test the practicality of implementing these different strategies within the context of a rehabilitation program. Furthermore, future study should explore the perceptions of HCPs in this field [particularly surgeons and OTs working with adults undergoing THR] in relation to the guiding principles proposed by this research. Comparing these different perspectives will provide additional insights which have the capacity to inform clinical practice. Finally, in light of updated literature search results, a similar research should be conducted in preoperative physically active younger women following THR. Findings can then be compared, providing a holistic overview of the postoperative recovery process in this subset of the THR population.

7.6 Concluding thoughts

Before beginning this work, I had no prior agenda, other than to explore the effectiveness of THR in returning people to their preoperative levels of PA. Thus, a pragmatic approach was taken to conduct the research. As a result, two concepts were used to frame the research: postoperative recovery and BPS model both dictating the most practical method for answering the two questions posed by the research. To be able to quantitate postoperative recovery using reliable and valid measures, the construct of recovery must first be well defined. For this research, this was defined as return to preoperative levels of PA − specifically the pre-symptomatic [or historic] phase and assessed using the UCLA activity level scale. The use of the BPS model to drive the exploration of the effectiveness of THR in returning people to their pre-surgical PA levels provided a structure to organise the THR research and identify gaps that need to be addressed. Given the developmental nature of the research, study 1 [SLR] informed an IPA study with historic physically active women aged 60 and over [study 2]. Both study results collectively contribute to the overall purpose of this research. This being to propose a BPS analysis of postoperative recovery in THR to elucidate understanding of the BPS characteristics influencing recovery. Utilising phenomenology and combining both the findings from study 1 & 2 for this thesis enabled a richer understanding of the biological predispositions, psychological factors, and the social-environmental influences acting on postoperative recovery in THR. Furthermore, the findings highlighted potential implications for healthcare practice by generating insights that informed the proposal of a set of guiding principles that can support the development and implementation of targeted evaluation and interventions based on the combination of the BPS dimensions that influence participation and/or return to preoperative levels of PA following THR. These principles can be shared with HCPs and those working with people with THR to obtain their views. Comparing these different perspectives [that of the participants and HCPs] will provide insights

which have the capacity to inform clinical practice. The views of OTs and surgeons specifically whose role is to encourage PA in this population will be of great value. Finally, given the impact of research on the participant group, nation [health and social care costs] and service delivery, I hope it inspires others to undertake similar research to expand and develop the knowledge and understandings of this important phenomenon.

APPENDICES

Appendix 1. Exploring the effectiveness of total hip replacement in returning people to their pre-surgical physical activity levels: a systematic review

Supplementary data A: CINAHL Search Strategy 220120

S1	(MH "Arthroplasty, Replacement, Hip") OR "total hip replacement" OR (MH "Arthroplasty, Replacement")
S2	hip replacement
S3	hip arthroplasty
S4	hip arthroplast*
S5	hip replacement*
S6	S1 OR S2 OR S3 OR S4 OR S5
S7	(MH "Physical Activity") OR "physical activity" OR (MH "Activities of Daily Living") OR (MH "Leisure Activities") OR (MH "Motor Activity") OR (MH "Exercise")
S8	activity
S9	recreation
S10	sports
S11	athletes
S12	athletic performance
S13	sporting events
S14	sports events
S15	sport*
S16	physical*
S17	recreat*
S18	athlet*
S19	S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18
S20	(MH "Recovery") OR "recovery"
S21	recovery of function
S22	recover*
S23	return
S24	S20 OR S21 OR S22 OR S23
S25	S6 AND S19 AND S24
S26	S6 AND S19 AND S24

Appendix 2. Exploring the effectiveness of total hip replacement in returning people to their pre-surgical physical activity levels: a systematic review

Supplementary data B. Criteria list for assessment of risk of bias: Customised QUIPS* tool

1) Study participation

a) Source population/population of interest is adequately described; low = fully mentioned, moderate = partially mentioned, high = not mentioned
b) Clear description of power analysis; low = mentioned, high = not mentioned
c) Recruitment period and place of recruitment of patients; low = fully mentioned, moderate = partially mentioned, high = not mentioned
d) Description of inclusion and exclusion criteria; low = fully mentioned, moderate = partially mentioned, high = not mentioned
e) Clear description of baseline characteristics: age, body mass index, comorbidities and preoperative PA level/outcome measure; low = fully mentioned, moderate = partially mentioned, high = not mentioned

2) Study attrition, follow-up

a) Follow-up of at least 12 weeks; low = > 12 weeks, high = < 12 weeks
b) Adequate response rate % for study participants; low = < 20%, high = > 20%
c) Information about non-responders versus responders: age, body mass index, comorbidities, and preoperative PA level; low = fully mentioned, moderate = partially mentioned, high = not mentioned

3) Prognostic factor measurement

a) Information about the indication or diagnosis for surgery; low = mentioned, high = not mentioned.
b) Clearly described information about the surgical approach; low = mentioned, high = not mentioned
c) Specified description of implant used; low = fully mentioned, moderate = partially mentioned, high = not mentioned
d) Information on type of procedure [bilateral or unilateral]; low = mentioned, high = not mentioned

4) Outcome measurement

a) Special attention to definition of preoperative [pre-symptomatic phase or before surgery] PA level; low = mentioned, high = not mentioned
b) Clear definition of outcomes with attention to pre- and postoperative PA participation, return to activity [level and impact thereof], time to return to PA, satisfaction about activities and/or surgery; low = mentioned, moderate = partially mentioned, high = not mentioned
c) Valid and reliable measurement of outcomes are used, including blinding of outcome assessors; low = mentioned, moderate = partially mentioned high = not mentioned
d) Same method and setting of outcome measurement for all study participants; low = fully mentioned and no large spreading of moments of outcome measurement; moderate = partially mentioned and/or large spreading of follow-up; high = not mentioned or different

5) Study confounding

a) Important confounders mentioned: body mass index, restricting comorbidities and described preoperative PA level [pre-symptomatic phase or just before surgery phase] and other possible reasons for restriction of PA participation or factors influencing return to activity; low = taken into account, moderate = partially mentioned, high = not taken into account at all
b) Information about rehabilitation protocol used provided; low = fully described, moderate = partially described, high = no description
c) Method used for missing data if > 20% loss of follow-up; low = taken into account, high = not taken into account at all

6) Analysis and reporting

a) Clear presentation of analysis and significance of primary outcomes; low = fully mentioned, moderate = partially mentioned, high = not mentioned
b) Authors reported use of one or more methods to reduce bias [standardisation, matching, adjustment in multivariate model, stratification, propensity scoring], assessed dose–response in some way [subgroup, regression] or justified sample size; low = fully mentioned, moderate = partially mentioned, high = not mentioned
c) Reporting of all results, no selective reporting; low = no selective reporting, moderate = probably selective reporting, high = clearly selective reporting

*Quality in Prognosis Studies (QUIPS) tool (158)

Appendix 3.

Table 2. Pre to post-surgical level of PA: activity rating scores [n =14]

Study	Study Population	Rehabilitation protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Confounding Factors
de Groot (173) Netherlands Level of evidence: II Single centre Follow-up: 6mo	-Non selected -36 pts [F=63.9%] -Mean age: 61.5 ± 12.8yrs -Mean BMI: 26.6 ± 4.2 -Co: NR -Dx: OA [Left=52.8%] -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR Surgical approach: Posterolateral Implant information: NR	Pts underwent routine postop rehab. They were mobilised early with full weightbearing as tolerated. All pts received PT as long as deemed necessary. In the majority of pts, PT was limited to the 1st 6wks postop.	***PASIPD** [*n of days a wk and hrs daily of participation in recreational, household, and occupational activities during the past 7 days*] ***WOMAC** [*pain & Stiffness: 0 (asymptomatic) to 96 (worst score)*]	**[1] before surgery** **Reported actual activity:** 7.7 [0.9–40.9] **Pain:** 44 [12–68] **Stiffness:** 25 [0–60]	**[1] 3mo post-surgery** **Reported actual activity:** 9.2 [0.7–81.9] [0.19] **Pain:** 74 [24–80] **Stiffness:** 60 [10–80] **[2] 6mo post-surgery** **Reported actual activity:** 15.3 [0.2–93.3] **Pain:** 76 [36–80] **Stiffness:** 60 [0–80]	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Pain & stiffness

Fowble et al (177) **USA** **Level of evidence: II** **Single centre** **Follow-up: min of 2yrs**	-Non selected -35 pts [F=59%] -Mean age: 55yrs [rg 27-75] -Mean BMI: 31.3 kg/m^2 -Co: 50% [Charnley Class B]; 61% [ASA Class II] -Dx: OA [n=40; 91%] -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR Surgical approach: Posterolateral Implant information: Cementless	Postop PT protocol was followed, with activity as tolerated. No pt was advised to restrict his or her postop activity.	***UCLA score** [*activity rating score: sedentary (1–2), mildly active (3–4), moderately active (5–7), and highly active (8–10)]* ***HHS** *[Pain and function of the hip during daily activities; <70 = poor; 70–80 = fair, 80–90 = good, and 90–100 = excellent*]	**[1] Preop** **UCLA score:** 3.6 ± 1.4 [2-7] **Pain** **-Marked:** n=23 [58%] **-Moderate:** n=17 [42%]	**[1] A min of 2yrs postop** **UCLA score:** 5.9 ± 1.7 [3-10] **Pain** **-None:** n=32 [80%] **-Slight:** n=6 [15%] **-Moderate:** n=2 [5%]	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Pain [2]Dislocation
Kuhn et al (160) **USA** **Level of evidence: II** **Single centre** **Follow-up: 1yr**	-Selected, pts 50yrs or less -37 pts [F=25 (68%)] -Mean age [avr age at time of enrolment]: 42.1 ± 7.2yrs [rg, 17.8-50.3] -Mean BMI: 29 ± 5.58 kg/m^2 [20.1 ± 44.3 kg/m^2]	All pts were encouraged to weight bear as tolerated immediately following surgery per routine protocol. After the initial post-op period, pts were encouraged to be	***UCLA score** [*activity score: wholly inactive or dependent (level1) to regular participation in impact sports such as jooging/tennis (level 10)*]	**[1] Preop** **Mean UCLA activity score:** 6.0 ± 2.2 [3.0-10.0] **Mean MHHS score:** 52.4 ± 10.3 [29.7-73.7] **Mean BMI:** 29 ± 5.58 kg/m^2 [20.1 ± 44.3 kg/m^2]	**[1] 1-yr postop** **Mean UCLA activity score:** 7.2 ± 1.6 [4.0-10.0] **Mean MHHS score:** 90.2 ± 11.6 [63-100]	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]BMI [2]Pain and function

	-Co: Knee OA [n=1]; mild OA [n=1]; mild knee pain that did not limit function [n=5] -Dx: OA [n=32 pts] -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR Surgical approach: NR Implant information: NR	active by participating in low-impact activities such as swimming, walking, elliptical and cycling. Running was discouraged by the treating surgeon.	***MHHS** [*Pain and function of the hip during daily activities; <70 = poor; 70–80 = fair, 80–90 = good, and 90–100 = excellent*]		**Mean BMI:** 29.3 ± 5.7 kg/m^2 [20.4 ± 45.5 kg/m^2]	
Harding et al (172) **Australia** **Level of evidence: II** **Single centre** **Follow-up: 6mo**	-Non selected -19 pts [M=NR; F=NR] -Mean age: 69 ± 8.4yrs -Mean BMI: NR -Co [TJR]: Cardiovascular n=27 [61%]; Musculoskeletal n=14 [32%]; Diabetes n=9 [21%]; Respiratory n=5 [11%] -Dx: OA [100%]	Weight bearing as tolerated and standardised routine postop care that includes daily PT. This included the PT assisting pts to mobilise with a gait aid on Day 1 postop and providing them with a bed exercise program. N=35 of the 57 [61%] pts [TJR]	***UCLA score** [*activity level: 1=wholly inactive, sedentary to 10=regular participation in impact sports*] ***NPRS** [*Pain during activity: 0=no pain to 10=worst possible pain*] ***OHS** [*Pain and physical function of*	**[1] Preop** **UCLA Score:** 3 ± 1 **NPRS Activity:** 8 ± 5 **OHS:** 11 ± 11	**[1] 6-mo postop** **UCLA Score:** 4 ± 3 **NPRS Activity:** 2 ± 5 **OHS:** 35 ± 17	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Pain scores [2]Self-perceived change in PA

	-Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR Surgical approach: NR Implant information: Cemented and Uncemented.	were discharged home with ongoing outpatient PT provided by community services. The remaining pts were discharged to inpatient rehab centres local to where the pt lived, the details of the rehab programs they received are unknown.	*the hip during daily activities; 0-19 indicating severe arthritis and 40-48 satisfactory joint function*] ***GRC score** [*Postop self-perceived change in PA: 7-point Likert scale rg from very much worse to very much better*]			
Innmann et al (189) Germany Level of evidence: IV Single centre Follow-up: mean of 11yrs [rg 10-12yrs]	-Non selected -86 pts [M=53; F=33] -Mean age [at surgery]: 52yrs [21-60] -Mean age [at follow-up]: 63yrs [40-72] -Mean BMI [at surgery]: 27 kg/m^2 [18–39 kg/m^2] -Co: NR -Dx: OA=57 hips [5 Bil] -Indication for surgery: NR -Motivation for undergoing surgery: NR	**NR**	***UCLA score** [*activity level; Return to intense PA was defined as a postop UCLA score of 7 or more points]*	**[1] Before the onset of restricting symptoms** **UCLA Score:** 3.8 ± 1.6 points	**[1] A mean of 10yrs postop** **UCLA Score:** 6.2 ± 1.5 points **-Return to intense PA [UCLA score ≥ 7]:** n=35 [41%]	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** Revision/implant loosening

	-Mean delay between the onset of symptoms and THR: NR Surgical approach: Transgluteal Bauer [80 hips]; Modified Watson-Jones [6 hips] Implant information: Cementless					
Keeney et al (169) **USA** **Level of evidence: III** **Single centre** **Follow-up: min of 1yr [rg, 12–160mo].**	-Selected, Y [≤50yrs] vs O [65-75yrs]; M vs W -1338 pts [Y=822; O=516] -Y pts [M=51.1%; W=48.9%] -O pts [M=40.3%; W=59.7%] -Mean age: O=69.4yrs; M [69.1 ± 3.0]; W [69.6 ± 3.1]/Y=39yrs; M [40.2 ± 9.3]; W [37.7 ± 10.6] -Mean BMI: O [29.0 ± 5.5 kg/m²]; Y [29.1 ± 6.8 kg/m²] -Co: NR -Dx: OA [O=90.3%; 6% Bil; Rt side=54.3%]; [Y=62.9%; 14% Bil; Rt side=50.8%];	**NR**	***UCLA score** [*changes in activity level; subclassified into different levels: sedentary (1–2), mildly active (3–4), moderately active (5–7), and highly active (8–10)*]	**[1] 6mo Preop** **'Y' pts:** 4.5 ± 2.4 **-M [with OA]:** 5.4 ± 2.6 **-Pts with other dx:** 4.0 ± 2.2 **'O' pts:** 3.8 ± 2.0 **All M:** 4.7 ± 2.5 **All W:** 3.8 ± 1.9 **-'Y' pts:** 4.2 ± 2.1 **-'O' pts:** 3.8 ± 1.7 **% of pts who were moderately or highly active:** **-'Y' pts:** 34% **-'O' pts:** 23%	**[1] Min of 12mo** **'Y' pts:** 6.4 ± 2.2 **-M [with OA]:** 6.5 ± 2.1 **-Pts with other dx:** 5.6 ± 2.3 **'O' pts:** 5.3 ± 1.9 **All M:** 6.3 ± 2.3 **All W:** 5.5 ± 2.0 **-'Y' pts:** 6.0 ± 2.0 **-'O' pts:** 5.0 ± 1.8 **Return to impact activities:** **-'Y' pts:** 37% **-'O' pts:** 15.5% **Return to at least moderate activity:** **-'Y' pts with OA:** 81%	**-Adjusted for in analysis:** [1]Sex [2]Age [3]Dx [4]BMI [5]UCLA levels **-Mentioned, not adjusted for:** None

	AVN [O=4.1%]; [Y=29.4%] -Indication for surgery: Pain; Advanced radiographic disease; Failure of appropriate nonoperative treatment measures -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR Surgical approach: NR Implant information: Cementless and cemented. Cemented stem was used in n=201 of 516 hips [39%] in the O pt group and in n=7 of 822 hips [0.7%] in the Y pt group [*p* <0.001].				**-'O' pts with OA:** 61% **% of pts with increased activity:** **-'Y' pts:** n=598 of 704 [85%] **-'O' pts:** n=411 of 484 [85%]	
Wu et al (180) **USA** **Level of evidence: II**	-Selected, BMI of <30 kg/m² [group A]; 30 to 35 kg/m² [group B]; and >35 to 40 kg/m² [group C]. **Total pts:** n=188 **Group A**	**NR**	***LEAS** [*self-perceived activity level from 1=bedbound to 18=daily rigorous physical activity, competitive sports*]	**[1] Preop** **Group A [<30 kg/m²]** **-Mean LEAS scores:** 8.9 **Group B [30 to 35 kg/m²]**	**[1] 6mo postop** **Group A [<30 kg/m²]** -**Mean LEAS scores:** 10.4	**-Adjusted for in analysis:** [1]BMI **-Mentioned, not adjusted for:** [1]Revision

Multicentre: 11 Institutions **Follow-up: 5yrs**	-115 pts [M=32; W=83] -Mean age: 70yrs [48-88] -Mean BMI: 25.8 kg/m² [19.8–29.9 kg/m²] -Dx: OA=118 hips [3 Bil; 112 Uni] **Group B** -52 pts [M=22; W=30] -Mean age: 70yrs [47-85] -Mean BMI: 32 kg/m² [30.1–35 kg/m²] -Dx: OA=55 hips [3 Bil; 49 Uni] **Group C** -21 pts [M=7; W=14] -Mean age: 64yrs [47-80] -Mean BMI: 37.1 kg/m² [35.2–38.9 kg/m²] -Dx: OA=21 hips [0 Bil; 21 Uni] -Co: NR -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of			-**Mean LEAS scores:** 7.9 **Group C [>35 to 40 kg/m²]** -**Mean LEAS scores:** 8.5	**Group B [30 to 35 kg/m²]** -**Mean LEAS scores:** 10.3 **Group C [>35 to 40 kg/m²]** -**Mean LEAS scores:** 10.1 **[2] 1, 2, 3 & 5yr postop:** Mentioned, data not provided	

	symptoms and THR: NR Surgical approach: NR Implant information: Cementless prosthesis.					
Hara et al (184) **Japan** **Level of evidence: III** **Single centre** **Follow-up: 68.2mo [rg, 12-199]**	-Non selected -524pts [M=84; W=440] -Mean age [at time of surgery]: 62.9±10.1yrs [rg, 22-86] -Mean BMI: 22.9±3.3 kg/m² [rg, 15.2-41.2] -Co: NR -Dx: OA=88pts; Acetabular Dysplasia=366pts; Osteonecrosis of the femoral head=56hips; RA=14hips -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR	Full weight-bearing as tolerated with crutches or a walker for a period of 3-4 wks postop were allowed. Pts were advised to progress without ambulatory aids when pain free and without a limp.	***UCLA score** [*PA levels before and after THA*]	**[1] Preop** **Mean UCLA score:** 3.8 ± 2.1 **-Pts who participated sports:** 4.3 ± 2.3 **-Pts who did not participate in sports:** 3.5 ± 2.0	**[1] A min of 68.2mo postop** **Mean UCLA score:** 4.6 ± 1.7 **-Pts who participated in sports:** 5.7 ± 1.8 **-Pts who did not participate in sports postop:** 4.1 ± 1.5	**-Adjusted for in analysis:** Factors positively associated with postop UCLA score [Multiple linear regression analysis] [1]Age at time of surgery [2]Sex [3]BMI [4]Cause of THA [5]Prior hip osteotomy [6]Preop participation in sports [7]Sex **-Mentioned, not adjusted for:** None

