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Title Page

Title: Patients' perceptions of physical activity before and after joint replacement: a systematic review with meta-ethnographic analysis.

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Abstract

Background: It has been perceived that people following hip (THA) or knee arthroplasty (TKA) have the capability, with reduced pain, to increase their levels of physical activity.

Objectives: To determine the attitudes and perceptions of people awaiting or having undergone THA or TKA to physical activity post-arthroplasty, and to identify potential facilitators or barriers to engage in active living and physical activity pursuits.

Methods: Systematic review of published and unpublished databases was undertaken from their inception to November 2014. Studies exploring the attitudes and perceptions of people awaiting or having undergone THA or TKA to physical activity post-arthroplasty were included. Data was analysed through a meta-ethnography approach.

Results: From 528 citations, 13 papers were eligibility, sampling 282 people post-THA or TKA. The literature was judged moderate to high quality. Following THA and TKA, people either wish to return to their pre-pathology level of physical activity or simply be able to engage in less physically demanding activities that are meaningful to them and their lifestyles. Barriers to engaging in higher levels of physical activity were largely related to limited information, which culminated in fear surrounding "doing the right thing" both for individual's recovery and the longevity of the joint replacement.

Conclusions: Whilst many people post-THA or TKA wish to return to pre-pathological physical activity status, there limited interest in actually undertaking greater levels of physical activity post-arthroplasty either for pleasure or health gains. Improvement in education and awareness of this may be key drivers to improve habitualisation of physical activity post-arthroplasty.

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Keywords: Osteoarthritis; arthroplasty; qualitative; expectations; active living; physical pursuits

Introduction

Total hip (THA) and knee arthroplasty (TKA) are two of the most common orthopaedic procedures undertaken worldwide. [1] The most frequent indications for surgery are pain, stiffness and atrophy associated with osteoarthritis. The principal objectives of these operations are therefore pain relief and to increase physical function in this predominantly older population.

With an ageing population, who present with multiple medical co-morbidities, the promotion of healthy lifestyles and in particular physical activity is considered a key driver to improving the health of this population. Physical inactivity is considered a major contributing factor to the global burden of disease and has subsequently become a global public health priority. [2] The evidence-base suggests that physical activity and particularly active living could significantly reduce the risks of many common medical conditions including: heart disease, diabetes, stroke and some cancers. [3] Therefore promotion and habitualisation of physical activity and active living in people's lifestyles, to recommended levels and above, may be viewed as an important health promotion goal.

Previous literature has suggested that people following joint arthroplasty do not quantifiably increase their levels of physical activity. [4, 5, 6] Studies by de Groot et al, [4] Lin et al [6] and Vissers et al [7] in the THA population report that accelerometery assessed movement-related activity and the percentage of time spent walking in 24 hours did not change pre- to post-operatively at six month follow-up. The current evidence suggests that people maintain their pre-operative physical activity levels, most notability remaining sedentary. However, it remains unclear why this is the case, with previous authors suggesting it may be related to both surgeon and patient uncertainty regarding implant failure and wear, and limited consensus on liberal recommendations on post-operative function and activity levels. [8]

Whilst these quantitative findings have been previously explored, no studies have attempted to assess the evidence-base regarding perception of physical activity following arthroplasty. The purpose of this study was therefore to explore, through meta-ethnography techniques, the

attitudes and perceptions of physical activity in people following hip or knee arthroplasty. We specifically aimed to determine whether people perceived that they wished to, or actually did, increase their physical activity following THA or TKA, and what the potential facilitators or barriers may be to engaging in physical activity following these orthopaedic procedures.

Methods

Study Selection

The primary search strategy was of the electronic databases: AMED, CINAHL, EMBASE, psycINFO, MEDLINE, Cochrane Clinical Trials Registry and Pubmed were reviewed from their inception to 17th November 2014. The search strategy adopted for the MEDLINE search is presented in **Table 1**. The strategy was amended for each database.

A secondary search was undertaken of the unpublished literature using the databases: ISI Web of Knowledge and OpenGrey (System for Information on Grey Literature in Europe), and the trial registries: the WHO International Clinical Trials Registry Platform, Current Controlled Trials, the United States National Institute of Health Trials Registry, and NIHR Clinical Research Portfolio Database, to identify on-going or unpublished studies. Reference lists from all potentially eligible studies and review papers were assessed to identify any previously unidentified studies. The corresponding authors of all included studies were asked to review the search results to identify any additional papers not previously identified.

Eligibility criteria

Studies were included if they investigated the attitudes, perceptions or expectations of people prior to or after THA or TKA towards physical activity. The target population were people awaiting or post-arthroplasty. People were included irrespective of their age, gender, severity of pathology, anatomical region of arthroplasty, or duration of arthroplasty in the instance where post-arthroplasty attitudes were under investigation. Studies were included irrespective of the age, origin of study or quality of the literature. Studies assessing health care professional's attitudes or perceptions were excluded.