	Surgical approach: Posterolateral approach, poly liner. Implant information: Cementless stems.					
Pritchett (165) USA Level of evidence: IV Single centre Follow-up: 2yrs	-Selected, pts with tripolar prosthesis -160pts [M=76; W=84] -Mean age [M]: 45yrs [rg, 23-71] -Mean age [W]: 42yrs [rg, 19-76] -BMI: ≥40kg/m^2 [excluded] -Co: NR -Dx: OA=76pts; Severe dysplasia=29pts; Osteonecrosis=19pts; PTA=27pts; IA=9pts -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: Superior approach, using highly crosslinked poly with	**NR**	***UCLA score** [*activity score*] ***Self-rated:** *-Satisfaction with hip replacement* *-Pain relief* *-Time and extent of ultimate recovery*	**[1]Preop** **UCLA score:** 4 [2-7]	**[1] 2yrs postop** **UCLA score:** 8.8 [6-10] -80% pts had a score of ≥8.	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Pain relief [2]Satisfaction [3]Complications [4]Discharge time [5]Time to full recovery [6]Satisfaction

	acetabular component -Implant information: Cementless tripolar prosthesis.					
Smith et al (171) **USA** **Level of Evidence: II** **Multicentre: Database consisting of 4 sites** **Follow-up: 24mo**	-Non selected -105pts [M=45/42.9%; W=60/57.1%] -Mean age: 68.2±9.3yrs -BMI: 28.8±4.2 kg/m² -Co: Diabetes [n=6/5.7%] -Dx: OA [100% + uni] -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: NR -Implant information: NR	**NR**	***PASE:** *[*Changes in PA: 12 questions assessing a breath of PA pursuits including sports and exercise recalled during a 7d period for people aged 65+]*	**[1]Preop** **Mean PASE score:** 136 **CES-D sore:** 8.95 ± 8.64	**[1]12mo postop** **Mean PASE score:** 135 **[2]24mo postop** **Mean PASE score:** 132	**-Adjusted for in analysis:** Explanatory variables for PA change [1]Age [2]Depression [3]Gender [4]BMI [5]Low back or neck pain **-Mentioned, not adjusted for:** [1]PASE subsection [pre to 12 and 24mo postop] timepoint variation
Batailler et al (181) **France**	-Selected, 1 stage Bil vs Uni THA -96pts [Bil: n=32; M=21 (65.6%); Uni:	Accelerated postop recovery protocol: mobilisation on	***UCLA score** [*activity levels*]	**[1]Preop** **UCLA score** **-Bil group:** 6.1 ± 1.7 [min=3; max=9]	**[1]A min of 20mo postop** **UCLA score**	**-Adjusted for in analysis:** None

Level of Evidence: III **Single centre** **Follow-up: 20.9 ± 10.8mo [Bil]; 28.9 ± 15mo [Uni]**	n=64; M=41 (65.6%)] -Mean age: Bil=60.7±9.8yrs [34; 74]; Uni =61.8±10yrs [38; 79] -BMI: Bil=26±4.1 kg/m²; Uni=25.9±4 kg/m² -Co: ASA [Bil=1.6±0.6 (1; 3); Uni=1.8±0.7 (1; 3)] -Dx: NR -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: DAA -Implant information: Cementless	the day of surgery, early discharge at 1 or 2d postop after therapeutic education, optimised pain and treatment.		**-Uni group:** 5.7 ± 1.9 [min=3; max=9]	**-Bil group:** 5.6 ± 1.6 [3-9] **-Uni group:** 4.9 ± 2.2 [2-9]	**-Mentioned, not adjusted for:** None
Donner et al (164) **Germany** **Level of Evidence: II** **Single centre**	-Selected, 1 Stage Bil Short-stem THA -51pts [M=29 (56.9%); W=22 (43.1%)] -Mean age [at time of incl]: 63.1yrs [rg, 36.7- 76.8]	Full weightbearing using 2 crutches was allowed immediately after surgery. Recommendations for sports activity levels met the consensus	***UCLA score** [*activity levels: 10=highest and 1=lowest*] ***HHS** *[pain and function of the hip during daily activities; <70 =*	**[1]Preop** **UCLA score:** 3.8 ± 2.0 [1.5-10.0] **HHS:** 44.2 ± 15.2 [rg, 7.0-70.0]	**[1]Mean of 5.2yrs postop** **UCLA score:** 4.7 ± 1.7 [2.0-10.0] **HHS:** 97.8 ± 5.3 [65.0-100.0]	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Satisfaction [2]Pain [3]Complications

Follow-up: 5.2yrs [rg, 4.8-6.3]	-BMI: 27.6 kg/m² [rg, 19.6-41.8] -Co: NR -Dx: NR -Indication for surgery: bil primary OA in 96.1% [n=49]; bil femoral head necrosis in 3.9% [n=2]. -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: Anterolateral approach -Implant information: Cementless short-stem	guidelines based on a survey of the Hip Society and the AAHKS [Klein et al 2007].	*poor; 70–80 = fair, 80–90 = good, and 90–100 = excellent*]			
Guler et al (182) Turkey Level of Evidence: II Single centre Follow-up: 6mo	-Non selected -50pts [M=14 (28%); W=36 (72%)] -Mean age: 57.1±13.0yrs [31-75] -BMI: 29.2±5.2 kg/m² [over-weight: n=22 (42%); obese: n=14 (28%); normal n=11 (22%) -Co: None [n=19; 38%]; Gastritis [n=9;	Postop pain was managed by tramadol and paracetamol as analgesics. However, in the late period following wound healing [after 3 wks], pts were allowed to take diclofenac 150	***IPAQ-SF** [*daily and wkly levels of PA i.e. 7 questions evaluating time spent in sitting, walking, and moderate-to-severe activities in the past 7d; <600 MET-min/wk = low, 600 to 3,000 MET-*	**[1]Before surgery** **Mean IPAQ-SF score [MET-min/wk]:** 953.2 ± 139.0 **The rate of pts in the PA categories according to the IPAQ-SF:** **-Low PA:** 34% **-Moderate PA:** 62% **-High PA:** 4%	**[1]6 wks after surgery** **Mean IPAQ-SF score [MET-min/wk]:** 2,125.6 ± 165.6 **The % of pts in the PA categories according to the IPAQ-SF:** **-Low PA:** 8%	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Pain

	18%]; Hypertension [n=8; 16%] -Dx: Pri hip OA -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: Anterolateral -Implant information: Uncemented	mg/day or its equivalent dose of NSAIDs. A postop Rehab program of weight-bearing exercises was performed by all pts.	*min/wk=moderate PA, >3,000 MET-min/wk=high PA*] ***NRS** [*Pain severity; 0=no pain and 10=severe pain*]	**Mean NRS score:** 7.7 ± 0.3	**-Moderate PA:** 66% **-High PA:** 26% **Mean NRS score:** 2.8 ± 0.3 **[2]6mo after surgery** **Mean IPAQ-SF score [MET-min/wk]:** 2,870.8 ± 229.7 **The rate of pts in the PA categories according to the IPAQ-SF:** **-Low PA:** - **-Moderate PA:** 50% **-High PA:** 50% **Mean NRS score:** 0.8 ± 0.2	
Jassim et al (162) **UK** **Level of Evidence: III** **Single centre** **Follow-up: Mean 2yrs**	-Non selected -40pts [M=19; W=21] -Mean age: 53.1±8.4yrs [rg, 33-64] -BMI: NR -Co: ASA >II excluded -Dx: NR	**NR**	***UCLA score** [*activity levels*]	**[1]Time just prior to op** **Mean UCLA score:** 7.78 ± 1.2 [6-10]	**[1] Mean 2yrs post-THR** **Mean UCLA score:** 7.93 ± 1.2 [6-10]	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** None

	-Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: NR -Implant information: NR					

Levels of evidence: I = randomized controlled study, II = prospective study, III = retrospective [comparative] study, IV = retrospective case series

AAHKS **American Association of Hip and Knee Arthroplasty Surgeons;** ***ASA*** **American Society of Anaesthesiologists;** ***ADL*** **activities of daily living;** ***AVN*** **Avascular necrosis;** ***avr average; approx*** **approximate;** ***bil*** **bilateral;** ***BMI*** **body mass index;** ***CES-D*** **Centre for Epidemiological Studies Depression Scale;** ***Co*** **co-morbidities;** ***Dx*** **Diagnosis;** ***DDH*** **developmental dysplasia of the hip;** ***DDA*** **Direct Anterior Approach;** ***DJD*** **degenerative joint disease;** ***d*** **day(s);** ***F*** **female;** ***GRC*** **global rating of change score;** ***HA*** **hydroxyapatite;** ***HRA*** **Hip Resurfacing Arthroplasty;** ***HHS*** **Harris Hip Score;** ***HOOS*** **Hip Osteoarthritis Outcome Score;** ***HAAS*** **High-Activity Arthroplasty Score;** ***h*** **hour(s);** ***IPAQ-SF*** **International Physical Activity Questionnaire Short Form;** ***QoL*** **Quality of life;** ***IA*** **Inflammatory arthritis;** ***Inc*** **Inclusion;** ***LEAS*** **Lower Extremity Activity Scale;** ***Lt*** **left;** ***meds*** **medication;** ***MET*** **Metabolic Equivalent of Task;** ***MOM*** **metal on metal;** ***MHHS*** **Modified Harris Hip Score;** ***M*** **male (men);** ***mo*** **months;** ***min*** **minimum;** ***n*** **number;** ***NS*** **not significant;** ***NRS*** **Numeric Rating Scale;** ***NPRS*** **numerical pain rating scale;** ***NR*** **not reported;** ***op*** **Operation;** ***OA*** **osteoarthritis;** ***O*** **older;** ***OHS*** **Oxford Hip Score;** ***Pri*** **primary;** ***Poly*** **polyethylene;** ***PTA*** **posttraumatic arthritis;** ***PA*** **physical activity;** ***Pt*** **patient/participant;** ***Postop*** **postoperative;** ***Preop*** **pre preoperative;** ***PT*** **physiotherapy/physiotherapist;** ***PASE*** **Physical Activity Scale for the Elderly;** ***PASIPD*** **Physical Activity Scale for Individuals with Physical Disabilities;** ***QOL*** **quality of life;** ***rg*** **range;** ***ROM*** **range of movement;** ***RA*** **rheumatoid arthritis;** ***Rehab*** **rehabilitation;** ***Rt*** **right;** ***RTS*** **return to sports;** ***RTA*** **return to activity;** ***SCSAAQ*** **Schulthess Clinic sports and activity questionnaire;** ***SAQ*** **sport activity questionnaire;** ***Sec*** **secondary;** ***TJR*** **total joint replacement;** ***THA*** **total hip arthroplasty;** ***THR*** **total hip replacement;** ***TKR*** **total knee replacement;** ***Uni*** **Unilateral;** ***UCLA*** **University of California Los Angeles activity score;** ***UKR*** **unicompartmental knee replacement;** ***VAS*** **Visual Analog Scale;** ***wk(s)*** **week(s);** ***WOMAC*** **Western Ontario and McMaster Universities Osteoarthritis Index;** ***W*** **women;** ***Y*** **younger;** ***yr(s)*** **year(s);** ***%*** **percentage/proportion.**

Appendix 4.

Table 3. PA participation pre to post-surgery [n =23]

Study	Study population	Rehabilitation Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors
Visuri & Honkanen (183) Finland Level of evidence: IV Single centre Follow-up: Mean of 4.2yrs	-Non selected -539 pts [M=166; W=373] -Mean age: 63.8yrs [87% over 54yrs] -Mean BMI: NR -Co: NR -Dx: OA [75%; uni: n=376; bil: n=112] -Indication for surgery: NR -Motivation for undergoing surgery: NR -Time between the onset of symptoms and THR: NR Surgical approach: NR Implant information: McKee-Farrar, Brunswik	Pre and postop in-pt exercise programs were used to strengthen the different muscle groups, especially the abductor muscles of the hip. -Pre-op, the pts were taught to use forearm crutches to facilitate postop mobilisation. -Postop, they were mobilised on the 1st day that full weight bearing on the operated hip was allowed. Pts were also taught a home exercise program, were advised to	***SAQ** *[regular i.e. daily walking or weekly recreational exercise forms 'before- and after THR' + % of participation]*	**[1] Preop exercise form [n/%]** -4 [0/0] -3 [0/0] -2 [16/3] -1 [84/16] -0 [439/81] **Participation in regular exercise [%]** **Walking** [2]**;** **Cycling** [7]**;** **Swimming** [13]**;** **Skiing** [0] **Relation of age and sex to forms of exercise:** ***25 to 64yrs [%]*** **Walking** M [0]; W [3] **Cycling** M [4]; W [12] **Swimming** M [19]; W [16] **Skiing** M [0]; W [0]	**[1] Postop exercise form [n/%]** -4 [18/3] -3 [52/10] -2 [130/24] -1 [166/31] -0 [173/32] **Participation in regular exercise [%]** **Walking** [55]**;** **Cycling** [29]**;** **Swimming** [30]**;** **Skiing** [9] **Relation of age and sex to forms of exercise:** ***25 to 64yrs[%]*** **Walking** M [57]; W [54] **Cycling** M [46]; W [34] **Swimming** M [42]; W [37] **Skiing** M [22]; W [3]	**NR**	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Relation of age and sex to forms of exercise [2]Other diseases restricting mobility [3]Bil vs uni op [4]Comparison of prosthesis types.

		continue it at home and given a written copy of the program.		***65 to 84yrs [%]*** **Walking** M [0]; W [5] **Cycling** M [8]; W [3] **Swimming** M [15]; W [7] **Skiing** M [0]; W [0]	***65 to 84yrs [%]*** **Walking** M [58]; W [52] **Cycling** M [35]; W [16] **Swimming** M [33]; W [17] **Skiing** M [9]; W [8]		
Dubs et al (159) Switzerland Level of evidence: IV Single centre Follow-up: Mean of 5.8yrs	-Selected, 'Y M pts' -101 pts -Mean age [avr age at time of op]: 55.4yrs -Mean BMI: NR -Co: NR -Dx: Coxitis [bil: n=42] -Indication for surgery: NR -Motivation for undergoing surgery: NR -Time between the onset of symptoms and THR: NR Surgical approach: NR Implant information: Cemented	**NR**	***SAQ** *[type and frequency of sport practised 'prior to and after op']*	**[1] Prior to the op** **-Type of sport and the frequency it was practised** **Hiking Climbing** [n=44] **Skiing** [n=43] **Swimming** [n=28] **Running** [n=17] **Ball sport** [n=16] **Cycling** [n=14] **Tennis** [n=9] **Riding** [n=9] **Light athletics** [n=6] **Wrestling** [n=2] **Rowing** [n=2] **Sailing** [n=1] **Boxing** [n=1] **Canoeing** [n=1] **-% of the pts actively engaged in an avr of 2 kinds of sport:** 78.2% [n=86]	**[1] After the op** **-Type of sport and the frequency it was practised** **Hiking Climbing** [n=41] **Skiing** [n=4] **Swimming** [n=35] **Running** [n=17] **Ball sport** [n=0] **Cycling** [n=10] **Tennis** [n=4] **Riding** [n=1] **Light athletics** [n=0] **Wrestling** [n=0] **Rowing** [n=0] **Sailing** [n=3] **Boxing** [n=0] **Canoeing** [n=1] **-% of the pts actively engaged in an avr of 2 kinds of sport:** 55.4% [n=61]	**NR**	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1] Relationship between sporting activity before and after op [2]Prosthetic replacement rate.

Mont et al (188) **USA** **Level of evidence: IV** **Multi centre: 3 Tennis Associations** **Follow-up: Mean of 8yrs**	-Selected, Competitive Tennis players -58 pts [M=50; F=8] -Mean age [at time of op]: 62yrs [rg 42–77] -Mean BMI: NR -Co: NR -Dx: NR -Indication for surgery: NR -Motivation for undergoing surgery: [1] n=12 [21%] to be able to continue playing tennis [2] n=21 [36%] to continue playing tennis and relief from pain [3] n=25 [43%] to continue playing tennis and achieve better motion -Time between the onset of symptoms and THR: NR Surgical approach: NR Implant information: 29% [cemented]; 64%	**NR**	***Tennis specific questionnaire** [*singles and doubles tennis play frequency per week + National Tennis Player Rating level*]	**[1] Before the onset of symptom National Tennis Player Rating level:** an avr of 4.25 **Singles and doubles tennis play:** approx. 3 times per wk [mean of 2.83] **Pain while playing:** 52% [n=30 pts] **Stiffness while playing:** 28% [n=16 pts] **Pain and stiffness while playing:** 21% [12 pts]	**[1] 1yr postop National Tennis Player Rating level:** an avr of 4.12 **Singles and doubles tennis play:** approx. 3 times per wk [mean of 2.83] **Pain while playing:** 10% [n=6 pts] **Stiffness while playing:** 19% [n=11 pts] **Pain and stiffness while playing:** 3% [2 pts] **[2] 8yrs postop Pain while playing:** 3% [n=2 pts] **Stiffness while playing:** 12% [n=7 pts] **Pain and stiffness while playing:** 0% [0 pt.]	**Time of return to competitive play:** mean of 6.7 months [1-12]	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Postop surgeon advice [2]Revision [3]Pain or stiffness, or both, during tennis play after op [4]Tennis mobility parameter scores [pain, stiffness and court speed] before and after op.

	[uncemented]; 7% [hybrid]						
Chatterji et al (186) Australia Level of evidence: IV Single centre Follow-up: 1-2yrs	-Selected, M vs W -216 pts [M=110; W=125] -Mean age: 67.8yrs [±10.2] -Mean age [sex]: M=65.7yrs F=69.7yrs -Mean BMI: NR -Co: NR -Dx: OA [206 primary; 19 Bil; 58.7% & 41.3% Rt side/Lt side respectively] -Indication for surgery: NR -Motivation for undergoing surgery: NR -Time between the onset of symptoms and THR: NR Surgical approach: NR Implant information: Cemented, uncemented and hybrid	Postop in-hospital PT-directed rehab carried out until discharge. As instructed prior to discharge, pts performed their own rehab on discharge as there was no out-pt PT provided.	***SAQ** [*frequency of participation in a series of 21 different sporting activities*] ***VAS** [*pt. perceived effect THA had on sporting activity*] ***Grimby score [Postop level of activity 1-6]** *1=Hardly any physical activity; 2=Mostly sit, occasional walk or gardening; 3=Light exercise; 4=Moderate exercise: <2 h per week; 5= Moderate exercise: at least 3 h per week; 6= Regular hard exercise*	**[1] The yr prior to op** **Pts who actually undertook a sport [derived sport score]:** 2.31 **M vs W sports score:** 2.06 vs 1.7 Pts participating in **Golf** [n=39] **Tennis** [n=14] **Jogging** [n=7] **Aqua aerobics** [n=17] **Exercise walking** [n=145]	**[1] 1- 2yrs postop** **Pts who actually undertook a sport [derived sport score]:** 1.97 **M vs W sports score:** 2.0 vs 1.4 **Decrease: Golf** [n=26] **Tennis** [n=1] **Jogging** [n=1] **Increase: Aqua aerobics** [n=32] **Exercise walking** [n=169] **Patient-perceived effect of THA on sporting function: M** [3.4 ± 2.8]; **W** [4.1 ± 3.3] **Grimby's score [avr level of PA]:** 3.46 ± 1.21	**-Time to return to specific sporting activity and frequency of participation** **Exercise walking** [n=113]: mean of 10.1wks [1-52] **Swimming** [n=28]: mean of 7.8wks [2.5-26] **Golfing** [n=21]: mean of 21.7wks [6-76] **Aqua Aerobics** [n=19]: mean of	**-Adjusted for in analysis:** Sex **-Mentioned, not adjusted for:** Beneficial effect of THA on the performance of sporting activities i.e. perception.

						9.2wks [3-24]	
Huch et al (166) Germany Level of evidence: II Multi centre: 4 centres Follow-up: 5yrs	-Selected, M vs W -420 pts [M=199/47.4%; F=221/52.6%] -Mean age: 63yrs -Mean BMI: overweight or obese=70% [25 - ≥30] -Co: hypertensive [over 45.2%] -Dx: OA [Uni=17.9% Bil=82.1%] -Indication for surgery: Painful OA of a hip -Motivation for undergoing surgery: NR -Time between the onset of symptoms and THR: NR Surgical approach: NR Implant information: NR	**NR**	***SAQ** [*frequency of participation in sports activities for 1 or more hrs a wk*] ***Pre-set pts explanations for reduction of their sporting activities:*** -Pain in the replaced joint -Pain in other regions -Precaution -To go easy on the artificial joint -Others [including free text comment—e.g., owing to age, impossible to perform, heart failure, instability of the joint, vertebral pain].	**[1] Sports performed during life** **Proportion [%] of pts performing sports activities for more than 2hrs a wk: M** [79%] vs **W** [64%] **% of pts performing sports:** 97% **'Most important' lifetime sports activities [% of pts performing sports activities at different intensities]: Biking** [59%] **Hiking** [53%] **Swimming** [46%] **'Least important' lifetime sports activities: Jogging** [18%] **Tennis** [12%] **Dancing** [6%]	**[1] 5yrs after op** **% of pts performing sports activities for more than 2hrs a wk [M vs W]:** M [38%] vs [23%] **% of pts performing sports:** 52% **Biking** [54%] **Hiking** [48%] **Swimming** [44%] **Jogging** [7%] **Tennis** [4%] **Dancing** [5%] **% of pts performing sports activities for more than 2hrs a wk:** 14%	**NR**	**-Adjusted for in analysis:** Factors at baseline associated with participation in sports activities for 1 or more hrs a wk 5yrs after TJR [Multivariable analysis] [1]Sex [2]Age [3]Preop sport activities levels [4]Heavy physical work [5]Smoking [6]Replaced joint **-Mentioned, not adjusted for:** [1]Main reasons for the reduction of sports activities 5yrs after THR.

				[2]Sports perused until op **% of pts performing sports activities for more than 2hrs a wk:** 8% **% of pts performing sports:** 36% **Biking** [11%] **Hiking** [2%] **Swimming** [9%] **Jogging** [0%] **Tennis** [1%] **Dancing** [0%]			
Liem et al (179) **Germany** **Level of evidence: IV** **Multicentre: Golf clubs** **Follow-up: avr of 58.8mo**	-Selected, Golfers; M vs F -46 pts [M=31/73.2%; F=15/26.8%] -Mean age: 66.5yrs [46-79] -Mean BMI: NR -Co: NR -Dx: OA [Uni=30 Bil=16] -Indication for surgery: NR -Motivation for undergoing surgery: NR	37pts [80.4%] were transferred from the hospital to a rehab institution where they stayed an avr of 19.2d. PT for an average of 7.2 wks.	***SAQ** [*n of times patients played golf during a week*]	**[1] Preop golfing activity** **N of times pts played golf during a wk:** Mean of 2.8 times [0-6] per wk **N of golfers [significantly active] playing golf 4.8 times per wk:** n=5 **Golfing performance** **Handicap:** 27.3 +/- 11.4	**[1] Postop [avr of 58.8mo] golfing activity** **N of times pts played golf during a wk:** Mean of 2.8 times [0.5-5] per wk **Reduction in activity level [Played less]:** n=5 golfers played golf 2.9 times per wk **Golfing performance**	**Time to return to golf:** mean of 3.8mo [1-18] **Time until full round:** mean of 5.2mo [1-18] **Time until full round [by sex]:** **F=**4.5mo **M=**3.5mo	**-Adjusted for in analysis:** [1]Pre and postop golfing performance by sex **-Mentioned, not adjusted for:** [1]Satisfaction [2]Complications [3]Rehab [4]Affected side [5]Evaluation of the time pts returned to golfing [6]Postop pain [7]Reasons for reduction in activity level amongst the 5

	-Time between the onset of symptoms and THR: NR Surgical approach: NR Implant information: NR			**-M** [25.1] vs **F** [33.9] **Driving distance:** 169.8 meters **-M** [174.7] vs **F** [154.5]	**Handicap:** 24.5 +/- 9.7 **-M** [22.2] vs **F** [31.4] **Driving distance:** 176.6 **-M** [181.2] vs **F** [154.0]		significantly more pre-THR active golfers [8]Hospital stay
Arbuthnot et al (170) **UK** **Level of evidence: IV** **Single centre** **Follow-up: min of 2yrs**	-Selected, Golfers -66 pts [M=NR; F=NR] -Mean age: 70.4yrs [avr age] -Mean BMI: NR -Co: NR -Dx: OA [100% Uni] -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR [Interval between being unable to continue playing golf and THR]: an avr of 8.8months Surgical approach: NR Implant information: NR	**NR**	***SAQ** [*n of rounds and frequency of participation in golfing per week*]	**[1] Pre-OA** **Mean n of rounds per wk:** 1.7 **Mean handicap scores and no.** of rounds played per wk: 15 **[2] Pre-THA** **Mean n of rounds per wk:** 0.9 **Mean handicap scores and n of rounds played per wk:** 18	**[1] 3-6mo after THA** **Mean n of rounds per wk:** 1.5 **Mean handicap scores and n of rounds played per wk:** 28 **[2] 3-5yrs after THA** **Mean n of rounds per wk:** 1.4 **Mean handicap scores and n of rounds played per wk:** 20	**Time to get back to practicing golf:** 4.1mo [0-48] **Time to get back to playing golf:** 5.4mo [0-60]	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Reason for inability to return to golf [2]Reasons for forced retirement from golfing [3]Pain/discomfort during and after play [4]Pre and postop golf performance

Wylde et al (174) **UK** **Level of evidence: III** **Single centre** **Follow-up: 1-3yrs**	-Non selected -911 pts [M=37%; F=63%] -Mean age: 68.2yrs [15-94] -Mean BMI: NR -Co: NR -Dx: NR -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR Surgical approach: NR Implant information: NR	**NR**	***SAQ** [*participation in sports*]	**[1] 3yrs before joint replacement** **N of pts active in sport:** n=318 [34.9%] **10 most common pre-TJR sporting activities [in descending order]:** **Swimming** **Walking Golf** **Cycling Bowling** **Dancing Gym** **Aerobics Skittles** **Tennis.**	**[1] 1-3yrs after op** **-N of pts unable to return to sport:** n=84 [26.4%] **Sporting activities with largest decline: Badminton** **Tennis dancing**	**NR**	**-Adjusted for in analysis:** Logistic regression of a return to sports after TJR [1]Gender [2]Age [3]Type of op **-Mentioned, not adjusted for:** [1]Reasons for inability to return to sport [2]Postop decline in participation
Delasotta et al (187) **USA** **Level of evidence: IV**	-Non selected -62 pts [M=NR; F=NR] -Mean age: 43.18yrs [rg, 25-49]	**NR**	***HAAS** [*Physician activity recommendations i.e. 'unlimited', 'occasional' and 'discouraged'*	**[1] 1-year Pre-THA activity** **-Activity participation and frequency levels:**	**[1] ≥10mo Post-THA** **-Activity participation and frequency levels:**	**NR**	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Reasons why pts

Single centre Follow-up: avr 30.6mo [rg, 10-81]	-Mean BMI: 29.46 kg/m² [Obese=41%; 31% overweight; 28% normal] -Co: NR -Dx: DJD, AVN -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR Surgical approach: NR Implant information: NR		*compared with patient-reported participation levels i.e. 'regularly', 'occasionally' and 'rarely' in 25 different athletic activities*] ***Pre-set reasons why pts stopped specific activities:** -Fear -Physician recommendation -Pain -Fatigue -No longer interested ***Satisfaction**	**"Unlimited Activities":** 54 [Regularly=19; Occasionally=21; Rarely=14] **"Occasional Activities":** 11 [Regularly=4; Occasionally=5; Rarely=2] **"Discouraged Activities":** 11 [Regularly=4; Occasionally=3; Rarely=4]	**"Unlimited Activities":** 72 [Regularly=21; Occasionally=31; Rarely=20]: increased by 33% i.e. **Golf; Doubles Tennis; Hike; on/off Road Cycle; Volleyball; Softball; Swimming; Ice Skate; Surf; Ski; Elliptical** **"Occasional Activities":** 6 [Regularly=0; Occasionally=2; Rarely=4]: decreased by 83.3% i.e. **Aerobic; Basketball; Singles Tennis; Racquetball** **"Discouraged Activities":** 2 [Regularly=1; Occasionally=1; Rarely=0]: decreased by 450% i.e. **Long-distance jog; Soccer; Squash**		stopped specific activities [2]Satisfaction with the level of activity achieved after THA

Schmidutz et al (163) Germany Level of evidence: IV Single centre Follow-up: min 2yrs [rg, 2.0-4.2]	-Selected, Gender [M vs W]; Age [≤55 and >55yrs] -68 pts [M=60%; W=40%] -30 pts ['Y' group ≤55]: 44% -38 pts ['O' group >55]: 56% -Mean age [group]: 55yrs [rg, 20-73] -Mean BMI [group]: 26 ± 4 kg/m² [rg, 18-39] -Mean BMI [M]: 27 ± 3 kg/m² [rg, 21-35] -Mean BMI [W]: 24 ± 5 kg/m² [rg, 18-39] -Mean BMI ['Y' group]: 26 ± 5 kg/m² [rg, 18-39] -Mean BMI ['O' group]: 26 ± 4 kg/m² [rg, 18-34] -Co: NR -Dx: OA [n=32]; dysplasia [n = 23], AVN [n = 17] -Indication for surgery: NR -Motivation for undergoing surgery: NR	**NR**	***SAQ** [*pre and postop participation in sporting activities; frequency; duration; time to return; missed preop sporting activity and reason for no longer participating in that activity*] ***VAS** [*Postop: Insecurity/fear and pain during sports activities; overall satisfaction; (VAS rg 1-10, 0=no pain and 10=severe pain*] ***UCLA Score** [*Postop activity levels*]	**[1] Preop** **No of pts who were still playing sports up until THR:** n=62/68 **Avr no. of sporting discipline:** 3.9 ± 2.4 **-M** [4.3 ± 2.6]**; W** [3.3 ± 2.0] **-'Y' group** [3.2 ± 2.3]**; 'O' group** [3.6 ± 2.7] **Mean wkly sports activity/session per wk:** 1.5 ± 0.9 **-'O' group** [1.4 ± 0.8]**; 'Y' group** [1.6 ± 1.1] **-M** [1.5 ± 1.0]**; W** [1.5 ± 0.9] **Mean session length:** 67 ± 35mins **-'O' group** [74 ± 29mins]**; 'Y' group** [58 ± 39mins] **-M** [69 ± 32mins]**; W** [64 ± 38mins] **Intensity of activities:** **-Low impact: Cycling** [69%]	**[1] Min 2yrs postop** **-No of pts who could return to sports after THR:** 98% **Avr no. of sporting discipline:** 3.5 ± 2.0 **-M** [3.5 ± 1.9]**; W** [3.5 ± 2.2] **-'Y' group** [3.8 ± 1.7]**; 'O' group** [4.2 ± 2.2] **-Lower no. of discipline performed:** 41% pts **-Equal or increased no. of discipline performed:** 59% **Mean wkly sports activity/session per wk:** 1.8 ± 1.1 **-'O' group** [1.7 ± 0.9]**; 'Y' group** [1.9 ± 1.3] **-M** [1.7 ± 1.1]**; W** [1.9 ± 1.2] **Mean session length [group]:** 66 ± 33mins **-'O' group** [82 ± 28mins]**; 'Y' group** [51 ± 29mins]	**-1 to 2mo postop:** 26% [n = 18] **-3 to 4mo postop:** 25% [n = 17] **-5 to 6mo or more postop:** 47% [n = 32]	**-Adjusted for in analysis:** [1]Gender [2]Age [3]Pre and postop sports frequency [4]Pre and postop sports session length [5]RTS activities [6]Subjective outcomes [postop UCLA score & VAS] **-Mentioned, not adjusted for:** [1]Hip pain during sports activities [2]Overall satisfaction [3]Reasons for restrictions in sports activities related to the THR

	-Mean delay between the onset of symptoms and THR: NR -Surgical approach: Hardinge -Implant information: Short-stem			**Hiking** [54%] **Nordic Walking** [12%] **Gymnastics** [22%] **Fitness/weight training** [22%] **Dancing** [22%] **Swimming** [57%] **Golf** [1%] **-Intermediate impact:** **Badminton** [7%] **Inline Skating** [4%] **Tennis** [15%] **Downhill Skiing** [24%] **Cross-country Skiing** [21%] **Riding** [7%] **Martial Arts** [4%] **Bowling** [10%] **Rock Climbing** [1%] **-High impact:** **Jogging** [9%] **Handball** [1%] **Volleyball** [7%] **Basketball** [4%] **Soccer** [9%] **Squash** [7%]	**-M** [66 ± 30mins]**; W** [65 ± 34mins] **Intensity of activities:** **-Low impact:** **Cycling** [69%] **Hiking** [57% (+5)] **Nordic Walking** [18% (+50)] **Gymnastics** [26% (+20)] **Fitness/weight training** [38% (+73)] **Dancing** [22%] **Swimming** [56% (-3)] **Golf** [1%] **-Intermediate impact: Badminton** [3% (-60)] **Inline Skating** [1% (-67)] **Tennis** [3% (-80)] **Downhill Skiing** [16% (-31)] **Cross-country Skiing** [15% (-29)] **Riding** [3% (-60)] **Martial arts** [1% (-67)] **Bowling** [6% (-43)] **Rock Climbing** [1%] **-High impact:** **Jogging** [3% (-67)] **Handball** [0% (-		

					100)] **Volleyball** [3% (-60)] **Basketball** [1% (-67)] **Soccer** [1% (-83)] **Squash** [0% (-100)] ***UCLA activity score [group]:** 7.6 ± 1.9 [3-10]. **-M:** 7.9 ± 1.9; **W:** 7.0 ± 1.9 ***VAS** **Hip pain during sports activities:** 1.5 ± 1.9. **-Pts reporting no or very low pain [VAS 0-3]:** 85% [n=58] **-Pts reporting intermediate pain [VAS 4-7]:** 13% [n=10] **-Pts reporting severe pain [VAS 8-10]:** 2% [n=1] **Overall satisfaction [avr score]:** 1.4 ± 2.3 **-Pts reporting being very satisfied [VAS 0-3]:** 85% [n=58] **-Pts reporting being**		

					intermediately satisfied [VAS 4-6]: 9% [n=6] **-Pts not satisfied [VAS 7-10]:** 6% [n=4] **Insecurity/fear during sports activities:** 2.6 ± 2.3		
Wylde et al (176) **UK** **Level of evidence: IV** **Single centre** **Follow-up: 1-yr**	-Non selected -56 pts [F=70%] -Mean age: 67yrs [rg, 60-74] -Mean BMI: NR -Co: NR -Dx: NR -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR Surgical approach: NR Implant information: NR	**NR**	***SAQ** [*participation in leisure activities i.e. sport/exercise, hobbies, social activities, holidays*]	**[1] Preop** **-Leisure activities pts participated in:** 209 [*avr activities per person=4 i.e. sports/exercise, hobbies, social activities and holidays*] **Difficulty and importance of performing leisure activities:** **-Rated as quite or very important:** 89% pts **[2] Before surgery** **Difficulty and importance of performing leisure activities:** **-Rated as quite or very difficult to perform because of**	**[3]1-yr after joint replacement** **Difficulty and importance of performing leisure activities:** **-Rated as quite or very difficult to perform because of joint problems:** 25% pts	**NR**	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** None

				joint problems: 82% pts			
Lefevre et al (167) France Level of evidence: IV Multi centre: French Judo Federation Follow-up: mean of 8.8 ± 7.1yrs	-Selected, Licensed judokas [with grade above black belt 6th and practising judo for more than 50yrs] -27 pts [M=NR; F=NR] -Mean age [at surgery]: 63 ± 7.2yrs -Mean age at time of study: 71.5 ± 7.7yrs -Mean BMI: NR -Co: NR -Dx: NR [Bil=9] -Indication for surgery: Pain [97.2 %] Stiffness [16.7%] Limping [64%] Instability [8.3%] Difficulties in everyday life [64%] Difficulties in sporting life [64%] Difficulties in Judo [55.5%] -Motivation for undergoing surgery: To	**NR**	***SAQ** [*participation in judo and other sports*]	**[1]Participation during life** **-N of pts with grade above black belt 6th and practising judo for more than 50yrs:** n=27 **[2]Before surgery** **-N of pts with grade above black belt 6th still practising judo:** n=27	**[1]Mean 8.8yrs after surgery** **-Return to judo:** 22/27 [81.5 %] ***Other sports practised by pts:** **Walking** [n=18; 66.7%] **Swimming** [n=12; 44.4%] **Bicycling** [n=12; 44.4%] **Skiing** [n=7; 26%] **Jogging** [n=3; 11.1%] **Tennis** [n=1; 3.7%] **Golf** [n=1; 3.7%]	**Mean no of mo pts began practising sports:** 3.9 ± 2.7mo	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Return to judo after joint replacement [2]Level of judo after surgery [3]Rate of surgical revision at the final follow-up [4]Level of pt satisfaction (very satisfied, satisfied, moderately or not satisfied) [5]Surgeons' recommendations at the time of joint replacement

	continue practising judo [n=15; 55 %] -Mean delay between the onset of symptoms and THR: 4.5 ± 3.9yrs Surgical approach: NR Implant information: NR						
Abe et al (178) Japan Level of evidence: III Multicentre: 2 Affiliated Hospitals Follow-up: mean of 4.8yrs [rg, 2.3-7.8]	-Selected, Joggers -527 pts [M=NR; F=NR] -Mean age [at time of assessment]: 62yrs [rg, 26-98] -Mean BMI: 23.2 kg/m² [rg, 14.7-34.2]. -Co: NR -Dx: OA; Chondroblastoma; Perthes disease; [Bil n=196; Uni n=412] -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR	Pts were allowed to walk with full weightbearing as tolerated on postop d 1. Most pts could walk without a cane in 1 to 3wks and returned to their usual daily activities at 1mo postop. Pts who wanted to jog were allowed to do so at 6mo postop. Pts were allowed to participate in sports activities except contact sports and martial arts (e.g. soccer, baseball, basketball, volleyball, rugby,	***SAQ** [*jogging habits; postop jogging parameters*] ***WOMAC Score** [*Postop pain and stiffness: 0 (asymptomatic) to 96 (worst score)*] ***UCLA Score** [*Postop activity levels*]	**[1]Preop** **-Habitual Jogging [THA]:** Of n=527 pts, 5 were habitual joggers	**[1] a mean of 4.8yrs postop** **-Habitual jogging [THA]:** 13 of 527 pts [2.5%] continued ***WOMAC Score [THA + HRA]:** Joggers [2.4 ± 4.0] vs Non-joggers [8.3 ± 12.0] **-Pain:** Joggers [0.3 ± 0.8] vs Non-joggers [1.2 ± 2.4]; *P* = .03 **-Stiffness:** Joggers [0.3 ± 0.6] vs Non-joggers [0.7 ± 1.3]; *P* = .08 **-Physical function:** Joggers [1.9 ± 3.6] vs Non-joggers [6.5 ± 9.7]; *P* = .02 ***UCLA Score [THA + HRA]**	**NR**	**-Adjusted for in analysis:** Factors related to postop jogging [multiple logistic regression analysis; THA + HRA] [1]Sex [2]Preop jogging **-Mentioned, not adjusted for:** [1]Reasons given for not participating in postop jogging [2] Complications i.e. implant loosening/dislocation [3] Cemented vs cementless THA [4]Pain, stiffness & physical function scores