The titles and abstracts of the search results were independently reviewed by two reviewers (VM, AB) and independently verified by a third reviewer (TS).

Data Extraction

Data were extracted from the original text onto a pre-defined data extraction table for each included study. This was conducted by one reviewer (TS) and independently verified by a second reviewer (SL).

Data included: sample size; age; gender; severity of symptoms prior to arthroplasty; indication for arthroplasty; duration of arthroplasty; joint arthroplasty undertaken; co-morbidities; previous joint arthroplasty; data collection methods; topics discussed including attitudes towards physical activity and exercise, in addition to any other health-lifestyle behaviours; analysis methods; and validation strategies.

Quality Assessment

Each included study was assessed using the Critical Appraisal Skills Programme Qualitative Critical Appraisal tool. [9] This tool consists of 10 items specifically assessing qualitative study designs with components including: appropriateness of design paradigm; sampling strategy; data collection and relationship between researcher and participant; ethical considerations; data analysis; interpretation of findings; and generalisability.

Each included study was independently appraised by one reviewer (TS) and verified by a second reviewer (SL).

Data Analysis

A meta-ethnography, as described by Noblit and Hare, [10] was the principal data analysis approach used. The principles of a meta-ethnography analysis are summarised in **Supplementary Table 1**. After reviewing all studies, all emerging themes and interpretive concepts were identified and placed in a grid to examine how the concepts juxtaposed or related to one another. [11] The relevant concepts were independently created by two reviewers (TS, SL) based on the primary data rather than prior knowledge. [11] Constant comparative techniques were then used to compare and relate how the emergent concepts related to the original texts.

These results were compared between each reviewer and consensus was reached through discussion to identify all agreed primary and secondary-order concepts.

The analysis involved the following three detailed phases:

Reciprocal Translation

The key concepts were examined through reciprocal translation, as suggested by Atkins et al's [11] interpretation of Noblit and Hare's [10] description. Papers were ordered chronologically, with emerging concepts analysed to be sensitive to possible changes in clinical management and social attitudes changes over time.

Through reciprocal translation, themes were refined into specific categories so the first paper was compared to the second. These collective themes compared to the third paper, and these collective concepts compared to the fourth and so on. [10]

Refutational Analysis

The categories generated were then re-examined against the primary data for "refutational analysis". This is a process where key concepts from each study are then compared and any contradictions within each study are examined to identify possible hypotheses for these. [11]

Lines of Argument

Each reviewer (TS, SL) undertook the refutational analysis to independently assess for similarities and differences between the categories from each study to develop a new interpretative concept. These new interpretative concepts are known as a "line of argument". [10] The three reviewers (SL, TS) then discussed the conclusions and formed a consensus of an overarching model.

Results

Search Results

The results of the search strategy are presented in **Figure 1**. A total of 528 papers were identified from the search strategy. Twenty-six were deemed potentially eligible according to our pre-defined eligible criteria. After reviewing the full-texts, 13 papers were deemed eligible and included in the review.

Characteristics of Included Studies

Participants: From the 13 included papers, 282 participants were reviewed (**Table 2**). This consisted of 144 people following TKA, and 134 following THA; four participants had other lower limb arthroplasty procedures. The cohort consisted of 104 males and 178 females with a mean age ranging from 59 years [12] to 76 years. [13] No studies reported the mean duration of pain symptoms and only Harding et al [14] reported the mean number of co-morbidities in their cohort (2.8). Three studies included patients who had previously undergone lower limb arthroplasty. [12, 15, 16]

Origin of study: One study was undertaken in the United States of America, [17] fours studies from Canada, [12, 18, 19, 20] two studies from the United Kingdom, [16,21] and one study each performed in New Zealand, [13] Turkey, [15] Australia, [14] Sweden, [22] Japan, [23] and the Dominican Republic. [24]

Timing of data collection: The qualitative investigations were performed post-operatively in nine studies, [12,13, 14, 15, 16, 20,21,22, 23] and longitudinally both pre- and post-operative in three studies. [17,18,19] The longest duration post-arthroplasty where participants were interviewed was to eight years, [12] with the majority gaining the attitudes of people up to six months post-arthroplasty. [14,16,18,20]

Data collection: Topics investigated in the interviews included pre-operative decision making and educational support, [13,16,17,18,19,22,23] the post-operative pathway and discharge [12,13,15,16,17,18,19,20,21,22,23] whereas only Harding et al [14] and Stenquist et al [24] specifically explored the attitudes to physical activities post-arthroplasty.

The data collection methods ranged from a combination of focus groups and individual interviews, [17,20] individual interviews, [12,13,14,16,18,19,21,22,23,24] whilst Sendir et al [15] collected their data with questionnaire and individual interviews.