	Surgical approach: MOM and poly Implant information: Cemented and Cementless	judo, and karate) at 6mo postop.			**-Joggers** [10 ± 0] **vs Non-joggers** [6.6 ± 2.4]		
Ollivier et al (168) France Level of evidence: IV Single centre Follow-up: mean 9.8 ± 2.9yrs [7-15]	-Non selected -571 pts [M=52%; n=297] -Mean age [at time of THR]: 61.3±10.9yrs [20-75] -Mean BMI: 27 ± 3.2 kg/m² [12-31 kg/m²] -Co: NR -Dx: OA [70.6%]**;** AVN [13.8%]**;** DDH [13.6 %]**;** other causes such as inflammatory arthritis [2%]. -Indication for surgery: Pain [84.9%]**;** Limitations in ADL [61.9%]**;** Limited ROM [42.9%]**;** Recommendation of the surgeon [30.9%]**;** Desire to return to sporting activity [23.9%].	**NR**	***SAQ** [*participation in different athletic activities according to the AAHKS and Hip Society 2007criteria; motivation for sport and satisfaction following THR*] ***HHS** *[pain and function of the hip during daily activities; <70 = poor; 70–80 = fair, 80–90 = good, and 90–100 = excellent*]	**[1] Prior to presenting with symptoms from hip** **-Sports participation:** n=571 pts **-Mean HHS:** 53.8 ± 13.7	**[1] mean 9.8yrs postop** **-Return to sporting activities:** n=366 pts **-No. of pts who did not return to sporting activities:** n=143 [69.7%] **-Mean HHS:** 97 ± 5 [p = 0.0024]	**-Mean time between THR and returning to sporting activity:** 6.6 ± 3.2mo [2-48]	**-Adjusted for in analysis:** *Predictive factors for participation in sport after THR [1]Age [2]Postop UCLA score [3]Delay in returning to sport [4]Preop HHS [5]Satisfaction **-Mentioned, not adjusted for:** [1]Reason given by pts who did not return to sporting activities [2]Participated in non-recommended activities following THR [3]Frequency of the activity [4]Sports limitations caused by the hip [5]Satisfaction

	-Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR [mean duration of hip symptoms prior to surgery]: 41mo [2-234] Surgical approach: Poly Implant information: Uncemented						
Innmann et al (189) Germany Level of evidence: IV Single centre Follow-up: mean of 11yrs [rg 10-12yrs]	-Non selected -86 pts [M=53; F=33] -Mean age [at surgery]: 52yrs [21-60] -Mean age [at follow-up]: 63yrs [40-72] -Mean BMI [at surgery]: 27 kg/m² [18–39 kg/m²] -Co: NR -Dx: OA=57 hips [5 Bil] -Indication for surgery: NR	**NR**	***SCSAAQ** [*Pre-and postop-sporting activities: n of disciplines, frequency per wk, minimum session length*] ***VAS** [*Postop pain: rg 1-10, 0=no pain and 10=severe pain]*]	**[1] Before the onset of restricting symptoms** **Pts active in at least one sports discipline:** 66/86 [77%] **Mean sports disciplines pts were participating in:** 1.8 different sport disciplines **N of sport participated by patients:** 20	**[1] A mean of 10yrs postop** **Pts active in at least one sports discipline:** 68/86 [79%] **-Pt who had ceased participating in sports:** n=7 [11%] **Return-to-activity rate:** 89% **Mean sports disciplines pts were participating in:** 1.7 different sport disciplines	**Time between implantation and return to activity:** *Less than 4wks: n=19 [22%] *1–3 mo: n=25 [29%] *3–6 mo: n=19 [22%] *more than 6 mo: n=5 [6%]	**-Adjusted for in analysis:** [1]Sex [2]Age **-Mentioned, not adjusted for:** [1]Pts reported reasons for change in sport disciplines

	-Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR Surgical approach: Transgluteal Bauer [80 hips]; Modified Watson-Jones [6 hips] Implant information: Cementless			**Mean sports frequency per wk:** 2.3 times **Duration of activities [min session length]:** 53 mins -Patients participating in **Soccer** [n=10] **Tennis** [n=14] **Swimming** [n=5] **Cycling** [n=25] **Gymnastics** [n=6] **Aqua aerobics** [n=2] **Hiking** [n=17] **Exercise walking** [n=14] **Downhill skiing** [n=7] **Cross-country skiing** [n=6] **Dancing** [n=2] **Jogging** [n=7] **Basketball/handball** [n=5] **Table tennis** [n=4] **Mountain climbing** [n=4] **Nordic walking** [n=2] **Fitness/weight lifting** [n=8]	**N of sports participated by patients:** 18 **Mean sports frequency per wk:** 2.6 times **Duration of activities [min session length]:** 55 mins **-Decrease: Soccer** [n=0] **Tennis** [n=5] **Jogging** [n=4] **Downhill skiing** [n=1] **Cross-country skiing** [n=1] **Table tennis** [n=1] **Hiking** [n=12] **Basketball/handball** [n=0] **Mountain climbing** [n=1] **-Increase: Swimming** [n=15] **Cycling** [n=36] **Gymnastics** [n=15] **Exercise walking** [n=16] **Aqua aerobics** [n=5] **Nordic walking** [n=6] **Dancing** [n=3]		

					Fitness/weightlifting [n=14] ***Mean VAS** **-Pain in the operated hip while practicing sports**=2.4 [13%] **-Limited ROM in the operated hip during exercise** [9%]		
Del Piccolo et al (161) **Italy** **Level of evidence: III** **Single centre** **Follow-up:** **Group 1=mean of 52.71mo [15-72]** **Group 2=mean of 54.11mo [15-68]**	-Selected, Short femoral cementless stem [Group 1] vs Conventional femoral cementless stem [Group 2] pts <50yrs -78pts [Group 1: n=58pt; 66 hips/Group 2: n=20pt; 24 hips] -Mean age: [Group 1= 39.46yrs (22-49); Group 2=38.68yrs (18-49)] -Mean BMI: NR -Co: NR -Dx: NR -Indication for surgery:	Pts were allowed to mobilise on the 2nd postop d and progress to full weight-bearing with crutches from the 4th wk as tolerated. They use a pair of crutches for 6wks and only 1 crutch for 2 more wks if required. All pts were able to stop using crutches in 3mo. Low-impact activities such as walking on soft surfaces, physical exercise and swimming were allowed from 6th wk postop. Pts	***SAQ** [*ability to return to activities performed prior to the onset of symptoms; Sports activity was graded as nothing, light (long-walking), medium (gym, dance, slight indoor running), intense (skiing, free running, tennis and contact sports)*]	**[1]Prior to the onset of symptoms** **Conventional cementless stem** **Practice of intensive sports activity:** 19pts [20 hips] **Short femoral cementless stem** **Practice of intensive sports activity:** 9pts	**[2]After surgery** **Conventional cementless stem [mean of 54.11mo]** **Return to intensive sports activity:** 40% **Short femoral cementless stem [mean of 52.71mo]** **Return to intensive sports activity:** 44%	**NR**	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Complications

	Osteonecrosis, OA, RA and femoral neck fracture -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR Surgical approach: Anterolateral/Anterior Implant information: Short femoral cementless stem/Conventional femoral cementless stem	were allowed to resume normal activities within their level of tolerance after 3mo.					
Hara et al (184) **Japan** **Level of evidence: III** **Single centre** **Follow-up: 68.2mo [rg, 12-199]**	-Non selected -524pts [M=84; W=440] -Mean age [at time of surgery]: 62.9±10.1yrs [rg, 22-86] -Mean BMI: 22.9±3.3 kg/m² [rg, 15.2-41.2] -Co: NR -Dx: OA=88pts; Acetabular Dysplasia=366pts;	Full weight-bearing as tolerated with crutches or a walker for a period of 3-4wks postop were allowed. Pts were advised to progress without ambulatory aids when pain free and without a limp.	***SAQ** [*before (at least once a mo) and after THA participation in sports; sports were classified according to the AAHKS*] ***OHS** [*Postop pain and function of the hip during daily activities; 0-19 indicating severe arthritis*	**[1] Preop** **N of pts who participated in sports:** n=81 [15.5%] **Pts participating in high impact sports [Jogging; Ball games]:** n=33 [6.3%]	**[1] A min of 68.2mo postop** **N of pts who participated in sports:** n=160 [30.5%] **-Those who participated preop:** n=66 [41.2%] **-Those who had not participated preop:** n=15 [4.1%] **-M sex:** n=40 [25.0%]	**NR**	**-Adjusted for in analysis:** *Factors associated with postop participation in sports [Multivariate binary logistic regression analysis] [1]Age at time of surgery [2]Sex [3]BMI [4]Cause of THA [5]Prior hip osteotomy [6]Preop

	Osteonecrosis of the femoral head=56hips; RA=14hips -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR Surgical approach: Posterolateral approach, poly liner. Implant information: Cementless stems.		*and 40-48 satisfactory joint function*]		**Pts participating in high impact sports [Jogging; Ball games]:** n=13 [2.5%] **Avr OHS:** 41.0 ± 8.5 [rg, 2-48] **-Pts who participated in sports:** 43.1 ± 6.8 **-Pts who did not participate in sports postop:** 40.1 ± 9.0		participation in sports **-Mentioned, not adjusted for:** [1]Pain score
Batailler et al (181) **France** **Level of Evidence: III** **Single centre** **Follow-up: 20.9 ± 10.8mo [Bil]; 28.9 ± 15mo [Uni]**	-Selected, 1 stage Bil vs Uni THA -96pts [Bil: n=32; M=21 (65.6%); Uni: n=64; M=41 (65.6%)] -Mean age: Bil=60.7±9.8yrs [34; 74]; Uni =61.8±10yrs [38; 79] -BMI: Bil=26±4.1 kg/m²; Uni=25.9±4 kg/m²	Accelerated postop recovery protocol: mobilisation on the day of surgery, early discharge at 1 or 2d postop after therapeutic education, optimised pain and treatment.	***SAQ** [*RTS (sport type, the impact level of sport, and the delay before RTS, reasons for no RTS or return to lower]* **Satisfaction following THA (very satisfied, satisfied, disappointed, and dissatisfied)*	**[1]Preop** **Pts who practiced sports** **Bil group:** n=32 **Uni group:** n=64	**[1]A min of 20mo postop** **Rate of RTS** **Bil group:** 87.5% (n = 28/32) **Uni group:** 57.8% (n = 37/64) **RTS at same sport** **Bil group:** 89.3% (n = 25/28) **Uni group:** 62.2% (n = 23/37) **RTS at the same intensity**	**Delay to RTS** **Bil group:** 4.2 ± 2.7mo [1-12] **Uni group:** 5.4 ± 5.1mo [1-24]	**-Adjusted for in analysis: ***Factor predicting RTS after 1 Bil THA [Univariate/Multi-variate analysis] [1]Age [2]Gender [3]ASA score [4]BMI [5]UCLA score [6]Motivation [7]Satisfaction [8]HHS **-Mentioned, not adjusted for:**

	-Co: ASA [Bil=1.6±0.6 (1; 3); Uni=1.8±0.7 (1; 3)] -Dx: NR -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: DAA -Implant information: Cementless		**Participation in different athletic activities as documented in the AAHKS survey (Klein et al 2007)*]		**Bil group:** 68% (n =17/25) **Uni group:** 56.5% (n = 13/23)		[1]Reasons to not RTS, returning to a lower intensity or returning to another sport after op [Uni vs Bil] [2]AAHKS sport recommendations and the level of motivation to participate in these sports after 1 Bil THA [3]Satisfaction [Uni vs Bil] [4]Complications [Uni vs Bil]
Donner et al (164) **Germany** **Level of Evidence: II** **Single centre** **Follow-up: 5.2yrs [rg, 4.8-6.3]**	-Selected, 1 Stage Bil Short-stem THA -51pts [M=29 (56.9%); W=22 (43.1%)] -Mean age [at time of incl]: 63.1yrs [rg, 36.7- 76.8] -BMI: 27.6 kg/m² [rg, 19.6-41.8] -Co: NR -Dx: - -Indication for surgery: bil primary OA in	Full weightbearing using 2 crutches was allowed immediately after surgery. Recommendations for sports activity levels met the consensus guidelines based on a survey of the Hip Society and the AAHKS [Klein et al 2007].	***SAQ** [*sporting behaviour, ability to RTS, pre and postop participation in sporting activities; pre and postop activity frequency (n of times per wk) and duration (given in hours)]* ***VAS** [*pain levels, and satisfaction with postop outcomes]*	**[1]Preop** **N. of pts regularly active in sports:** n= 31 [60.8%] **Mean n. of athletic disciplines pts engaged in:** 2.3 [1.0-6.0] **Types of sports and % of active pts [Most popular activities pts engaged in]:** **Cycling** [31.4%]	**[1]Mean of 5.2yrs postop** **N. of pts regularly active in sports:** n= 39 [76.5%] **Mean n. of athletic disciplines pts engaged in:** 1.8 [1.0-5.0] **Types of sports and % of active pts [Most popular activities pts engaged in]:** Most	**NR**	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Satisfaction [2]Pain [3]Complications

	96.1% [n=49]; bil femoral head necrosis in 3.9% [n=2]. -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: Anterolateral approach -Implant information: Cementless short-stem			**Hiking** [29.4%] **Swimming** [21.6%] **Fitness/weight training** [15.7%]. **Frequency and Hrs of Sports per Wk** **-N of times per wk:** 3.4hrs [3.0-10.0hrs] **Hrs of daily sports per wk:** 3.4hrs [0.0-10.0hrs] **Level of general pain [VAS score]:** 7.4 [0.8-10.0] **Pain during sports [VAS score]:** 7.1 [1.5-10.0]	pts were engaged in **Cycling** [35.3%] **Fitness/weight training** [33.3%] **Swimming** [25.5%] **Hiking** [19.6%] **Frequency and Hrs of Sports per Wk** **-N of times per wk:** 4.2hrs [3.0-14.0hrs] **Hrs of daily sports per wk:** 3.7 hrs [0.0-16.5hrs] **Level of general pain [VAS score]:** 1.3 [0.0-8.0] **Pain during sports [VAS score]:** 1.3 [0.0-7.0]		
Jassim et al (162) **UK** **Level of Evidence: III** **Single centre** **Follow-up: Mean 2yrs**	-Non selected -40pts [M=19; W=21] -Mean age: 53.1±8.4yrs [rg, 33-64] -BMI: NR -Co: ASA >II excluded -Dx: NR -Indication for surgery: NR	**NR**	***SAQ** [*participation levels in sporting activity; reasons behind a lack of participation of sports (if any)*]	**[1]Time just prior to op** **Participation in activities before TJR [n. of pts]** **Cycling** [12] **Golf** [10] **Running** [9] **Walking** [8] **Dance** [6] **Tennis** [5] **Football** [2] **Gym** [2] **Sky diving** [2] **Yoga** [2] **Judo** [1]	**[1] Mean 2yrs post-THR** **Participation in activities after TJR [n. of pts]** **Cycling** [4] **Golf** [11] **Running** [9] **Walking** [6] **Dance** [3] **Tennis** [8] **Football** [2] **Gym** [9] **Sky Diving** [0] **Yoga** [2] **Judo** [0] **Pilates**	**NR**	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** [1]Most common reasons listed for non-participation in particular activities post-THR [2]Satisfaction with op [3]Importance

	-Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: NR -Implant information: NR			**Pilates** [1] **Table Tennis** [1] **Rugby** [1] **Scuba Diving** [1] **Swimming** [1] **Triathlon** [0] **Badminton** [0]	[3] **Table Tennis** [0] **Rugby** [0] **Scuba Diving** [1] **Swimming** [1] **Triathlon** [2] **Badminton** [1] **Frequency of performing favoured activities post-THR** **-Once a wk:** 3pts **-2-3 a wk:** 17pts **-4-6 times a wk:** 18pts **-Daily:** 2pts		of been able to continue favoured activities after THR [4]Ability to perform favoured activities pre and postop
Madrid et al (185) Colombia Level of Evidence: IV Single centre Follow-up: NR	-Non selected -535pts [M=161 (30.1%); W=374 (69.9%)] -Mean age: 67±11.9yrs [rg, 13-91] -BMI: 25.5±3.9 kg/m² -Co: ASA Class II=52.72%; Class III=43.4% -Dx: Pri OA [n=402; 75.1%]; Sec OA [n=91; 17.0%]; Hip fracture [n=42; 7.9%]; 100% Uni	All pts underwent a standardised education and rehab program, which was not focused on the resumption of sports activities.	***SAQ** [*practice of sport; type; frequency; perceived level of performance; change in sport practiced; reasons for inability to return to sport activities*]	**[1] Before surgery** **Pts who practiced sports:** n=72 of 535 [13.5%] **Frequency of sports practiced by pts [n=72]** **Martial arts** [1] **Horse Riding** [2] **Polo** [1] **Squash** [1] **Weightlifting** [1] **Road Cycling** [2] **Hiking** [3] **Basketball** [4] **Swimming** [5] **Jogging** [5] **Football (Soccer)** [11] **Tennis** [16]	**[1] After surgery** **Pts who RTS:** n=30 of 72 [44.4%] **Pts who practiced sports:** n=38 **Frequency of sports practiced by pts [n=38]** **Martial arts** [0] **Horse Riding** [0] **Polo** [1] **Squash** [0] **Weightlifting** [1] **Road Cycling** [0] **Hiking** [7] **Basketball** [0] **Swimming** [6] **Jogging** [0] **Football**	**-The mean time to RTS:** 2.60 ± 1.2mo [rg 1–4]	**-Adjusted for in analysis:** *Factors influencing RTS and perceived level of performance [Multivariate analysis] [1]Gender [2]Age [3]Pre-operative diagnosis [4]BMI [5]ASA classification **-Mentioned, not adjusted for:** [1]Main reasons for no RTS

	-Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: Posterolateral -Implant information: NR			**Most frequently or commonly practiced sport: Golf** [26.4%] **Frequency of sports practiced per wk** **<5 hrs per wk:** 39% **5-10 hrs per wk:** 35% **10-20 hrs per wk:** 25% **>20 hrs per wk:** 3%	**(Soccer)** [1] **Tennis** [4] **Most frequently or commonly practiced sport: Golf** [47.3%] **Frequency of sports practiced per wk** **<5 hrs per wk:** 42% **5-10 hrs per wk:** 37% **10-20 hrs per wk:** 21% **>20 hrs per wk:** 0%		
Naylor et al (175) **Australia** **Level of Evidence: II** **Multi-centre: National cohort** **Follow-up: 3yrs**	-Non selected -571pts [THR]; [TJR: W=55%] -Mean age at time of surgery [TJR]: 67.2±9yrs -BMI at time of surgery [TJR]: 30.9±6 kg/m^2 -Co [TJR]: ASA Class II=58%; Class 3=29%; Co requiring daily meds [65%] -Dx [TJR]: OA [100%; Uni=95%] -Indication for surgery: NR	**NR**	***SAQ** [*Regular (≥ 1 time per wk) PA; frequency; Reasons for not going back to an activity or inactivity; Important pre-surgery goal; Joint-related complications; Further arthroplasty; Development of new comorbid condition*]	**[1] The year pre-surgery** **Participation in PA at least once per wk [regular]:** 50.6% **Activities undertaken: Walking** [31%] **Swimming/Aqua classes** [6%] **Cycling** [5%] **Gym exercise** [8%] **Yoga** [2%] **Tai Chi** [0] **Pilates** [2%] **Lawn Bowls** [3%] **Golf** [7%] **Singles/Double**	**[2] 3yrs post-surgery** **Participation in PA at least once per wk [regular]:** 67.3% **Activities undertaken: Walking** [49%] **Swimming/Aqua classes** [10%] **Cycling** [9%] **Gym exercise** [14%] **Yoga** [2%] **Tai Chi** [0] **Pilates** [2%] **Lawn Bowls** [3%] **Golf** [8%] **Singles/Double**	**NR**	**-Adjusted for in analysis:** *Factors associated with participation in PA at least once per wk [multivariable analysis; TJR] [1]Sex [2]Uni or Bil procedure [3]Global improvement postop [4]Pre-surgery PA involvement [5]Educational level [6]ASA score [7]Insurance status [8]Rehabilitation pathway

	-Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: NR -Implant information: NR		***OHS** [*Pain and function of the hip during daily activities; 0-19 indicating severe arthritis and 40-48 satisfactory joint function*] ***EuroQoL VAS Score** [*measures 5 domains: mobility; self-care; usual activities i.e. work, study, housework, family or leisure activities; pain/discomfort; anxiety/depression; 0 -100 indicating worst to best imaginable health state*]	**Tennis** [3%] **Squash** [0] **Running/Jogging** [3%] **OHS** **-Pts who participated in PA:** 22.8 ± 9.1 **-Pts who did not participate in PA:** 19.4 ± 8.5 **EuroQoL VAS** **-Pts who participated in PA:** 72.1 ± 18.7 **-Pts who did not participate in PA:** 68.6 ± 20.1	**Tennis** [2%] **Squash** [0] **Running/Jogging** [1%] **OHS** **-Pts who participated in PA:** 45.0 ± 4.7 **-Pts who did not participate in PA:** 41.9 ± 8.1 **EuroQoL VAS** **-Pts who participated in PA:** 81.6 ± 13.1 **-Pts who did not participate in PA:** 74.4 ± 16.3		[9]Presence of other lower extremity or back problems limiting mobility at postop [10]Complication within the first 3yrs [11]History of >1 lower-extremity arthroplasty [12]Comorbidity requiring daily medication [13]Presence of index joint issues [14]Age at the time of surgery [15]Pre and postop BMI [16]Pre and postop OHS [17]Pre and postop EuroQoL **-Mentioned, not adjusted for:** [1]Reasons for not participating in regular PA post-surgery [2]Participation in regular PA as an important goal of surgery

Ortmaier et al (190) Austria **Level of evidence: III** **Single centre** **Follow-up: min of 18mo**	-Selected, M vs W; ≤60; >60 to ≤70 & >70yrs -137pts [M=65; F=72]; ≤60 [n=38]; >60 to ≤70 [n=43] & >70yrs [n=56] -Mean age: 65.6±12.4yrs -Mean BMI: 26.6±4 kg/m² -Co: NR -Dx: OA=95%; AVN=5%; Rt hip=55%; Lt hip=45% -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR Surgical approach: Anterolateral, modified Watson-Jones approach Implant information: Cement-less, short-stem.	Postop rehab regime comprised full weight-bearing ambulation under surveillance of PT using crutches immediately on postop day 1. Functional active and passive motion was allowed with initially restriction of flexion to 90° for 1wk.The avr time until hospital discharge was 6.7d. 37% of all pts were subsequently sent to an inpatient PT facility for 2wks and 67% were sent home. 6wks postop, 83% of all pts were additionally sent for in-pt rehab for 2 to 3wks, the remaining 7% had out-pt PT until the 10th postop wk.	***SAQ** [*Pre-and postop-sport activities: frequency per wk, length per session*] ***VAS** *[Postop scores]* *-Pain during and after sports activity in the affected hip or in other joints (0=no pain and 10=worst pain imaginable)* *-Satisfaction with the outcome* *-Insecure or fear during sports* *-Fitness level* *-Ability to perform sports* ***UCLA Score** [*Postop activity levels*]	**[1] Before onset of restricting symptoms** **Pts participating in sport activities:** n=126 [92%] **No of sports disciplines pts were engaged in:** 2.9 ± 2.1 **No of sports disciplines pts were engaged in [W vs M]:** 2.7 ± 0.48 vs 3.2 ± 0.51 **Pts participating in sport >4 times per wk:** 18% **Definition of sport level ['Recreational sports']:** **-M** [84%]; **W:** [69%] **Top 5 sports [W]** **Hiking** [56%] **Swimming** [39%] **Nordic Walking** [32%] **Cycling** [44%] **Alpine Skiing** [17%]	**[1] Min of 18mo postop** **Pts participating in sport activities:** n=119 [87%] **Pts who did not RTA:** n=11 [9%] **Pts who RTS:** n=115 [91%] **No of sports disciplines pts were engaged in:** 2.6 ± 1.9 **No of sports disciplines pts were engaged in [W vs M]:** 2.2 ± 0.45 vs 3.1 ± 0.46 **Pts participating in sport >4 times per wk:** 27% **Pts involved in recreational sports:** More than 80% **Definition of sport level ['Recreational sports']:** **M** [88%]; **W** [68%] **≤60yrs:** 79% **>60 to ≤70yrs:** 88%	**Time before RTS after surgery** **Within 4wks:** n=7 [6%] **1 & 3mo:** n=67 [56%] **3 & 6mo:** n=29 [24%] ≤60 [32%] >60 to ≤70 [21%] >70yrs [14%] **More than 6mo:** n=16 [13%]	**-Adjusted for in analysis:** [1]Age [2]Gender [3]Activity levels **-Mentioned, not adjusted for:** [1]Most frequently named reasons to quit disciplines [2]Hip pain during sport [3]Insecurity or afraid during sports [4]Ability to perform sports [5]Satisfaction [6]ROM

				Top 5 sports [M] **Hiking** [66%] **Cycling** [55%] **Swimming** [43%] **Nordic Walking** [31%] **Alpine Skiing** [40%] **Top 5 sports patients [≤60yrs]** **Hiking** [54%] **Swimming** [42%] **Cycling** [45%] **Nordic Walking** [24%] **Alpine Skiing** [26%] **Top 5 sports [>60 to ≤70yrs]** **Hiking** [68%] **Cycling** [56%] **Swimming** [41%] **Nordic Walking** [40%] **Alpine Skiing** [18%] **Top 5 sports [>70yrs]** **Hiking** [51%] **Cycling** [43%] **Swimming** [29%] **Nordic Walking** [25%] **Alpine Skiing** [12%]	**>70yrs:** 67% **Durations per session:** ***0-15 mins:** 35% of pts aged >70yrs ***120mins:** 32% [≤60yrs] & 35% [60 to ≤70yrs] **No of sports disciplines pts returned to [by age group]** **≤60yrs** [3.1 ± 2] **>60 to ≤70yrs** [3 ± 2.3] **>70yrs** [2.1 ± 1.56] **Top 5 sports [W]** **Hiking** [46%; -10] **Swimming** [33%; -6] **Nordic Walking** [31%; -1] **Cycling** [29%; -15] **Alpine Skiing** [4%; -13] **Top 5 sports [M]** **Hiking** [65%; -2] **Cycling** [54%; -2] **Swimming** [45%; +2] **Nordic Walking** [29%; -2]		

					Alpine Skiing [25%; -16] **Top 5 sports patients [≤60yrs]** **Hiking** [48%; -6] **Swimming** [31%; -11] **Cycling** [28%; -17] **Nordic Walking** [24%; 0] **Alpine Skiing** [10%; -16] **Top 5 sports [>60 to ≤70yrs]** **Hiking** [62%; -6] **Cycling** [54%; -2] **Swimming** [46%; +5] **Nordic Walking** [37%; -3] **Alpine Skiing** [8%; -10] **Top 5 sports [>70yrs]** **Hiking** [36%; -15] **Cycling** [36%; -7] **Swimming** [24%; -5] **Nordic Walking** [21%; -4] **Alpine Skiing** [5%; -7]		

					***Mean UCLA activity score [group]:** 7.1 [4-10] **M** [6.6] vs **W** [7.8] **≤60yrs** [8.1] **>60 to ≤70yrs** [7.3] **>70yrs** [6.2] ***VAS** **Hip pain during sport:** [1]Very low [VAS 0-3]=93% pts [2]Intermediate pain [VAS 4-6]= 4%pts **Feeling insecure or afraid during sports:** [1]No insecurity or anxiety [VAS 0-3]=85%pts [2]Intermediate insecurity or anxiety [VAS 4-6]=10%pts **Ability to perform sports:** [1]Excellent ability to practice sport [VAS 0-3]= 81%pts [2]Intermediate ability to practice sports [VAS 4-6]=13%pts		

					Hip mobility: [1]Excellent [VAS 0-3]=85%pts [2]Intermediate [VAS 4-6]=12%pts **Subjective satisfaction with the outcome:** [1]Excellent [0.9] and no gender [*P* = 0.465] or age-related [*P* = 0.658] differences.		

Levels of evidence: I = randomized controlled study, II = prospective study, III = retrospective [comparative] study, IV = retrospective case series

AAHKS **American Association of Hip and Knee Arthroplasty Surgeons;** ***ASA*** **American Society of Anaesthesiologists;** ***ADL*** **activities of daily living;** ***AVN*** **Avascular necrosis;** ***avr average; approx*** **approximate;** ***bil*** **bilateral;** ***BMI*** **body mass index;** ***CES-D*** **Centre for Epidemiological Studies Depression Scale;** ***Co*** **co-morbidities;** ***Dx*** **Diagnosis;** ***DDH*** **developmental dysplasia of the hip;** ***DDA*** **Direct Anterior Approach;** ***DJD*** **degenerative joint disease;** ***d*** **day(s);** ***F*** **female;** ***GRC*** **global rating of change score;** ***HA*** **hydroxyapatite;** ***HRA*** **Hip Resurfacing Arthroplasty;** ***HHS*** **Harris Hip Score;** ***HOOS*** **Hip Osteoarthritis Outcome Score;** ***HAAS*** **High-Activity Arthroplasty Score;** ***h*** **hour(s);** ***IPAQ-SF*** **International Physical Activity Questionnaire Short Form;** ***QoL*** **Quality of life;** ***IA*** **Inflammatory arthritis;** ***Inc*** **Inclusion;** ***LEAS*** **Lower Extremity Activity Scale;** ***Lt*** **left;** ***meds*** **medication;** ***MET*** **Metabolic Equivalent of Task;** ***MOM*** **metal on metal;** ***MHHS*** **Modified Harris Hip Score;** ***M*** **male (men);** ***mo*** **months;** ***min*** **minimum;** ***n*** **number;** ***NS*** **not significant;** ***NRS*** **Numeric Rating Scale;** ***NPRS*** **numerical pain rating scale;** ***NR*** **not reported;** ***op*** **Operation;** ***OA*** **osteoarthritis;** ***O*** **older;** ***OHS*** **Oxford Hip Score;** ***Pri*** **primary;** ***Poly*** **polyethylene;** ***PTA*** **posttraumatic arthritis;** ***PA*** **physical activity;** ***Pt*** **patient/participant;** ***Postop*** **postoperative;** ***Preop*** **pre preoperative;** ***PT*** **physiotherapy/physiotherapist;** ***PASE*** **Physical Activity Scale for the Elderly;** ***PASIPD*** **Physical Activity Scale for Individuals with Physical Disabilities;** ***QOL*** **quality of life;** ***rg*** **range;** ***ROM*** **range of movement;** ***RA*** **rheumatoid arthritis;** ***Rehab*** **rehabilitation;** ***Rt*** **right;** ***RTS*** **return to sports;** ***RTA*** **return to activity;** ***SCSAAQ*** **Schulthess Clinic sports and activity questionnaire;** ***SAQ*** **sport activity questionnaire;** ***Sec*** **secondary;** ***TJR*** **total joint replacement;** ***THA*** **total hip arthroplasty;** ***THR*** **total hip replacement;** ***TKR*** **total knee replacement;** ***Uni*** **Unilateral;** ***UCLA*** **University of California Los Angeles activity score;** ***UKR*** **unicompartmental knee replacement;** ***VAS*** **Visual Analog Scale;** ***wk(s)*** **week(s);** ***WOMAC*** **Western Ontario and McMaster Universities Osteoarthritis Index;** ***W*** **women;** ***Y*** **younger;** ***yr(s)*** **year(s);** ***%*** **percentage/proportion.**

Appendix 5. Topic guide [semi-structured interview]

1) Compared to your PA rating score (prior to onset of restricting symptoms), can you please talk me through your PA rating scores? (Prompts/Probes: Did anything surprise you when you were making your rating or how you scored yourself? Is there anything that did not come up that you were expecting to come up?)
   - Before THR
   - Following THR

2) Can you tell me about your lifestyle? (Prompts/Probes: what life was like before THR and what life is like now? Age at time-points?)
   - Prior to onset of restricting symptoms for hip problem
   - Diagnosis (Prompts/Probes: time between the onset of restricting symptoms; unable to do PA and THR)
   - Preparation for THR
   - Undergoing THR
   - Following THR

3) What does the word PA mean to you?
   - Prior to onset of restricting symptoms
   - Before surgery (Diagnosis/Prior to surgery)
   - Following Surgery

4) Can you tell me about your surgical experience? (Prompts/Probes: Clinical support, rehabilitation, information/education received)
   - Diagnosis
   - Preparing for surgery
   - In-hospital
   - Following surgery

5) What is preventing your recovery in the way that you would like it to or used to? (Prompts/Probes: what would have helped? what will help? Gender? Age? Comorbidities?)
   - Prior to onset of restricting symptoms
   - Before surgery (Diagnosis/Prior to surgery)

6) What is helping your recovery? (Personal, physical, social, and environmental factors?)

7) Where your hopes and expectations met? (Prompts/Probes: for THR? For PA?)

8) Has THR affected the way you see yourself (Prompts/Probes: how?)

Appendix 6. Research ethical approval

University of Cumbria

University of Cumbria
Research Office
Lancaster Campus
Lancaster, LA1 3JD

Tel: 01524 590804
Fax: 01524 384385
Email: research.office@cumbria.ac.uk

16 January 2019

Our Ref: DC/SB

Olu Ejuoneatse
MSS
Bowerham Road

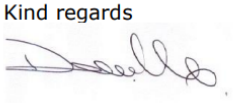
Dear Olu

Request for Ethical Clearance – Our Ref: 18/32
Project: The meaning and lived experience of physical activity for people aged 60 and over following total hip replacement surgery

Thank you for your recent application for ethical review.

Approval has been granted with no changes or amendments required.

Kind regards



Appendix 7. Research advertisement

University of Cumbria

Physical Activity Promotion
Research Study

Can people return to physical activity after Total Hip Replacement?

One interview to tell your story!

1) Are you aged 60 and over?

2) Have you had unilateral Total Hip Replacement surgery for the treatment of Osteoarthritis?

3) Did surgery take place 12 weeks to 6 years ago?

4) Before diagnosis leading to surgery, did you:

    a) Regularly participate in activities such as golf, swimming, walking, dancing or water aerobics, bicycling, bowling, rowing, speed walking, table tennis, free weight lifting, hiking, rock climbing, horseback riding, double tennis, skating or skiing?

Appendix 8. Participant Information Sheet

'The role and meanings of physical activity for people aged 60 and over following total hip replacement for Osteoarthritis'

Participant Information Sheet

About the study
The purpose of the study is to explore the meaning and experience of physical activity in people who have had Total Hip Replacement surgery. The study will be one of the first in the United Kingdom to do this. The aim of the study is to help 'give voice' to patients, with the goal of promoting an understanding of physical activity in people who have had Total Hip Replacement. This understanding will help families, healthcare teams, surgeons, the NHS and most importantly manage patient expectations better. The study will also form a Doctoral Thesis for the researcher.

Some questions you may have about the research project:

Why have you asked me to take part and what will I be required to do?
The researcher is interested in peoples' experience of physical activity (past, present and future), and what it means to them following a Total Hip Replacement. You are being asked because you expressed interest in the research advert that required:

i. You regularly participated in physical activity before your hip complaints/problems that led to you having a Total Hip Replacement surgery
ii. Time since your Total Hip Replacement surgery range from 12 weeks to 6 years
iii. You are aged 60 and over

You will be asked to take part in a semi-structured interview. This interview will last about 60 minutes and take place face to face in a quiet public place or building (e.g. library or University). Alternatively, if you prefer, a Skype interview could be arranged. Immediately before the interview, you will be required to complete the University of California at Los Angeles activity score questionnaire. The completion of this questionnaire requires you to rate your activity levels at three (3) time points:

i. The time when you did not feel any discomfort participating in your daily and leisure activities because of hip complaints/problems
ii. At the time of your Total Hip Replacement surgery
iii. Presently

You will get to see a copy of this activity-rating questionnaire and the interview themes to have a look at before the interview is conducted.

What if I do not wish to take part or change my mind during the study?
Your participation in the study is entirely voluntary. You are free to withdraw from the study at any time without having to provide a reason for doing so and without disadvantage to you. You can ask to see the transcription to ensure you are happy with what you said. Although every attempt will be made to not identify any individual, there is a small chance that something you may say, if it is personal enough, can be identified by e.g. a friend you have said that to.

What happens to the research data?
Interviews will be audio recorded. This audio files will be kept in secure storage until they are transcribed. All identifiable data will be removed, and only anonymised transcripts will be kept. The original audio files will be destroyed. When the data is typed up all details that could identify you will be removed.

If you choose to withdraw from the study before its completion date, your data will not be included in the findings of the study and will be destroyed. After the completion date, your anonymous data will remain as a part of the findings and cannot be withdrawn.

How will the research be reported?
The findings of this study may be used in part or whole for presentations or publications. At request, you are eligible to receive an overview of the findings, and/or a copy of any presentations or publications produced. No individual will be identified or linked to the data.

How can I find out more information?
Please contact the researcher directly. Olu Ejuoneatse, University of Cumbria, Bowerham Road, Lancaster, LA1 3JD.
Email: olu.ejuoneatse@uni.cumbria.ac.uk

What if I want to complain about the research
Initially you should contact the researcher directly. However, if you are not satisfied or wish to make a more formal complaint you should contact Diane Cox, Director of Research Office, University of Cumbria, Bowerham Road, Lancaster, LA1 3JD.
Email: diane.cox@cumbria.ac.uk

Attachment:
-The University of California at Los Angeles Activity Score Questionnaire:

- Copy 1: To rate activity levels before hip complaints/problems leading to Total Hip Replacement surgery
- Copy 2: To rate activity levels at the time of Total Hip Replacement surgery
- Copy 3: To rate current activity levels

-Interview themes

Appendix 9. Consent Form

University of Cumbria

'The role and meanings of physical activity for people aged 60 and over following total hip replacement for Osteoarthritis'

Participant Consent Form

Please answer the following questions by circling your responses:

Have you read and understood the information sheet about this study? YES NO ☐

Have you been able to ask questions and had enough information? YES NO ☐

Do you understand that you are free to withdraw from this study at any time, and without having to give a reason for withdrawal?
YES NO ☐

Your data will be anonymised before being analysed. Do you give permission for members of the research team to have access to your anonymised data?
YES NO ☐

Do you understand that anonymised data will be kept for no longer, than necessary as per institutional guidelines, however, this period could be indefinite?
YES NO ☐

If you leave the study before its completion date, your data will be removed from the findings and securely destroyed.

Do you understand that after the completion date, your anonymised data will remain a part of the findings and cannot be withdrawn?
YES NO ☐

Do you want to receive an overview of findings at the end of this study?
YES NO ☐

Please sign here if you wish to take part in the research and feel you have had enough information about what is involved:

Signature of participant: ..... **Date:** .....

Name (block letters): .....

Signature of researcher: ..... **Date:** .....

Name (block letters): .....OLU EJUONEATSE.....

Appendix 10. Sample in-depth overview of themes

Theme 1: *"I should have had it almost a year before, I was in absolute agony"*: The long and painful path leading to surgery			
s/n	**Sub-theme**	**Description**	**Illustrative quotations**
1	Consequences of pre-existing joint and other medical problems	*"It just got worse and worse and worse over the time"*: Functional consequences	*Historic [pre-diagnosis]* *-I've never been able to sit cross-legged on the floor even as a child, I've never had that range of movement because I've got this slight anomaly in the anatomy of my hip joints… Um, um, and all my life I'd noticed, I didn't have quite the same ability to sit cross-legs as everybody else did. So, and I go to Yoga when they've tried me on several blocks to get my knees down the same height as my hips, but it was a struggle* [Grace]. *-It's [blood pressure] been very difficult to get my blood pressure, to be controlled by medication and for me to tolerate most of the medications. When I took one of the medications called Irbesartan over about two years, I started to get leg pain… And then it just got worse and worse and worse over the time* [Grace]. *Following diagnosis* *-Yeah [enduring her pain], and I was reluctant to have surgery and then the whole thing was a bit disrupted by me having treatment for non-Hodgkin's lymphoma…So, I had a lot of chemotherapy* [Lilian]. *Mis-diagnosis consequences* *-It took quite a while for the, for it for the, for the diagnosis of the quite a significant hip problem to come to light. It was maybe a year, 18 months after I first went to the physio about the limp…We thought it was knees and, then you know, we went through all that long protracted process. Um, before we realised it was knees [hips] and I was thinking more blimey* [Mary].