Quality Assessment

A summary of the CASP results is presented in **Table 3**. The included studies were considered of moderate to high quality. Recurrent strengths across all included studies were that all clearly stated the aims of their research, appropriately using a qualitative methodology, all designed their studies to meet the objectives of the research questions, clearly stated the findings of their investigations and related the findings accurately to clinical practice implications to aid transferability. There was one recurrent limitation as demonstrated in 10 studies where the relationship between the researcher and participants was not adequately reported. [12,14,15, 16,17,18,19,20,22,24] Four papers did not clearly report how their recruitment strategy was undertaken, [14,15,18,22] whilst two studies were considered to poorly report the analysis of their qualitative data. [14,15]

Meta-ethnography

Five key themes arose from the evidence: increasing physical activity behaviours; desired return to pre-pathology (i.e. degenerative joint disease) physical activity levels; no wish to increase physical activity; facilitators to physical activity; barriers to physical activity engagement.

Theme 1: increasing physical activity behaviours;

There was limited evidence to suggest that people following joint replacement perceived their physical activity levels to have increased above pre-pathology status. Two studies reported this

attitude. Harding et al [14] cohort explored physical activity for people following THA, reported that most of their participants perceived that they were more physically active. This was associated with a reduction in pain, as may be expected, but also due to increased energy levels. Stenquist et al [24] cohort of both THA and TKA reported that 17 out of 18 participants perceived an increase in physical activity pursuits, over and above normal activities of daily living. A distinction was made however, that only half of this cohort increased their physical activity levels for 'health benefit' over increasing social engagement or pleasure. The motivation for physical activity may therefore vary between health versus social factors, which may be a driver for increased engagement.

Theme 2: desired return to pre-pathology physical activity levels

There was a greater evidence-based towards the notion that participants did not feel that their physical activity levels increased post-arthroplasty, but a desire existed to regain the same physical activity level they had achieved pre-pathology. Eight papers reported this expectation. [12,13,14,17,19,20,22,24] Frequently participants articulated the existence of 'goal-activities'. These were activities which they found increasingly difficult as their disease progressed, but post-operatively were activities they aspired to regain. For example, Jacobson [17] reported that participants aimed to perform activities that "they had been capable of doing without having to think about and without pain such as housework, gardening and walking the dog". This was seen as an incentive to surgery with a perceived attitude that surgery would enable them to return to their active lives, thereby reinforcing the perceived necessity of surgical intervention [12,13].

When physical activity was associated with sports and more rigorous activity, this distinction was more apparent. Respondents had little interest in engaging in new sports, rather wishing to return to sports that they had perceived as normal pre-pathology.[20] The objective for some participants was to return to a 'golden-age' as Gustafsson et al [22] reported. This was particularly apparent in participants when interviewed pre-operatively, with the hope that the arthroplasty would provide them with a new 'lease of life' in a diminished world pre-operatively.

Stenquist et al [24] suggested their participants made a distinction with the level of physical activity. Whilst there was an universal suggestion that participants increased their physical activity with 'obligatory' activities, which were personal activities of daily living such as washing and walking short distances, this did not translate to increasing longer walking capabilities. Nonetheless, the return to obligatory activities was seen as a major improvement to participant's quality of life and held in great esteem.

Theme 3: no wish to increase physical activity

An unexpected finding reported in one study, was the suggestion that some individuals did not wish to increase their physical activity levels post-arthroplasty. Hall et al [19] reported attitudes of low post-operative expectations. Participants reported the sole wish to be out of pain and to be able to undertake normal daily activities without pain and "did not want to achieve anything extraordinary".

Theme 4: facilitators to physical activity

Surprisingly only one study stressed the difference in perception of physical activity capabilities between THA and TKA. Stenquist et al [24] acknowledged that only one participant who received TKA began exercising for the first time when previously sedentary. The facilitator attributed to this exceptional case was encouraged from a family member.

The suggestion of external engagement and support resonates across the evidence when investigating possible facilitators for physical activity. [16,17,19,22] Jacobson [17] participants suggested that peer-support, as in being able to talk to others who have had a successful TKA, would have facilitated their whole recovery. Those who had had this opportunity valued it. Such contact was hypothesised to provide insight into the expected levels of physical activity which were an unknown to many participants. [17] The issue of social contact was seen as a major derogatory impact on physical activity recovery. Hall et al [19] stressed the importance of social contact to this population. They and Gustafsson et al's [22] participants suggested that this was

an incentive for physical activity, focusing people to socially integrate and to seek contact and networks which were lost during the early recovery period following arthroplasty.