2	Delayed decision-making for surgery	*"I couldn't decide"*: Personal perspective	*Avoidance due to perceived fear* *-Ah, yes, because what happened when I went for the first, uh, appointment down at [name of place], uh, he said, "well, the options are, we can either give you an, uh, cortisone, cortisone injection in the hip. Um, and or we can go for replacement so, and it's your choice"… And I said, well, let's go for the injection first of all. So, I went down again for the injection. Uh, first time that made a massive difference… Uh, but, but after a couple of months it had worn off. Um, and then it went down for a second injection and it, it, it ha it only had an impact for, for a matter of days. So that was when we realised it, obviously the replacement was the thing to do* [Mary]. *Avoidance due to terminal illness* *-So, I hung on and then I became ill with non-Hodgkin's lymphoma, which is a blood cancer. So, I had a lot of chemotherapy and wasn't really expecting to live very long um, so the, I don't want to waste any of the time I've got left recuperating from hip surgery. Um, So I was avoiding it really* [Lilian]. *Avoidance due to negative experience of others…"I might end up worse off"* *-And also, my mother, sorry, had, um, a hip replacement, she's had both hips replaced, but the second one went a bit wrong, and she was left with a paralysed leg from the knee down. Um, so I was well aware that it could go wrong, and I might end up worse off… So, I kept putting it off and putting off, got used to being disabled in a way um* [Lilian] *Other priority… "that wasn't our priority at the time, wasn't me"* *-I was under a physiotherapist, uh and then, um my grandson was born and there was a trauma of that, so, um she [physiotherapist] said I couldn't continue with the physiotherapy….I'm spending so much time with my grandson. It was 5 months in the hospital altogether… It was bad—I just could hardly walk—It was*

			going downhill—this is getting worse [thinking to herself], and I was struggling to walk and everything, but I was just keeping it to myself, yeah, yeah. I was only as active as I was because of um personal situation of a grandchild being in the hospital— Looking after the other grandson…The physiotherapist used to fit me in when I used to come home to collect clean clothes and things in [name of town of residence]. She then realised it was my hip going not the muscle. I couldn't get up, I couldn't get up out of chairs and she'd watched me getting up out of the chair but she [PT] didn't tell me that until [name of grandson] was fine because she following my —you know — we were all worried…but again, that wasn't our priority at the time, wasn't me…..And as soon as we knew my grandson was out of the hospital would be okay, that was when I was sent straight away for x-rays, I was booked in. By the time when they were going to give me the hip replacement, it actually deteriorated badly and then um — it became urgent [Rose].
		"We've got people out there in the waiting room who are in a far worse state than you are": Healthcare system perspective	*Perceived age discrimination: awful consultation experience and feedback/opinion of consultant* *-And then I was referred to uh, uh, a consultant in [name of Town], um, and I was thinking, oh, thank goodness. I'm going to get through the you know, going to get through the process at last and that, uh, consultation was absolutely awful…I had this terrible experience where, uh, you know, he's staring at his computer screen and shouts out a lot of different questions.… And at one point he said in a, quite an aggressive tone, um, "we've got people out there in the waiting room who are in a far worse state than you are". And he said, "I think you'd be very disappointed at the result of, uh, your, you know, your expectations of an operation of a hip replacement would not be fulfilled"…. He had no, he had never asked me what my expectations were, so, he was making a bit of an assumption there.…Um, you know, I can't suddenly, I don't see why I should suddenly have much lower expectation…But I do have quite high expectations of what I can do physically. Um, but that, but that's just who I am and that's what my past is* [Mary].

			Perceived 'discouragement': Joint replacement age policy *-Well, um, I'm not sure if it's still is NHS policy, but, uh, then when I was first having problems, the policy was to try and get people to wait until they're 60 years old… It is [a long gap between OA diagnosis in 1995 and hip replacement in 2017]. Well, when I was first diagnosed. Um, although the surgeon said that the deterioration in the hip looked bad enough to do a hip replacement, that his advice was to keep going with my own hip as long as I possibly could, because it might go wrong and I'd be worse off, um, or it might need doing a second time. You know, it wouldn't last me the rest of my natural life possibly, so and it gets more difficult and less of a chance of success the second time you do it on the same leg…because, um, the risk that, you know, somebody with a normal life expectancy would need a second hip replacement that, you know, they would wear out* [Lilian]. *Surgery booking error* *-Everybody was trying the hardest because they knew what I'd been through and everybody was trying their hardest and to get it [surgery] done…it's just the place that books all the appointments hasn't seen it as supposed to be urgent, they messed it up…They [appointment booking centre] didn't see the word urgent on it… So, it should have been done, should have been done by November but it wasn't… So, in the end, my doctor — I was in so much pain, my doctor actually rangs, because I couldn't get through because when they got through, they apologised and then gave me a date for day surgery* [Rose].
		"I was been able to do less and less and less": Poor/worsen preoperative functional state at time of surgery	*-Just before I had it done, no, I wasn't doing very much at all. I couldn't do very much at all, that last part and that Christmas before, I was in agony, absolute agony, it was really very painful. And I was been able to do less and less and less, yeah um, in theory, I should have had it almost a year before, I was in absolute agony, yea, it was really hard… They gave me tramadol, my brain went just very, very low, hardly moving.*

			My feet was bad well, I could use the loo and still get around but painful, is very painful, hips can be very painful, I now realise [in low tone] [Rose]
3	*"My biggest expectations was to get rid of the pain"*: Recovery expectations	Negative impact of prolong time until surgery centred on improving functions.	*-Um, so mainly I wanted to be free of pain and a bit of re-joining things with other people…I could no longer remember what it was like to have that range of movement… I was avoiding it [PA] as much as possible. Yeah, too, it was just too painful…because of pain and because I couldn't keep up with other people. Um, so that disincentivise me to join in with any group activities and, um, I couldn't find anything that I could enjoy doing by myself really. So, I just got more and more isolated and debilitated really… Uh, you know, I felt like I was excluded from a lot of things….and even going on shopping trips with my nieces got very difficult, you know, because I felt like I was holding them back all the time and having to sit down and ask them to wait for me. It's embarrassing* [Lilian]
		Other people's opinion, feedback, and experience	*Impact of consultant's opinion on surgical expectations/outcome* *-I wasn't sure [expectation] because when I went to see that consultant in [name of place], I was told very firmly that I would be my, I would be disappointed with the results of the, uh, of hip replacement…Um, but I mean, I just hoped that, I would assume that I would be able to get back to walking without a limp and walking freely without being conscious of walking if that makes sense, so that you can just move around the, walking can flow uh, and you are not having to worry about, uh, discomfort or, um, fatigue in particular areas of the body. And I think that's what I was hoping for* [Mary] *Experience of people who have undergone similar surgery.* *-Um, and so yeah, my expectation was that I will be able to ride horses again, and it be pain-free um, that I would be able to walk. I know that people do these things again um, without limitations… I've got experience of other people, family, and friends, having hip surgery and all and patients that I saw and some patients that I used to get up to mobilise post-operatively as well. Um, so over the years I've seen quite a few*

			people have hip replacements, one or two have had incidents with them. Um, but on the whole, people do really well [Grace]
Theme 2: *"I would have liked much more information about longer term rehab and getting back to a pre problem level of fitness"*: Support from healthcare professionals			
1	Information received about recovery and returning to PA	*"It was very much about managing"*: Limited information about longer term recovery	*-I think it was limited [information received]…we did a, we did a training thing…and it was very much about managing, you know, the do's and don'ts immediately after post-op which is quite important and, uh, that was well done—One thing they didn't do was actually said, say anything: a very construct—or anything at all about the recovery process* [Mary]. *-It's been, um, a bit fraught, I would say simply because of a lack of straightforward information of do's and don'ts, and of course the hospital would assume somebody my age, um, they would not assume that that person was thinking about getting back to a level of fitness once they've recovered from the physical effects of the operation. They wouldn't be thinking in those terms and very, probably the NHS doesn't think in those terms either, you know, it took, it probably thinks in terms of sort of a minimal level of functioning, but day-to-day living. Yeah, so, uh, I, uh, as I say, I have found that difficult, quite that process, quite difficult* [Mary] *-I'm very far from typical of a 76-year-old woman, uh, physically because of my past. Um, and, and so, uh, you know, what, what would have suited me in terms of information about rehab might've been total waste of time for a lot of people. So, you know, you have to put what I'm saying within that context, but, but for me, I would have liked much more information about longer term rehab and getting back to a pre problem level of fitness* [Mary].

		"I don't think the hip will prevent me": Medical advice received for other joint problems	*-I can't [jog], um, I mustn't because um, I have been told not to because of my knee. Yea, they [consultants] wouldn't like me to jog, they may have changed it since I had my knee done, but he [consultant] said certainly, if you go to the gym, just don't get on the tread mill. Yeah, is not the hip, I don't think the hip will prevent me* [Rose] *Lack of clarity* *-The chap [surgeon] who did my hip said, "be careful", he said "when you get in and out of things, don't bend forward when you go to Yoga", he said don't do, you know what I mean, what it is, when you sit down, your legs are like that, it could go crossed legs…Whether that's to do with the surgery, I don't know* [Rose]. *-I used to be able to briskly walk and do all sorts and do longer walks, it's possibly before my knee. My knee was done in 2012, so that is possibly pre-knee. I couldn't do [long walks] that after my knee really. The consultant who consulted with the knee replacement not to pound the streets, not to pound for your knee but I couldn't do that [long walks] after my knee really… I started to be very careful about the terrain* [Rose].
		"I got conflicting advice": Lack of interprofessional collaborative and care coordination	*I got conflicting advice when I got back home uh, the contact rehab team, uh, who were saying, "we'd give you exercises to do". And I said, oh fine uh, but [name of place] hospital, uh, when I spoke to them about it, were saying, "no, no, no, no exercises uh, because of the risk of dislocation of the hip prior to the soft tissue being fully, um, fully healed". Not realising that you've got this three-month period um…before you can start thinking about physical rehabilitation and getting your basic strength back. I mean, I did walk quite early um, and I probably know there's a, uh, um, uh, about a mile walk around this village that includes quite a steep hill, which I did, I think three weeks after coming out of hospital. Um, but I actually*

			now looking back on it, I think, well, maybe I shouldn't have done that, maybe I was actually, um, slowing down the soft tissue recovery [Mary] *-My recommendation, it would be that we, the people are given an overview of the recovery process. And so that patients are left very clear as to what they could do to help themselves in terms of exercises and things like that and when it's appropriate to do that* [Mary].
2	Knowledge of OA, joint replacements, and the recovery process	*"People haven't got time to discuss it with you really"*: Lack of knowledge	*-This blanket thing of people should wait till they are 60, if they can, it's wrong because people's needs are different even. You can make a hip last longer by modifying your activities, I don't see why [the hip would] actually wear out unless you're a long-distance runner or something like that, normal day to day activities* [Lilian]. *-So, I can walk quite long distances, I wouldn't walk briskly now — as briskly as I could, yeah, but then I think that is walking briskly and wearing shoes that are too flat because of my height that has actually led to my knee deteriorating quicker I think, that might have done it, yeah, yeah* [Rose]
		"I'm more aware of, of physical activities that um that are going to help": Adequate knowledge	*- I've been doing this, um, continuing learning group at [name of Town]. We've heard a lot of people talking about ageing, uh, and what makes successful ageing. Um, so was very aware that exercise is key really to being healthy in old age. Um, and I knew that some of the muscles in my legs would have um become very weak because of the way that I was walking and the restriction. I'd lost all, but about 2 or 3% of my rotation that I should have and um sort of trying to build myself up before the operation… I did go see a personal trainer and do some exercises, want to build up my muscles around here and around my core so that I would have a better recovery* [Lilian]. *-With the knee and my hip, I'm more aware of, of physical activities that um that are going to help, you know, sustain physical activeness,…Also, aware that as I get older, like many of my friends, if you sit too long, you stiffen up. You have to keep going* [Rose].

			-I put it in the same context of, uh, as being an athlete in the sense that you have a physical problem, you get the treatment, you can recover from it, and then you do rehab, and you try to return to a previous level of fitness. So that's how I'm thinking about it……So, I don't think it's psycho...I don't think it's made any impact on me psychologically [Mary].
3	Limited supervision in recovery	The OT services provided happen to only focus on facilitating a smooth transition from hospital to home.	*-I had to get the house ready, and the occupational therapist because of my height, had to have adjustment made so I could be independent and go home…You take the measurement of your chair, the bed you're going to sleep on, the height etcetera and then I took all these measurements in and that alerted them to the fact that nothing was high enough for me and if I was going to go home and be on my own, this had to be looked into. They just delivered all these surgical things…On my stick, they had to mark the height everything had to be at* [Grace].
		PT was rarely provided, and when it was offered, it was considered insufficient and not aimed at facilitating return to PA.	*-Um, I didn't do any specific exercises or anything like that um, I didn't have any form of physiotherapy… It wasn't just there [PT], it wasn't offered….I think they gave us, they gave us a CD or a booklet with exercises in, I am not sure if it was a video or just a booklet, um but it was tone and collect exercises, quadriceps exercises, crunching your buttocks, I think and doing, um, bending, strengthening your knee which is fine, and I followed those and I knew them anyway because it was one of the areas I used to work in as a physio as well* [Grace]. *-So, um, the day after the surgery, physiotherapist came, got me out of bed and got me to walk to the bathroom, I think back to the bed, uh, going to sit in a chair. Um, yeah, and watched me get in and out of bed with both legs. And then the second day they got me up, walked me down the corridor, and then the third day, we walked up and down some steps using the crutches and I could do that. So that meant I could go home* [Lilian]

Theme 3: Reasons and deterrents to participating in PA			
1	*"You've got age deterioration that you have to take into account"*: Beliefs	Age beliefs	*-I've seen a lot of people have hip replacements that if you're reasonably young and fit and active, then you should get a pretty good recovery from it and you should almost go back to being able to do things and nobody would know you've had a hip replacement… I didn't particularly feel my age—it [pain] was just limiting so much* [Grace] *-Being able to do, take up the activities I was doing, not obviously before my knee but —but certain things that I was doing before — before I had my hip. I mean, you slow down anyway don't you, cause as you get older, I know some people don't* [Rose] *-Um, well, I used to like walking uphills, um, when it was at my fittest, when I was younger…I used to finish work at two o'clock and then walk uphill Helvellyn every day…I was a tennis player when I was younger person* [Lilian]
		Perception of age and/or other joint problems impact on PA levels.	*Perceived enhanced deterioration caused by combination of joint problems and ageing.* *I want to get back to a level of fitness that I would have had given that you've got age deterioration that you have to take into account…I want to get it back to a level, the best level of fitness that I can given all my circumstances…that was what I was concerned about because, um, it, it's not only the problem with the knee, the specific problems with the knee and the hip, but it's also the huge contribution to them that, that, that those problems make to your general level of fitness and, and mobility.…So, I'm hoping that the recovery process—recovery process will get me back to a point where I can, um, you know, keep, keep a level of fitness up rather than just going into an enhanced deterioration mode* [Mary]

			Recovery assessment timepoint comparator *-Being able to do, take up the activities I was doing, not obviously before my knee but —but certain things that I was doing before — before I had my hip…And, have have before my hip, I have started to do Tai chi as well* [Rose] *Impact of other joint problems* *-I only had six months in between them [both hip replacements] so, I didn't have long before I had the second one [hip] done. So, I think probably I went to to, 6 [referring to activity levels] after the first one. Cause I was still recovering from the first surgery when I had the second one done* [Lilian].
2	The meaning of PA	Keeping active to sustain independence in old age	*Influence of older age, other medical condition [illness; other joint problems] and need to be independent* *-When you get older, you want to remain as independent as long as possible…where you know, you might not be able to live independently and that would end up being one of the things that would restrict my independence…So I was beginning to lose my independence, I was thinking 'I'm gonna have to move, I'm gonna have to move to a bungalow, I'm gonna have to — you know, how long I'm gonna look after myself'. It's that ageing, is not you know. I'm not as mobile as I was when I was young at all but to have your mobility really reduced, that is so life restricting. It's so — restricts so much, just general living and everything* [Rose] *-As I've got older and because of being ill, um, I've realised that it's [PA] key to happiness in later life. It's keeping active, um keeping all your joints working, can loose, um, so that you can do the things that you want to do and so you can look after yourself* [Lilian] *-Physical activity means to me, um being able to keep moving as I get older…so there's things that you have to do that are physical activities and keep those going* [Grace].

			Distinction between PA, fitness, and exercise *-I, uh, going, going back a half a million years to 1964. Tokyo Tokyo Olympics…I had, my, my oldest son was born in 1968. Uh, I got back to fitness after that. Uh, so I stopped competing in the early 70s. Um, um, probably didn't do very much physical activity for quite a long time. Um, anyway, fast forward, a couple of decades…I, I actually started running. So, fitness before we moved up here, uh, when was that...uh, 20, just over 20 years ago, I was still running. I started jogging and, uh, I got really very fit during that. I also started teaching aerobics in my village hall, down in [name of place] and so um on, and I did get very, very fit at that time. And I would have been sort of late thirties…So it would have been, uh, yeah, um, probably early forties when I got back into that. So, I did in my forties, I did get very, very fit in a, in a different kind of way than I was when I was competing athlete* [Mary]
		"I've got to enjoy doing it": Something liked and enjoyable	*-Some physical activities I wouldn't enjoy doing if I could do them, you know…I wouldn't enjoy bicycling up and down, cycling up and down [name of road] on the slope, I don't find it easy [laughing]. For me, physical activity, unless is something that was highly recommended for me cos I've got to enjoy doing it* [Rose] *-Um, and then I've taken up dancing – um, this dance class – um, found that really difficult to start with, it's salsa dancing. So, you got to learn a routine of steps, keep them in your head, work with a partner, um, and do a lot of turning…Um, I think it's taken about 12 months [to get better with dance steps]. Yeah. I think anybody dancing with me now probably couldn't tell* [Lilian/preferred activities e.g., group] *-Being independent in being able to get around the house, um, and surrounding areas, whatever that is for you, whether it's a garden or a park or whatever. Just to be being able to go and do those…I'm back to riding one of my horses…I'm walking my dog still* [Grace/preferred activities e.g., sole]

		"Got my commitments to my dogs": Something committed to	*-I haven't gone back to swimming so much, but that's more my time than my physical ability. I haven't really gone back to doing anything bigger on the fells uh, but that's more to do with time than my hip. It's because, um, I, and I've not got the sort of dogs that I could really take on the fell, they chase sheep too much. That's not safe to take them. So, it means I still have to walk them out then go and walk on the fells or something like that…So got my commitments to my dogs* [Grace] *-The only thing I do at the moment that really aggravates it [knee] is if I've got to do some decorating and I'm up and down the ladder or I'm, um, cause we've been decorating our house to get it ready to sell. So, I've been trying to do paintings, if I'm kneeling on the floor painting, skirting board or up and down ladders or in awkward positions, weirdly it's made my knee more sore* [Grace]
3	To foster a positive self-body image	*"Before I looked like an old woman, I was bent forward"*: How others see them	*-I might've just carried on, struggling on [but for the physiotherapist]…Um, it was just her being uh because she had never seen me before, she'd looked at me, thank God she said "you being ridiculous"* [Lilian]. *-Um, when I see my reflection now, um, it takes me aback really because before I looked like an old woman, I was bent forward. Um, I couldn't wear skirts because the skirts went right down at the front and they look ridiculous, you know, cause my bum was sticking out at the back. Um, I must look terrible really and now people look at me and they, well what's happened to you* [Lilian] *-There is a wound where they, you know so….I was a bit uncomfortable with having a wound when I went swimming initially, but you don't see it very much at all now* [Grace]
		Regaining the old abled self	*-I want to get to a point where I can physically feel like I am the same person that I was before, I can walk about without, without thinking about the problems of walking…I still am inclined to hunch over at the hip. Um, and it's, you know, it becomes kind of habitual. So, I have to consciously say to myself and come on, stand up straight, and there's also a tendency to keep the knees bent as well to protect them. And I'm saying*

			to my hip "come on, you've got to stand up straight"! And when I stand up straight, I can walk without a limp…And there were times where I could walk with you know, and it felt, "oh God, it feels like the old me" [Mary]
4	*"Having the courage to go back"*: Facilitators of recovery	The role weather plays	*-It seemed to take a while to be able to lift your legs and do all sorts of things. I think it was, it wasn't straight back into being able to do what I can do before, but I just built it up. It took a bit of concentration, a bit of faith really… Yeah, it was having the courage to go back…By the time six weeks was up…I still used —took my sticks with me when I went to hospital only because I was still supposed to watch how low things were where I had a marker on it because it was the winter, it was more security blanket using a stick because I was trying to slip in, it was wet and everything. The weather was bad, it was that security because obviously you don't want to fall, fall on it…probably would have been able to shed the stick sooner* [Rose]
		"It helped having some background in physio": Fore knowledge of the recovery process	*-It was even perhaps within the first month because I was, my progress felt like it was quite good. I was able to walk around pain-free, I was building up things gradually….so, yeah, I would say is in the first month I knew that it was, it felt like it was going to be a good outcome and that it was well on the way to being okay. It wasn't at that point totally fully healed around all soft tissues, I know that takes a lot longer than just 4 weeks* [Grace] *-I think it helped having some background in physio, of not trying to do more than I could or should* [Grace]
		"Your hip's different": Acceptance	*-It's actually being aware because some of the movement you do, do feel different because your hip's different…So, it's actually about concentrating on —on —on an exercise that you might have done, you know that you can do one side more easier than the other* [Rose] *-Um, but I've taken some different activities. The personal trainer, when I worked with him, he said, um, "you might get upset if you try and do the things that you did before" because I was a tennis player when I was younger person and, uh, he said, "if you can't get back to being as good as you were, it might put you off*

			and de-motivate you", he said "find a new sport". So, I've taken up paddling, um, in a dragon boat…I do Pilates now and, um, this dance class… I've taken up dancing [Lilian]
		"It's really mainly my desire to improve and my desire to return": Motivation to return	*-Yes, Yes, [partner and son facilitating recovery] Um, especially my partner, because he's heavily into fitness and he's um, keeps nudging me about things I ought to be doing. Um, and my son was a very good athlete as well. So, you know, he understands what I'm going through… So yeah, they, they have, but it's, it's really mainly my desire to improve and my desire to return to, um, some level of fitness and this, and an ability to enjoy being–enjoying, moving* [Mary] *-I think the saving grace was living on my own and having to go up and down the steps and having to walk on very long corridor to get to the kitchen and everything.…See housework, I've got a uh 2 storey house with a lot of 5 bedrooms, lot of stairs and I'm running down the stairs all the time…It makes you get up, makes you move it* [Rose]
		"It did give me an enormous boost": Fulfilment of recovery expectations	*-It did give me an enormous boost, um, having that one hip done, uh, and being released from that amount of pain, um... Um, it was like, my mind was released…. I didn't think I would get the range of movement that I have, it's just brilliant. I can ride a bike, couldn't even get my foot to go around on the pedal…And, and now I can, I can climb over a gate. I can dance. It's just like total new life…. because it made such a lot of progress, you know, I feel like I'm going to keep going to, have reached the limits…So, I'm gonna go uphill Helvellyn again one day, start with some small hills, then get up there* [Lilian].

Appendix 11. Copy 1: To rate activity levels before hip complaints/problems leading to total hip replacement surgery

The University of California at Los Angeles Activity (UCLA) Score Questionnaire

Activity Questionnaire	**Name:**
	Gender: □ Male □ Female
	Age:
	Study Hip: □ Left □ Right
	Date of Hip complaints [MM/DD/YY]: / /
	Phone no:
	Email:

Check one box that best describes your activity level at the time when you did not yet feel any discomfort participating because of hip complaints	
□	1: Wholly Inactive, dependent on others, and cannot leave residence
□	2: Mostly Inactive or restricted to minimum activities of daily living
□	3: Sometimes participates in mild activities, such as walking, limited housework and limited shopping
□	4: Regularly* Participates in mild activities
□	5: Sometimes participates in moderate activities such as swimming or could do unlimited housework or shopping
□	6: Regularly* participates in moderate activities such as brisk walking, housework, and domestic chores
□	7: Regularly* participates in active events such as bicycling
□	8: Regularly* participates in active events, such as golf or bowling
□	9: Sometimes participates in impact sports such as jogging, tennis, skiing, acrobatics, ballet, heavy labour or backpacking
□	10: Regularly* participates in impact sports
Regularly= Activities should add up to 30 minutes on at least 5 days a week	

Appendix 12.

Table 8. Pre to post-surgical level of PA: activity rating scores [Study 1] - updated search 11 January 2024

S/N	Study	Study Population	Rehabilitation protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Confounding Factors
				N=5			
1)	Payo-Ollero et al. (196) Spain Level of evidence: IV Single centre Follow-up: 7.5yrs	-Non selected -46 pts [M=33; F=13] -Mean age: 41yrs [rg 37-48] -Mean BMI: 26.11 kg/m² (24.5-29) -Co: NR -Dx: Idiopathic coxarthrosis (34/58.6%), Avascular necrosis (8/15.5%), Epiphysiolysis (5/8.6%), Consequence of septic arthritis (4/6.9%), Hip dysplasia (4/6.9%), Proximal femur fracture (2/3.5%), Reactive arthritis (1/1.7%)	All the pts followed the same rehab protocol, walking fully weight bearing at 24 h initially assisted with a walking frame and later with 2 crutches. Before discharge, pts are taught to walk up and down stairs.	***UCLA activity score** [*level of sports activity*]	**[1]Before the intervention** **UCLA score:** 6.85 ± 3.01	**[1]After the intervention [7.5yrs]** **UCLA score:** 6.22 ± 2.24 **Differences in the UCLA scale before and after op:** None (*P* > 0.05).	**-Adjusted for in analysis:** [1]sports activity according to the UCLA scale [2]sports activities practiced before and after THR [3]complications [4]recommendations given by doctors **-Mentioned, not adjusted for:** [1]age [2]sex

S/N	Study	Study Population	Rehabilitation protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Confounding Factors
		-Indication for surgery: Same as Dx -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: Anterolateral -Implant information: Non-cemented -Surgical side: NR					
2)	Navas et al. (195) Germany Level of evidence: II Single centre Follow-up: 3.9yrs	-Selected, pts younger than 40yrs -36 pts [M=23; W=13] -Mean age: 31.5±5(rg 19-39)yrs -Mean BMI: 27.1±5.3 (17.3-43.8)kg/m² -Co: NR	NR	**UCLA activity score** *[PA level]* **VAS** *[Pain level]*	**[1]Preop UCLA Score [PA level]:** 3.2 **[2]Preop VAS [Pain level]:** 8	**[1]Postop UCLA Score [PA level]:** 7.6 -Statistically significant improvement $p < 0.0001$ in UCLA scores pre to postop. **Effectiveness of THA:**	**-Adjusted for in analysis:** [1]sex **-Mentioned, not adjusted for:** [1]laterality [2]age [3]BMI [4]yrs of follow-up [5]dx

S/N	Study	Study Population	Rehabilitation protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Confounding Factors
		-Dx: secondary OA due to FAIS (6 hips); DDH (19 hips), Trauma (10 hips); AVN of the femoral head (5 hips) -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: 4.8±4.4 (0.5-23)yrs -Surgical approach: NR -Implant information: non-cemented Surgical side: L (20); R (20)				-PA level: 31pts (86%) reported a UCLA score ≥7, corresponding to being highly active in sport activities. **[2]Postop VAS [Pain level]:** 1 -Statistically significant improvement $p <$ 0.0001 in pain pre to postop.	
3)	Ponzi et al. (134) USA Level of evidence: IV Database study Follow-up: 2yrs	-Selected [active vs inactive pts] -Active + Inactive: n=1053 pts [M: 55.8%; F: 44.2%]	**NR**	***LEAS** *[activity levels] ranging from levels 1 to 18 (LEAS 7-12 defined as inactive;*	**[1] Baseline [preop] LEAS:** *significantly differed between Groups (P < .0001)* **-Inactive:** 9.3 ± 1.7 **-Active:** 14.6 ± 1.3	**[1] 2yrs postop LEAS** *[available for n=795 inactive patients and n=850 active pts]* **-Inactive:** 3.0 ± 3.0 *Cohort*	**-Adjusted for in analysis:** (1)the associations between preop expectations and postop satisfaction (2)change in activity level (LEAS) from

S/N	Study	Study Population	Rehabilitation protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Confounding Factors
		-Mean age: 62yrs [Active=62.2±10; Inactive= 62.2±9.9] -Mean BMI: Active=26.6 ± 4.7kg/m²; Inactive=26.7 ± 4.6 kg/m² -Co: ASA [Active + Inactive]: 1 to 2=939 (89.2%); 3 to 4=114 (10.8%) *Charlson comorbidity index (CCI) [Active + Inactive]: 0=864 (82.1%); 1 to 2=164 (15.6%); ≥3=25 (2.4%) -Dx: OA [uni] -Indication for surgery: NR -Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR		*LEAS 13-18 defined as active.)* ***HOOS** *[pain; symptoms; sports and recreation]* ***HSS-HRES** *[expectations]* ***5-point Likert scale survey (1-5, "very satisfied," to 5, "very dissatisfied)** *[satisfaction]*	**[2] Expectations HSS-HRES [preop]:** -How much relief or improvement do you expect in ability to participate in recreation? ***Back to normal** **Inactive**=63.9% **Active**=73.7% -How much relief or improvement do you expect in ability to exercise and participate in sports? ***Back to normal** **Inactive**=68.9% **Active**=69.7% **-Total expectation score: Inactive**=84.8 ± 15.4 **Active**=83 ± 17.6	*demonstrated an increase in activity level* **-Active:** 0.4 ± 2.6 *Cohort decreased* *****74% (590/795) of inactive pts and 32% (275/850) of active pts improved on their baseline activity level ($P < .0001$). *****31% (260/850) of the active pts experienced a reduction in activity level compared with only 9% (71/795) of the inactive pts. **[2] 2yrs postop Expectations HSS-HRES:** Higher expectation with regard to exercise and sports was associated with higher sports and	baseline to 2yrs (3)complication rate (4)revision rate. **-Mentioned, not adjusted for:** None

S/N	Study	Study Population	Rehabilitation protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Confounding Factors
		-Surgical approach: Posterior -Implant information: NR -Surgical side: NR				recreation scores, by a mean of 8.4 ± 3.3 points (*P* =.012) **Satisfaction** -How satisfied are you with the results of your surgery for improving your ability to do recreational activities? ***Very satisfied** **Inactive**=79% **Active**=81.6% -How satisfied are you with the results of your surgery for relieving pain? ***Very satisfied** **Inactive**=93% **Active**=92.7% -Overall, how satisfied are you with the results of your surgery? *Very satisfied **Inactive**=89.6% **Active**=88.3%	

S/N	Study	Study Population	Rehabilitation protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Confounding Factors
						-F pts were more likely to be dissatisfied with the overall results of surgery compared with M pts (OR, 2.3; *P* = .04). **Co** -Pts with ASA of 3 to 4 were more likely to be dissatisfied with ability to perform housework and yard work (OR, 3.6; *P* = .003), ability to participate in recreational activities (OR, 2.7; *P* = .007), and QoL (OR, 2.1; *P* = .022). **Complications [6mo]** -The most frequently reported were (1)"muscle	

S/N	Study	Study Population	Rehabilitation protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Confounding Factors
						weakness in the leg of the joint replacement," (2)"change in sensation around your replaced joint," (3)"more symptoms than you would like in the replaced hip," and (4)"difference in leg-length that is new since surgery." -Complications were similar between active and inactive pts. **Revisions** -At 5 to 10yrs, revision rates were similar in active and inactive patients (*P* = .168). -The mean time to revision: **Active**= 3yrs (range, 0mos to 7yrs)	

S/N	Study	Study Population	Rehabilitation protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Confounding Factors
						Inactive=2.5yrs (0ms to 8yrs) -The most frequently reported reason for revision in pts was 'all cause': **Active**=33 **Inactive**=46	
4)	Takeuchi et al. (194) Japan Level of evidence: IV Multi-centre (4 hospitals) Follow-up: 59.5mos (4.9yrs)	-Selected, pts <60yrs -204pts (M=36[17.6%]; W=168[82.4%]) -Mean age: 53.7yrs (min 30yrs) -Mean BMI: -Co: NR -Dx: OA (primary=29; DDH=145); AVN=19; RA=5; Other reasons=6 -Indication for surgery: NR -Motivation for undergoing surgery: -Mean delay between the onset of	All pts were mobilised with full weight-bearing on postop d1.	**UCLA activity score** *[PA levels]*	**[1]Preop activity scores** **≧9**=0(0%) **8**=0(0%) **7**=0(0%) **6**=34(16.7%) **5**=83(40.7%) **≦4**=87(42.6%)	**[1]59.5mo postop activity score** **≧9**=16(7.8%) **8**=12(5.9%) **7**=10(4.9%) **6**=127(62.3%) **5**=32(15.7%) **≦4**=7(3.4%) **Difference in scores pre to postop:** **-Significant** *The mean preop score of 4.55 improved to 6.17 ($p < 0.01$) *Sex: Scores in males were significantly	**-Adjusted for in analysis:** [1]mean preop UCLA score [2]sex [3]femoral head size [4]surgical approach [5]dx [6]satisfaction **-Mentioned, not adjusted for:** None

S/N	Study	Study Population	Rehabilitation protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Confounding Factors
		symptoms and THR: NR -Surgical approach: Anterolateral approach=67; Posterolateral approach=137 -Implant information: Non-cemented -Surgical side: NR				higher than females, both pre and post operatively ($p < 0.05$). **-Not significant** *Femoral head size *Surgical approach; *Dx **Pt satisfaction and postop activity level:** -Correlates with postop activity level ($p < 0.001$) but not with reinstatement level ($p = 0.157$)	
5)	Harada et al. (197) Japan Level of evidence: III Single centre Follow-up: 1yr	-Non selected -n=42pts[M=9; F=33]; Uni THA -Mean age: 68.6 ± 8.6 (rg. 48–89) -Mean BMI: 23.9 ± 3.9 kg/m2 (rg. 16.8–33.9) -Co: NR -Dx: OA -Indication for surgery: NR	NR	**UCLA activity score** *[PA levels]*	**Preop UCLA score:** 3.4	**3mos postop UCLA score:** 4.8 **1yr postop UCLA score:** 4.6 **Difference in UCLA score [pre to postop]:** Significant postop increases ($P < 0.05$).	**-Adjusted for in analysis:** None **-Mentioned, not adjusted for:** None

S/N	Study	Study Population	Rehabilitation protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Confounding Factors
		-Motivation for undergoing surgery: NR -Mean delay between the onset of symptoms and THR: NR -Surgical approach: Posterolateral (posterior) -Implant information: NR -Surgical side: L (12); R (30)				**Difference in UCLA score [2 postop timepoints]:** No significant difference was found	

Levels of evidence: I = randomized controlled study, II = prospective study, III = retrospective [comparative] study, IV = retrospective case series

AAHKS American Association of Hip and Knee Arthroplasty Surgeons; ***ASA*** American Society of Anaesthesiologists; ***ADL*** activities of daily living; ***AVN*** Avascular necrosis; ***avr average; approx*** approximate***; bil*** bilateral***; BMI*** body mass index; ***CES-D*** Centre for Epidemiological Studies Depression Scale; ***Co*** co-morbidities; ***Dx*** Diagnosis; ***DDH*** developmental dysplasia of the hip; ***DDA*** Direct Anterior Approach; ***DJD*** degenerative joint disease; ***d*** day(s); ***F*** female; ***GRC*** global rating of change score; ***HA*** hydroxyapatite; ***HRA*** Hip Resurfacing Arthroplasty; ***HHS*** Harris Hip Score; ***HOOS*** Hip Osteoarthritis Outcome Score; Hospital for Special Surgery Hip Replacement Expectations Survey ***HSS-HRES***; ***HAAS*** High-Activity Arthroplasty Score; ***h*** hour(s); ***IPAQ-SF*** International Physical Activity Questionnaire Short Form; ***QoL*** Quality of life; ***IA*** Inflammatory arthritis; ***Inc*** Inclusion; ***LEAS*** Lower Extremity Activity Scale; ***Lt*** left; ***meds*** medication; ***MET*** Metabolic Equivalent of Task; ***MOM*** metal on metal; ***MHHS*** Modified Harris Hip Score; ***M*** male (men); ***mo*** months; ***min*** minimum; ***n*** number; ***NS*** not significant; ***NRS*** Numeric Rating Scale; ***NPRS*** numerical pain rating scale; ***NR*** not reported; ***op*** Operation; ***OA*** osteoarthritis; ***O*** older; ***OHS*** Oxford Hip Score; ***Pri*** primary; ***Poly*** polyethylene; ***PTA*** posttraumatic arthritis; ***PA*** physical activity; ***Pt*** patient/participant; ***Postop*** postoperative; ***Preop*** pre preoperative; ***PT*** physiotherapy/physiotherapist; ***PASE*** Physical Activity Scale for the Elderly; ***PASIPD*** Physical Activity Scale for Individuals with Physical Disabilities; ***QOL*** quality of life; ***rg*** range; ***ROM*** range of movement; ***RA*** rheumatoid arthritis; ***Rehab*** rehabilitation; ***Rt*** right; ***RTS*** return to sports; ***RTA*** return to activity; ***SCSAAQ*** Schulthess Clinic sports and activity questionnaire; ***SAQ*** sport activity questionnaire; ***Sec*** secondary; ***TJR*** total joint replacement; ***THA*** total hip arthroplasty; ***THR*** total hip replacement; ***TKR*** total knee replacement; ***Uni*** Unilateral; ***UCLA*** University of California Los Angeles activity score; ***UKR*** unicompartmental knee

S/N	Study	Study Population	Rehabilitation protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Confounding Factors
replacement; *VAS* Visual Analog Scale; *wk(s)* week(s); *WOMAC* Western Ontario and McMaster Universities Osteoarthritis Index; *W* women; *Y* younger; *yr(s)* year(s); *%* percentage/proportion.							

Appendix 13.

Table 9. PA participation pre- to post-surgery [Study 1] - updated search 11 January 2024

S/N	Study	Study population	Rehab Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors
	N=5							
1)	Payo-Ollero et al. (196) Spain Level of evidence: IV Single centre Follow-up: 7.5yrs	-Non selected -46 pts [M=33; F=13] -Mean age: 41yrs [rg 37-48] -Mean BMI: 26.11 kg/m² (24.5-29) -Co: NR -Dx: Idiopathic coxarthrosis (34/58.6%), Avascular necrosis (8/15.5%), Epiphysiolysis (5/8.6%), Consequence of septic arthritis (4/6.9%), Hip dysplasia (4/6.9%), Proximal femur fracture (2/3.5%), Reactive arthritis (1/1.7%) -Indication for surgery: Same as Dx	All the pts followed the same rehab protocol, walking fully weight bearing at 24 h initially assisted with a walking frame and later with 2 crutches. Before discharge, pts are taught to walk up and down stairs.	***SAQ** [*level of sports activity*]	**[1] Before the intervention** **-No of sports performed by the pt:** None (12); One (9); Two (11); Three (5); Four or more (9); Impact sports (32) **[2]The most practiced sport:** swimming [low impact] and contact sports [high impact] (17%)	**[1] After the intervention [7.5yrs]** **-No of sports performed by the pt:** None (10); One (13); Two (13); Three (5); Four or more (5); Impact sports (7) **[2]The most practiced sport:** swimming (23.75%), walking [low impact] (16.25%) and the exercise bike [low impact] (15%). **Decrease in sports activities practiced before and after THR:** Contact sports decreased from 17% to 1.25%.	**The avg time to resume sport activity:** 5 (3-10)mos	**-Adjusted for in analysis:** [1]sports activity according to the UCLA scale [2]sports activities practiced before and after THR [3]complications [4]recommendations given by doctors **-Mentioned, not adjusted for:** [1]age [2]sex

S/N	Study	Study population	Rehab Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors
		-Motivation for undergoing surgery: NR -Time between the onset of symptoms and THR: NR -Surgical approach: Anterolateral -Implant information: Non-cemented -Surgical side: NR				**Recommendations given by doctors:** -31% of patients did not receive advice from their physician. -65.2% were dissuaded from playing sports. -The recommended sports were swimming (44%) and static bicycle [low impact] (17.5%), correlating with the most practiced sports after THR. **Sports related complications:** -Only 3pts reported a feeling of hip instability when playing sports. -There was one case each for: (1)hip dislocation with femoral nerve injury after trauma (2) fracture-dislocation that required a hip prosthesis replacement.		