A third facilitator to physical activity was the individual's own perceptions of physical activity as a 'personal enjoyment'. Harding et al [14] reported that members of their cohort who perceived physical activity as a personal enjoyment rather than being encouraged to improve health and achieve broader health goals. They and Stenquist et al [24] suggested that the motivation for physical activity was not to become healthier individuals, but to enjoy pursuits and activities, and these were far greater incentives to engagement than a public health/improving health driver. [14]

A final motivator to engage in physical activity was pain relief. The cohort reported that the loss of pre-arthroplasty pain and limited range of motion was a key facilitator in being able to engage in pre-pathology activities or to other physically demanding tasks. Fujita et al [23] associated this to a 'honeymoon' period in their THA population, with the first six to eight weeks being a period where pain was reduced and physical activity could be increased. Their cohort perceived this as a motivating time for people to undergo rehabilitation and may therefore be a captive period to engagement in physical activity education.

Theme 5: barriers to physical activity engagement

Three sub-themes arose around possible barriers to physical activity engagement in people following joint arthroplasty. The most frequently reported barrier to physical activity engagement was that of lack of information on recovery, expected capability and fear of 'damaging' the recovery process and implant [13,15,16,18,20,21,23,24]. Across the literature, irrespective of country of origin or THA or TKA procedure, there appeared a dearth of patient education on physical activity expectations and capabilities. [13,15,18,20,21,24] There were recurrent responses that participants were afraid of doing harm by over-extending themselves and were not sure on the duration until they would be 'back to normal'. [13] A trial and error approach, or being reliant on internet or popular press sources to increase physical activity, was

seen as a result of limited pre- and post-operative educational provision. [13,20] This was not viewed positively. Perry [13] attributed this to a non-patient centred approach. Instead of professional advice, which was regarded by Westby and Backman [20] as being disparate with variation between physiotherapists, general practitioners and surgeons, individual's graded their physical activity on pain which, as a guide, they became fearful of. The term 'fear' was also attributed to damage, and the concern that physical activity would damage the arthroplasty procedure both in the recovery period [15] but also affect the longevity of the implant. [23] Therefore anxiety surrounding implant durability and education on this was a growing anxiety over the first post-operative year as new physically demanding activities could become theoretically attainable with reduced joint symptoms in this population. [23]

Harding et al [14] was the only paper to report the concept of 'substitution of reasons' for not engaging in physical activity. They reported that pre-arthroplasty, individuals were unable to engage in physical activity due to joint pain and limitation. Post-arthroplasty, individuals justified not engaging in physical activity due to 'new limitations' most notably age and co-morbidities. In this group of patients, education tailored to increasing physical activity based on their health limitations and potential health beliefs surrounding age and co-morbidities is consequently valuable to consider.

Line of Argument

The line of argument drawn from the meta-ethnography is presented in **Figure 2**. Based on the meta-ethnography, it appears that following THA or TKA people either wish to return to their pre-pathology levels of physical activity or simply be able to engage in less physically demanding activities, which are meaningful to them and their lifestyles. Barriers to engaging in higher levels of physical activity were largely related to limited information, culminating in fear surrounding "doing the right thing" both for individual's recovery and the longevity of the joint replacement. Key facilitators to engagement surround social integration and the incentive of increasing social

contact and personal enjoyment of social physical activities, with the exception being the desire to engage in physical activity from a 'health' benefit.

Discussion

Following THA or TKA people want to return to their pre-pathology levels of physical activity. However, there is little interest in actually undertaking greater levels of physical activity (than pre-pathology levels) either for pleasure or health gains. People appear to value the resolution of symptoms to allow them to undertake normal activities of daily living and more sedentary physical activity tasks such as gardening and walking, rather than more physically demanding sporting pursuits. Barriers to engaging in physical activity were largely related to limited or poor education and awareness of what and when is the correct level of activity during the recovery phases post-arthroplasty. Key facilitators to increasing physical activity uptake were individualising physical activity to the patient, and linking this to social integration and activities which were perceived as pleasurable rather than for health benefits.

A recurrent finding was the association of individualising physical activity advice and recommendations to the individual. This coupled with the finding that greater social integration and identifying activities, which were perceived as pleasurable, were both components that could increase the uptake of physical activity in this population. The finding that physical activity engagement can be promoted by identifying pursuits deemed meaningful to the individual has been previously reported in other populations such as rheumatoid arthritis, [25] colon cancer [26] and in older people. [27] Harding et al [14] emphasised that physical activity recommendations should be structured around people's interest and enjoyment rather than health improvement goals. They suggested that titling physical activity as a health benefit or for health goals was not seen as an effective driver, whereas people were more receptive to increasing physical activity if it was perceived to benefit their lifestyle and social engagement. In addition to social engagement, participants in this study, and in others on promotion of active living, have supported the notion that social support and community support are perceived as important incentives to increase physical activity in older people. [28] These are key findings

when considering the content and form of delivery of patient education and advice on physical activity promotion in this population.

Previous quantitative research has reported that people following lower limb arthroplasty do not increase their levels of physical activity. [5,6,8] These findings are mirrored in this exploration of qualitative research. Whilst the majority of participants interviewed in the included studies reported that physical activity did not significantly improve, maintaining their activities of daily living, the ease and capability of performing such activities to facilitate 'active living' was significantly improved across the cohorts. This was highly valued by participants. Accordingly, the improvement in pain management, whilst not quantitatively increasing physical engagement, appeared to improve the quality of these participant's lives. It must therefore be acknowledged that the clinical rationale for performing a THA or TKA may therefore not be to increase physical function, but to reduce pain and relieve symptoms to facilitate the continuity of previous levels of function.

There is currently a number of papers providing guidance and recommendations on counselling younger patients following lower limb joint arthroplasty on the return to sports and athletic performance. [29,30,31] Whilst these are valuable, the mean age people undergo THA or TKA is 69 years.[32] There is a dearth of literature on what advice and support should be provided to this older population on returning to physical activity. This was mirrored by this study's findings where limited education and awareness provided to patients was a fundamental barrier to engaging in physical activity. Whilst older people may perceive physical activity as more sedentary activities such as housework, gardening and walking,[33] engagement in these activities, rather than gym attendance, has the potential for a significant impact on the physical and mental health of this population.[34,35] Additionally, given the delirious health effects of sedentary lifestyles, there is a strong rationale not only to increase physical activity to pre-arthroplasty levels, but to aim for higher, pre-pathology, levels, to reduce the risks of conditions such as: heart disease, diabetes, stroke and some cancers. [3] Given this importance, and the clear

barrier which educational provision has on physical activity, further research is warranted to explore how to better inform all age groups of people who undergo THA or TKA on what and how physical activity should be incorporated into their lives.

This review presented with three major limitations. Firstly, the current evidence-base presented a limited distinction in the attitudes and perceptions of people following THA or TKA. This may be considered a surprising finding given the clinical outcomes of THA are largely considered better than those of age- and gender-matched TKA cohorts in respect to pain[36] and functional outcomes. [37,38] Furthermore, with the current recommendation on movement restrictions applied by some surgeons, most notably in flexion and rotation, it may be expected that patients following THA would present with some added anxieties about physical activity and prosthesis dislocation compared to the TKA population.[39] Conversely, the residual pain experienced by typically 20% to 30% of all patients post-TKA may be perceived as a barrier to physical activity.[40] None of these findings were reported within the current qualitative evidence-base in physical activity. Whether this was related to such questions not being asked, or a possible self-selection in sampling where people who did not, or had no intention of engaging in physical activity, were not interviewed in the included studies, remains unclear. Secondly, there was limited data overall, and particularly in respect to the impact of co-morbidities on physical activity. Peters et al [41] highlighted the prevalence of major co-morbidities such as musculoskeletal pain, hypertension and cancer which can all impact on exercise and physical activity participation. Further research to explore the potential importance of this as a barrier is therefore warranted. Thirdly, there was limited data on how physical activity changed during the recovery period. There was considerable variation between the studies in respect to when participants were interviewed post-arthroplasty, ranging from the first week post-operatively [19] to eight years [12]. No studies explored how response and attitudes to physical activity changed over time. Given that functional capability changed [7], this exploration would be a valuable addition to the evidence-base.

A major finding from this study was the limited variability in attitudes of people to physical activity following arthroplasty from across the world. The research was undertaken across nine developed countries worldwide. Possible variability in normal physical pursuits or customs between western and eastern countries and cultures did not appear to influence the responses provided. [2,42,43] At a more local level, the individual's environment also did not appear to be perceived facilitators or barriers to physical activity engagement following joint replacement. Built environment factors such as pavements, streetlights, degree of motor traffic and access to parks and open space have previously been acknowledged as having an important association to people's access and engagement with active transport and physical activity in general. [44,45] Whilst social access and social engagement were perceived as important to this population, based on the current evidence, it remains unclear how important these are to people following joint arthroplasty, and whether this changes during the different phases of an individual's recovery following surgery.

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Ethical considerations: None.

Figure and Table Legends

Figure 1: PRISMA flow-chart of search results.

Figure 2: Schema of the line of argument.

Table 1: MEDLINE search strategy.

Table 2: Summary of the CASP critical appraisal results.

Table 3: Summary of study characteristics.

Supplementary Table 1: Principles to meta-ethnography

Main Messages

- People following joint replacement have a low expectation to participate in greater sports and physical activity pursuits compared to pre-joint disease levels.
- Some people post-THA or TKA have a perceived wish to return to pre-pathological physical activity status, but limited and inconsistent education and advice are major barriers to facilitate this desire.
- Education on physical activity progression and on the durability of their arthroplasty implant may increase people's confidence in undertaking greater levels of physical activity.
- Individualising physical activity targets and greater social integration post-arthroplasty are key facilitators to physical activity in this population.
- Further research is required to develop interventions to encourage longer-term habitualisation of physical activity and active living for this population who may present with multiple medical co-morbidities.