S/N	Study	Study population	Rehab Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors
2)	Lancaster et al. (193) USA Level of evidence: IV Single centre Follow-up: avr 4.4yrs	-Selected, Skiers -n=193(25.3%); Single THA -Mean age: avr. 66.2yrs(10.0) -Mean BMI: NR -Co: NR -Dx: NR -Indication for surgery: NR -Motivation for undergoing surgery: NR -Time between the onset of symptoms and THR: NR -Surgical approach: NR -Implant information: NR -Surgical side: NR	NR	**Online Survey**	**[1]Pts who had skied ≤5yrs prior to surgery i.e., in leading up to surgery:** n=83 (28.7%)	**[1]Skiing status after surgery for pts who skied within 5yrs leading up to surgery:** **•Did not Ski:** n=20 (26.0%) **•Skied (RTS):** n=63 (29.7%)	**NR**	**-Adjusted for in analysis:** [1]Skiing Activity and Ability Over Time (Skiing levels, time spent skiing, and distance from a ski resort) [2]procedure type [3]no. of joints replaced (group data) [3]reoperation (group data) **-Mentioned, not adjusted** for: [1] expectations for skiing after TJA
3)	Navas et al. (195) Germany Level of evidence: II Single centre Follow-up: 3.9yrs	-Selected, pts younger than 40yrs -36 pts [M=23; W=13] -Mean age: 31.5±5(rg 19-39)yrs -Mean BMI: 27.1±5.3 (17.3-43.8)kg/m2 -Co: NR	NR	**SCSAAQ** *[Sporting and physical activities]*	**[1]Before the onset of first symptoms** **No. of pt active in at least one recreational activity:** 16(44%) **The no. of sport disciplines practiced: W**(1.4) vs **M**(2.1)	**[1]After THA** **No. of pt active in at least one recreational activity:** 33(92%) -More pts $p <$ 0.0001 were active in sports at follow-up.	**-Within 3mo after THA:** 67% initiated sports and recreational activities **-Between 3&6 mo:** 17% **-6mo:** 17%	**-Adjusted for in analysis:** [1]sex **-Mentioned, not adjusted for:** [1]laterality [2]age [3]BMI [4]yrs of follow-up [5]dx

S/N	Study	Study population	Rehab Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors
		-Dx: secondary OA due to FAIS (6 hips); DDH (19 hips), Trauma (10 hips); AVN of the femoral head (5 hips) -Indication for surgery: NR -Motivation for undergoing surgery: NR -Time between the onset of symptoms and THR: 4.8±4.4 (0.5-23)yrs -Surgical approach: NR -Implant information: non-cemented Surgical side: L (20); R (20)			**Sports disciplines:** **1.Long Walks:** n=8 (22.2%) **2.Biking:** n=12 (33.3%) **3.Hiking:** n=5 (13.9%) **4.Nordic-Walking:** n=1 (2.8%) **5.Fitness Training:** n=6 (16.7%) **6.Alpine skiing:** n=4 (11.1%) **7.Jogging:** n=2 (5.6%) **8.Soccer:** n=2 (5.6%) **9.Handball:** n=2 (5.6%) **10.Volleyball:** n=1 (2.8%) **11.Golf:** n=1 (2.8%) **Sports disciplines [W vs M]:** **1.Hiking** **W:** n=1 (2.8%) **M:** n=4 (11.1%)	**The no. of sport disciplines practiced: W**(3.7) vs **M**(4.4) -There was no difference in the practiced sports disciplines before onset of the first symptoms and after THA with group. Both sex had an increase practiced disciplines ($p <$ 0.0001). **Sports disciplines:** **1.Long Walks:** n=27 (75%) <0.0001 **2.Biking:** n=29 (80.6%) <0.0001 **3.Hiking:** n=21 (58.3%) <0.0001 **4.Nordic-Walking:** n=6 (16.7%) 0.063 **5.Fitness Training:** n=23 (63.9%) <0.0001 **6.Alpine skiing:** n=6 (16.7%) **7.Jogging:** n=8 (22.2%) 0.031		

S/N	Study	Study population	Rehab Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors
					2.Long Walks **W:** n=3 (8.3%) **M:** n=5 (13.9%) **3.Biking** **W:** n=4 (11.1%) **M:** n=8 (22.2%) **4.Nordic Walking** **W:** n=0 **M:** n=1 (2.8%) **5.Fitness Training** **W:** n=0 **M:** n=6 (16.7%) **6.Soccer** **W:** n=0 **M:** n=0 **The frequency (sports sessions per wk):** Pts were active 1d per wk **The frequency (sports sessions per wk): M vs W** -W were active 1d per wk -M were active 0.8d per wk **The min session length per wk:**	**8.Soccer:** n=2 (5.6%) 0.500 **9.Handball:** n=2 (5.6%) 0.500 **10.Volleyball:** n=3 (8.3%) 0.250 **11.Golf:** n=1 (2.8%) 0.500 **Sports disciplines [W vs M]:** **1.Hiking** **W:** n=5 (13.9%) **M:** n=16 (44.4%) <0.0001 **2.Long Walks** **W:** n=12 (33.3%) **M:** n=15 (41.7%) 0.002 **3.Biking** **W:** n=11 (30.6%) **M:** n=18 (50%) 0.002 **4.Nordic Walking** **W:** n=3 (8.3%) **M:** n=3 (8.3%) 0.500 **5.Fitness Training** **W:** n=10 (27.8%) **M:** n=13 (36.11%) 0.016 **6.Soccer** **W:** n=0 and n=0		

S/N	Study	Study population	Rehab Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors
					23 ± 31.6 (0–120) mins **The min session length per wk [M vs W]:** **W:** 18.4 ± 33.1 min per session **-M:** 25.4 ± 31.2 min per session	**M:** n=0 and n=2 (5.6%) 0.500 -Overall, there was a significant increase in the types of sports performed before onset of the first symptoms and after THA. **The frequency (sports sessions per wk):** Pts were active 3x per wk **The frequency (sports sessions per wk): M vs W** M and W were both active 3x times per wk -M and W participated in sports at the same frequency after THA (p = 0.869) **The min session length per wk:** 82 ± 40.8 (0–150) min		

S/N	Study	Study population	Rehab Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors
						The min session length per wk [M vs W]: **W:** 85.4 ± 34.3 min per session **M:** 80.2 ± 47.3 min per session -There was no postop significant difference (p = 0.716) in session length per wk between M and W. -The duration and frequency of sports activities showed a significant increase ($p < 0.0001$). **Effectiveness of THA:** 85% of the pts reported an enhancement in sports and recreational activity due to THA. **Complications:** No revision surgery had to be performed. However, 2pts presented a leg		

S/N	Study	Study population	Rehab Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors
						length difference of 1 cm.		
4)	Pioger et al. (136) France Level of evidence: IV Multi-centre (French Golf Federation) Follow-up: min 2yrs	-Selected, Active Golfers -599 pts [M=492(82.1%); W=107(17.9%)]; Uni THA -Mean age: 66.9yrs(7.5, rg 43-90yrs) -Mean BMI: NR -Co: NR -Dx: NR -Indication for surgery: NR -Motivation for undergoing surgery: NR -Time between the onset of symptoms and THR: NR Surgical approach: Posterior(66.3%); DAA(24.6%); Hardinge(0.7%); Unknown(5.2%) Implant information: Cemented(31.7%); non-cemented(63.1%);	NR	**Email survey**	**[1]Before THA:** **-Handicap:** 25.2 (12.8) **-Pain VAS:** 6.35 (1.9) **-Weekly playtime (h):** 8.8 (5.7)	**[2]Min 2yrs after THA** **-Handicap:** 23.4 (11.1) *Improvement in handicap of 1.8 from pre to postop (P = .012) **-Pain VAS:** 2.5 (1.7) *A significant decrease P < .001 in hip pain while playing golf was observed. *Pain was located in the operated thigh in 40% of the cases. **-Weekly playtime (h):** 9.3 (5.9) *The avr wkly playtime was increased (P = .24 NS) **-RTS:** n=590 (98.5%) returned to golf	**The median time to return to golf (corresponding to the first 18-hole course completed):** 4.73mos (4.15; rg: 0.7-36)	**-Adjusted for in analysis:** [1]hand dominance (R or L) [2]surgical side [3]handicap [4]time to return [5]age **-Mentioned, not adjusted for:** Pain

S/N	Study	Study population	Rehab Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors
		Hybrid(5.2%); Unknown(n=192) Surgical side: L (50.8%); R (49.2%)				**-Not able to go back on the course:** n=9 **-Experience during or after golfing activity of the n=9 who did not return to golfing:** ***n=4** experienced resting joint pain ***n=5** felt pain (2 reported buttock pain and 3 a groin pain) **Predictive factors of return to golf:** **-No significant difference regarding delay from surgery to golf activity (*P* > .05):** Golfers who had (1)undergone a right-side THA (2)those who had a left-side THA. **-Strong correlation found between preop handicap and time to return:**		

S/N	Study	Study population	Rehab Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors
						(1)Practice (*P* = .0003) (2)18-hole golf course (*P* < .0001) with stronger players returning earlier.		
5)	Osawa et al. (192) Japan Level of evidence: III Single centre Follow-up: mean 3.3yrs	-Selected, Return to sports as much as or more than before surgery (S group); Could not participate in sports as much as before surgery [N group] -165pts: S group [n=68(41%); M=9/F=59]; N group [n=97(59%); M=29/F=68] -Mean age: S group [63.3±11.8]; N group [61.3±12.6] -Mean BMI: S group [23.7±3.6kg/m2]; N group [24.1±3.3kg/m2] -Co: NR -Dx (OA/Osteonecrosis of	Walking training and ROM training with full weight-bearing was allowed in both groups. Regarding sports instruction after THA, hard contact sports and active marine sports were not allowed. The combined movement of hip flexion and internal rotation, which is at risk of dislocation was prohibited for 6mos after surgery.	**Sports activities** *[each item was evaluated on a 3-point scale of low, intermediate, and high impact]* **Anxiety about participating in sports after THA** *[6 items of pain exacerbation, joint flexibility, implant loosening, falls, dislocation, and infection were evaluated on a 5-point scale on a verbal rating scale as to*	**[1]Participation in sports before THA** **•Most popular sport** **-Walking:** n=77(47%) **-Swimming:** n=54(33%) **-Golf:** n=35(21%) **S group:** n=68(41%) **N group:** n=97(59%)	**[1]Participation in sports mean 3.3yrs after THA** **•Most popular sport** **-Walking:** n=76(46%) **-Swimming:** n=37(22%) **-Muscle training:** n=25(15%) **RTS rate:** **-S group:** 79%; n=35(21%) did not participate in sports. **-N group:** n=62 continued sports with reduced sports intensity. **Independent risk factors for return to sports after THA**	**NR**	**-Adjusted for in analysis:** [1]sex [2]age [3]BMI [4]anxiety of dislocation [5]postop Japanese Orthopaedic Association Hip-Disease Evaluation Questionnaire (JHEQ) **-Mentioned, not adjusted for:** None

S/N	Study	Study population	Rehab Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors
		the femoral head): S group [61/7]; N group [73/24] -Indication for surgery: NR -Motivation for undergoing surgery: NR -Time between the onset of symptoms and THR: NR -Surgical approach: NR -Implant information (Cemented/non-cemented): S group [4/67]; N group [10/108] -Surgical side (Bilateral THA): S group [n=11]; N group [n=21]		*whether they were inhibitors of postop sports participation]*		-Male sex (p=0.029) -Anxiety of dislocation (p<0.01)		

Levels of evidence: I = randomized controlled study, II = prospective study, III = retrospective [comparative] study, IV = retrospective case series

AAHKS **American Association of Hip and Knee Arthroplasty Surgeons;** ***ASA*** **American Society of Anaesthesiologists;** ***ADL*** **activities of daily living;** ***AVN*** **Avascular necrosis;** ***avr average; approx*** **approximate;** ***bil*** **bilateral;** ***BMI*** **body mass index;** ***CES-D*** **Centre for Epidemiological Studies Depression Scale;** ***Co*** **co-morbidities;** ***Dx*** **Diagnosis;** ***DDH*** **developmental dysplasia of the hip;** ***DDA*** **Direct Anterior Approach;** ***DJD*** **degenerative joint disease;** ***d*** **day(s);** ***F*** **female;** ***GRC*** **global rating of change score;** ***HA*** **hydroxyapatite;** ***HRA*** **Hip Resurfacing Arthroplasty;** ***HHS*** **Harris Hip Score;** ***HOOS*** **Hip Osteoarthritis Outcome Score;** ***HAAS*** **High-Activity Arthroplasty Score;** ***h*** **hour(s);** ***IPAQ-SF*** **International Physical Activity Questionnaire Short Form;** ***QoL*** **Quality of life;** ***IA*** **Inflammatory arthritis;** ***Inc*** **Inclusion;** ***LEAS*** **Lower Extremity Activity Scale;** ***Lt*** **left;** ***meds*** **medication;** ***MET*** **Metabolic Equivalent of Task;** ***MOM*** **metal on metal;** ***MHHS*** **Modified Harris Hip Score;** ***M*** **male (men);** ***mo*** **months;** ***min***

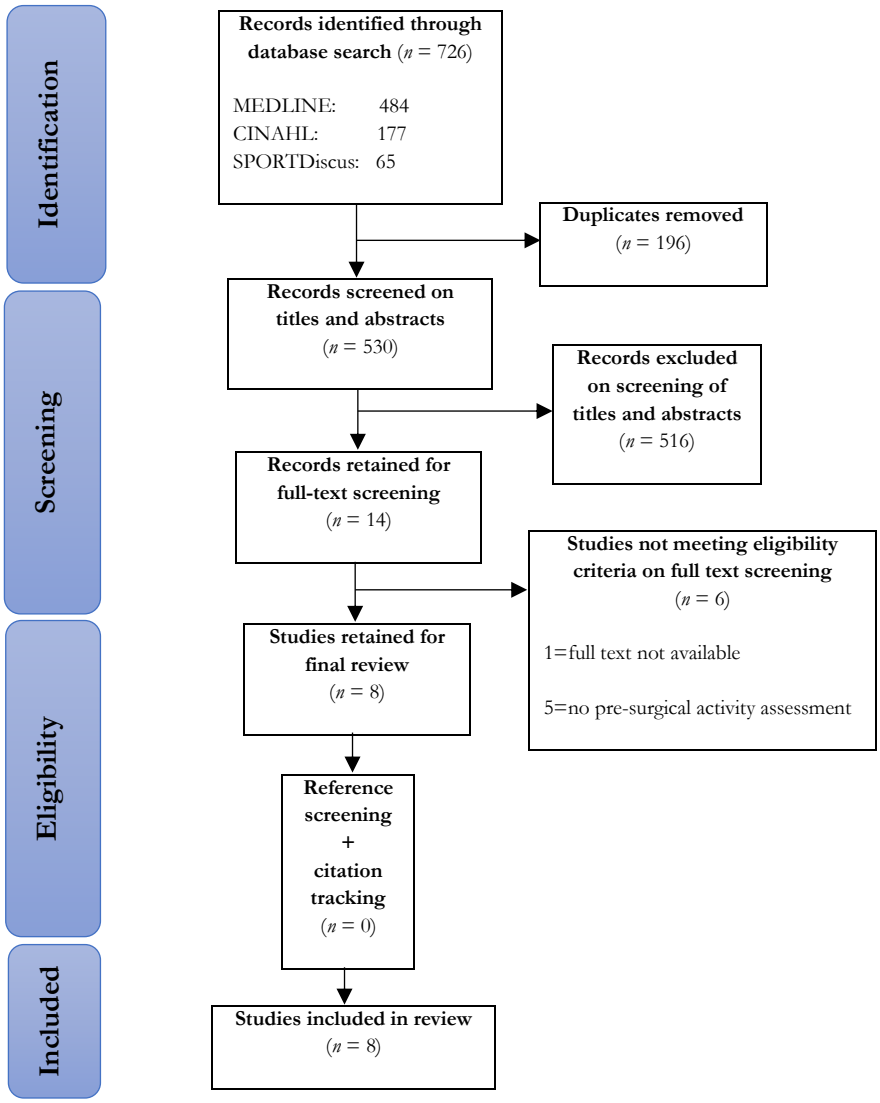
S/N	Study	Study population	Rehab Protocol	Outcome measure[s]	Preop activity + definition	Postop activity	Time to RTS	Confounding Factors

minimum; *n* number; *NS* not significant; *NRS* Numeric Rating Scale; *NPRS* numerical pain rating scale; *NR* not reported; *op* Operation; *OA* osteoarthritis; *O* older; *OHS* Oxford Hip Score; *Pri* primary; *Poly* polyethylene; *PTA* posttraumatic arthritis; *PA* physical activity; *Pt* patient/participant; *Postop* postoperative; *Preop* pre preoperative; *PT* physiotherapy/physiotherapist; *PASE* Physical Activity Scale for the Elderly; *PASIPD* Physical Activity Scale for Individuals with Physical Disabilities; *QOL* quality of life; *rg* range; *ROM* range of movement; *RA* rheumatoid arthritis; *Rehab* rehabilitation; *Rt* right; *RTS* return to sports; *RTA* return to activity; *SCSAAQ* Schulthess Clinic sports and activity questionnaire; *SAQ* sport activity questionnaire; *Sec* secondary; *TJR* total joint replacement; *THA* total hip arthroplasty; *THR* total hip replacement; *TKR* total knee replacement; *Uni* Unilateral; *UCLA* University of California Los Angeles activity score; *UKR* unicompartmental knee replacement; *VAS* Visual Analog Scale; *wk(s)* week(s); *WOMAC* Western Ontario and McMaster Universities Osteoarthritis Index; *W* women; *Y* younger; *yr(s)* year(s); *%* percentage/proportion.

Appendix 14.

Figure 5. Flow chart depicting the search process in identifying suitable papers for analysis [adapted from PRISMA guidelines for systematic reviews] - updated search 11 January 2024

Figure 5. Flow chart depicting the search process in identifying suitable papers for analysis [Adapted from PRISMA guidelines for systematic reviews]



Appendix 15.

Table 10. Methodological assessment according to QUIPS six domains of potential bias - updated search 11 January 2024

Study	Study participation	Study attrition [follow-up]	Prognostic factor	Outcome Measurement	Confounding factor	Analysis	Overall risk of Bias*
Payo-Ollero et al. (196)	Moderate	Low	Moderate	Moderate	Low	Moderate	Moderate
Lancaster et al. (193)	Moderate	High	High	High	Moderate	Moderate	High
Navas et al. (195)	Moderate	Low	Moderate	Low	Moderate	Moderate	Moderate
Ponzi et al. (134)	Moderate	Moderate	Moderate	Moderate	High	Moderate	Moderate
Pioger et al. (136)	Moderate	Moderate	Moderate	Moderate	Moderate	Low	Moderate
Takeuchi et al. (194)	Moderate	Moderate	Moderate	Moderate	Low	Moderate	Moderate
Harada et al. (197)	Low	High	Moderate	Moderate	High	Low	Moderate
Osawa et al. (192)	Moderate	Low	Moderate	Moderate	Low	Low	Moderate

QUIPS Quality in Prognosis Studies
****Low risk of bias: Rated as low or moderate in all six domains, with at least four domains being rated 'low'.***
****Moderate risk of bias: in-between quality was scored as 'moderate'.***
****High risk of bias: Two or more of the domains scored 'high'.***

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