Current Research Questions

- What is the effect of built environment factors such as pavements, streetlights, degree of motor traffic and access to parks and open space on physical activity engagement for people following joint replacement?
- What is the effect of residual symptoms such as pain and stiffness following joint replacement, on physical activity engagement?
- What is the most effective means for clinicians to promote physical activity following joint replacement?

MVQs (correct answers in bold)

1. What symptoms do people following TKA or THA perceive as the most important marker on when to increase or decrease physical activity during their post-operative recovery?

- Joint stiffness
- **Pain**
- Muscle atrophy
- Personal confidence

2. What level of physical activity does the current evidence-base suggest people perceive as their target level post-operatively?

- Less than pre-joint disease (i.e. commencement of symptomatic osteoarthritis)
- Same level as pre-arthroplasty
- **Pre-joint disease levels (i.e. commencement of symptomatic osteoarthritis)**
- Greater than pre-joint disease levels (i.e. commencement of symptomatic osteoarthritis)

3. There is some evidence to suggest that people use substitute reasons for not participating in physical activity. Identify the correct substitute in the list below:

- Weather
- Diet
- Family attitudes
- **Other medical co-morbidities**

4. Which is the following strategies did this paper suggest could provide the largest impact on improving physical activity post-arthroplasty?

- **Greater pre- and post-operative education on physical activity recommendations**
- Greater levels of post-operative rehabilitation
- Nutritional support
- Regular pain medication review

5. The results suggested that the perception of desired and attained physical activity were not influenced by a number of factors. These included whether participants underwent a TKA or THA, age, gender or geographical location. Which of the following was also identified as not having an influence on physical activity from the current evidence-base?

- Duration of pre-operatively joint disability
- Intensity of rehabilitation
- Distance from acute hospital to home
- **Built environment**

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Figure 1: PRISMA flow-chart of search results.

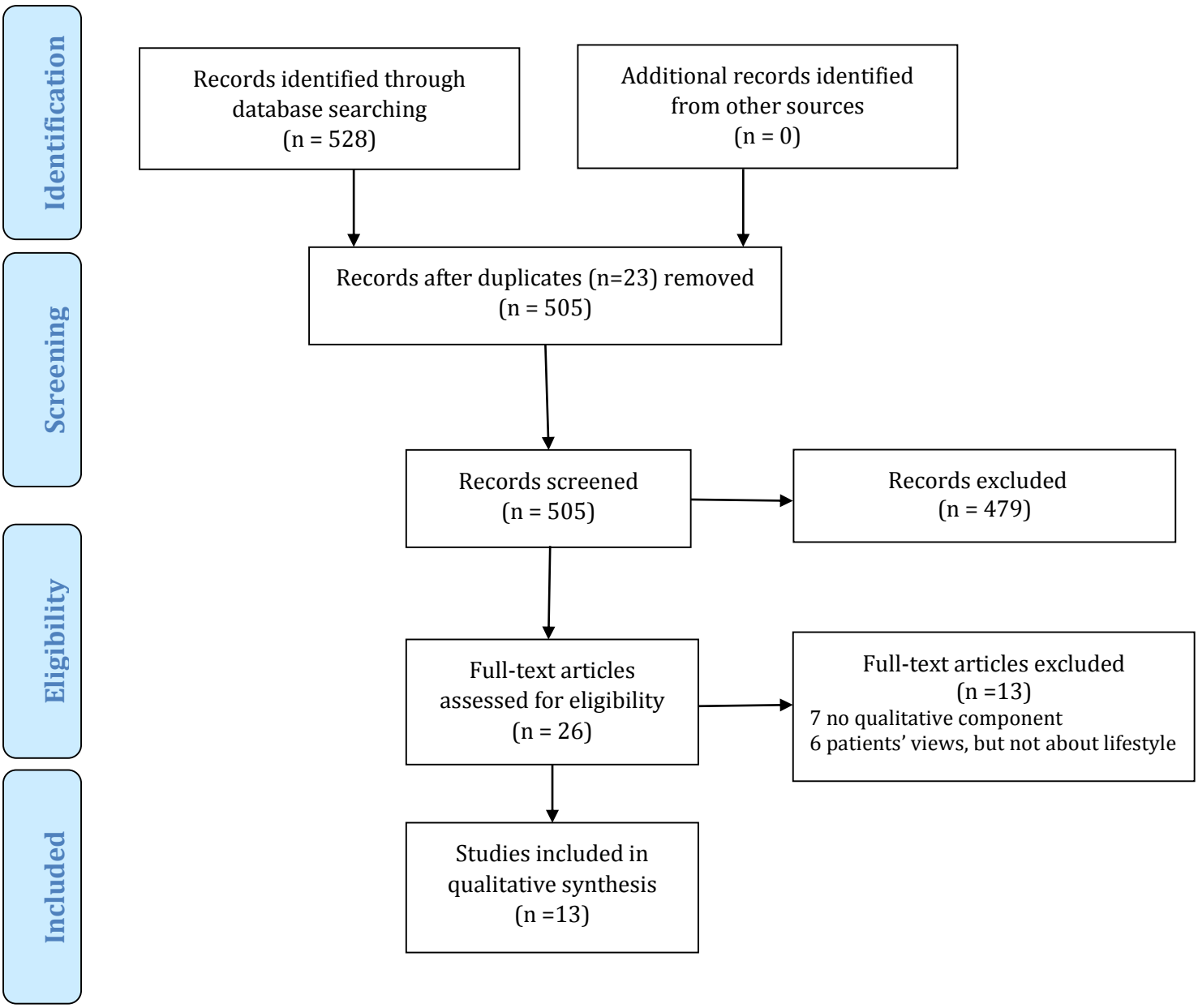

Figure 2: Schema of the line of argument.

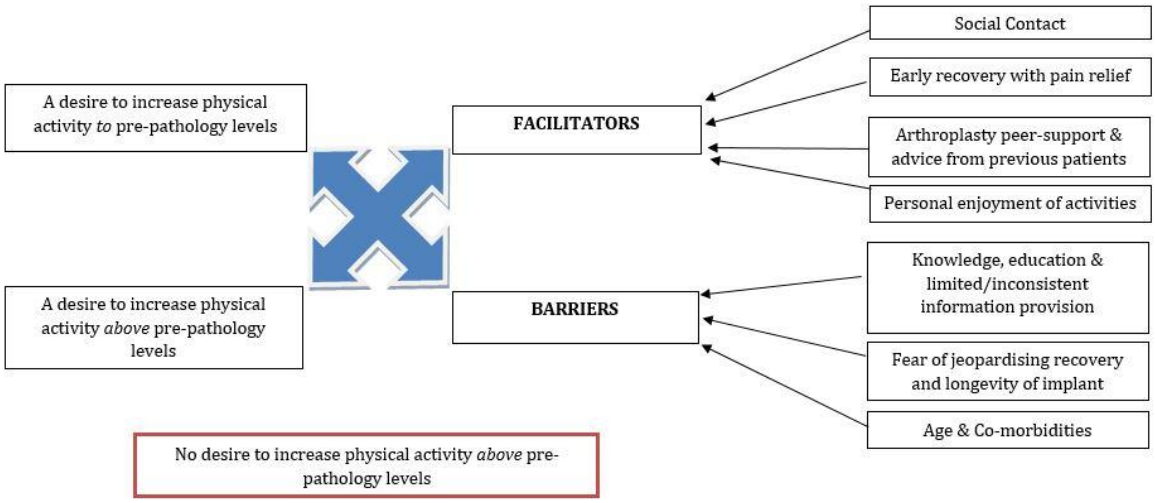

Table 1: MEDLINE search strategy

1. exp Knee/
2. exp Osteoarthritis/
3. liv$.tw.
4. experience$.tw
5. perspective$.tw
6. attitude$.tw
7. exp qualitative/
8. OR/3-7
9. AND/1,2,8

Table 2: Summary of the CASP critical appraisal results

Study	Criterion									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Crooks [12]	✓	✓	✓	✓	✓	x	✓	✓	✓	✓
Fujita et al [23]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Gustafsson et al [22]	✓	✓	✓	x	✓	x	x	✓	✓	✓
Hall et al [19]	✓	✓	✓	✓	✓	X	✓	✓	✓	✓
Harding et al [14]	✓	✓	✓	x	✓	x	✓	x	✓	✓
Jacobson [17]	✓	✓	✓	✓	✓	x	✓	✓	✓	✓
Nasr et al [21]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Perry [13]	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sendir et al [15]	✓	✓	✓	x	x	x	✓	x	✓	✓
Soever et al [18]	✓	✓	✓	x	x	x	✓	✓	✓	✓
Stenquist et al [24]	✓	✓	✓	✓	x	x	x	✓	✓	✓
Westby and Backman [20]	✓	✓	✓	✓	✓	x	✓	✓	✓	✓
Woolhead et al [16]	✓	✓	✓	✓	✓	x	x	✓	✓	✓

✓ - Satisfied; x – Not satisfied; N/C – Not clear

CASP Critical Appraisal Criteria

1. Was there a clear statement of the aims of the research?
2. Is a qualitative methodology appropriate?
3. Was the research design appropriate to address the aims of the research?
4. Was the recruitment strategy appropriate to the aims of the research?
5. Were the data collected in a way that addressed the research issue?
6. Has the relationship between researcher and participants been adequately considered?
7. Have ethical issues been taken into consideration?
8. Was the data analysis sufficiently rigorous?
9. Is there a clear statement of findings?
10. Is the research valuable to clinical practice?

Table 3: Summary of study characteristics

Study: country	Sample Size	Gender (m/f); Mean Age (yrs)	Mean duration of pain symptoms	Co-morbidities	Joint Arthroplasty (TKA/THA)	Duration of Arthroplasty	Previous arthroplasty	Discussion areas	Method of Data Collection
Crooks [12]; Canada	14 (11 hip replacement-3 TKA)	6/8; 59 (42-77)	N/S	N/S	N/S	Range 0-8 years.	Yes 2 previous hip resurfacing; 1 previous TKA	Health status; logistics of care abroad; experiences of care abroad; decision-making; ethical considerations.	Semi-structured telephone interviews
Fujita [23]; Japan	20 (20 THA)	7/13; 62 (46-91)	N/S	N/S	20 THA	6 weeks to 3 years post-THA	N/S	Patients perceptions before and after THA and its impact on their lives.	Individual interviews
Gustafsson [22]; Sweden	16 (11 THA, 5TKA)	8/8; (67-85)	N/S	N/S	11 THA, 5TKA	12 months post-arthroplasty	N/S	Pre-op, then 1 week, 6months, 12 months post-arthroplasty to assess experiences longitudinally.	Individual interviews.
Hall [19]; Canada	15 (15 TKA)	9/6; 68.3 (60-80)	N/S	N/S	15 TKA	1-3 weeks pre-TKA, to 1 year post-TKA	N/S	3 interviews at 3 intervals during pathway to assess experiences longitudinally.	Individual interviews
Harding [14]; Australia	10 (5THA; 5 TKA)	5/5; 69.5 (51-78)	N/S	Mean number of comorbidities: 2.8	5THA; 5 TKA	6 months	N/S	Physical activity post-THA or TKA. Barriers, enables, rationale foe engagement.	Individual interviews
Jacobson [17]; USA	27	13/14; 66 (45-83)	N/S	N/S	TKA	Pre-operatively (focus groups); post-	None (all primary unilateral)	Pre-operative and decision making to have TKA, pre-op education and support; post-operative management	Focus group (n=17); individual interviews

						operatively (within 2 months)		and operation pathway; post-op and discharge rehab.	(n=10) All pre-op
Nasr [21]; UK	20 (20 THA)	7/13; 68 (44-83)	N/S	N/S	20 THA	12 to 24 months post-THA	N/S	Experience of the THA (in general)	Individual interviews
Perry [13]; New Zealand	11 (4 TKA; 4 THR; 3 lower limb trauma surgery)	3/8; 76 (66-88)	N/S	N/S	N/S	6-12 weeks post-operatively.	N/S	Pre-operative, within hospital and post-discharge recovery.	Individual interviews
Sendir [15]; Turkey	74 (42 THA; 32 TKA)	22/52; 65.0 (21-87)	N/S	N/S	42 THA; 32 TKA	48 hours post-hospital discharge	50 people had had previous surgery	Patient pathway and expectations.	Questionnaire and interviews
Soever [18]; Canada	15 (9 THA; 6 TKA)	3/13; (23-89)	N/S	N/S	9 THA; 6 TKA	5 pre-op; 15 3 to 6 months	N/S	Educational needs pre- and post-arthroplasty	Individual interviews
Stenquist [24]; Dominican Republic	18 (18 TKA; 14 unilaterals; 4 bilaterals)	4/14 (66.5 (34-80)	N/S	N/S	(18 TKA; 14 unilaterals; 4 bilaterals)	N/S	N/S	Physical activities post-TKA.	Individual interviews.
Westby and Backman [20]: Canada	32 (13 THA; 19 TKA)	14/18; (46-81)	N/S	N/S	13 THA; 19 TKA	1-11 months	N/S	Patient pathway and recovery. Interacton of healthcare professionals and patients.	Focus groups (11); Interviews (8)
Woolhead [16]; UK	10 (10 TKA)	4/6; 64 (40-81)	N/S	N/S	25 TKA	6 months post-TKA	2 previous TKA, 1 previous THA.	Pre-TKA and 10 participants interviewed at 6 months post-TKA	Individual interviews

f- females; m – males; N/S – Not Stated; THA – Total Hip Arthroplasty; TKA – Total Knee Arthroplasty: UK – United Kingdom; USA – United States of America; yrs – years.

Supplementary Table 1: Principles to meta-ethnography

- Meta-ethnography is an analysis approached used to synthesis qualitative research.
- It is an interpretive approach and can has the potential to syntheses current evidence and generate new understanding and research questions from the collective evidence.
- The analysis can be divided into four phases:
    - Phase 1: creating a list of themes and exploring how they are related across the included studies.
    - Phase 2: comparing these concepts raised from each study and determining how and why they may agree or disagree with one another based on their characteristics. This is termed reciprocal translation.
    - Phase 3: data following the reciprocal translation is -examined against the primary individual paper's data to examine where any key concepts from the analysis contradict individual studies. This is termed refutational analysis.
    - Phase 4: developing new theory or knowledge from the evidence. This is terms a "line of argument" synthesis. This higher order interpretation is also termed third-order where the reviewers generate their interpretation of the collective evidence-base.