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Barriers and facilitators to physical activity in people with hip or knee osteoarthritis: Protocol for a systematic review of qualitative evidence.

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ABSTRACT

Introduction This protocol aims at describing the objective and methods to be followed in a systematic review of qualitative studies on barriers and facilitators to physical activity (PA) in people living with hip or knee osteoarthritis (OA).

Methods and analysis The databases MEDLINE, EMBASE, PhychINFO, Web of Science, CINAHL, SPORTDiscus, Scopus and grey literature sources will be electronically searched. Hand search of qualitative-research-centred journals, reference screening of relevant reviews and inquiries to active researchers on the field will complement the search. Studies will be selected if they apply qualitative or mixed-methods designs to directly explore factors that correspond to engagement in PA/ exercise or, the perceptions regarding PA/ exercise in people with hip or knee OA. The CASP Qualitative Checklist and the evaluative criteria of credibility, transferability, dependability and confirmability will be applied for the study appraisal. Two independent reviewers will perform the search, study selection and study appraisal. Thematic synthesis will be used for synthesising the findings of the primary studies and the process and product of the synthesis will be checked by a second researcher. ConQual approach will be used for assessing the confidence in the qualitative findings.

Ethics and dissemination This systematic review will inform our understanding of the physical activity determinants and how to optimise behaviour change in people living with hip or knee osteoarthritis. The review findings will be reported in the form of an article prepared for publication in a peer-reviewed journal and for presentation at a national or international conference. The study raises no ethical issues.

Registration number PROSPERO CRD42016030024

Keywords: hip/ knee osteoarthritis, physical activity, barriers, facilitators

Strengths and limitations:

- To the best of our knowledge this is the first systematic review of qualitative evidence on barriers and facilitators to physical activity in people with hip or knee OA. Further, differences in barriers and facilitators between (i) exercise and lifestyle PA and (ii) uptake and maintenance of PA will be explored. This will largely contribute to our understanding of physical activity behaviours and provide information of how to optimise behaviour change in the population of interest.
- Rigorous methods will be applied and reported at all stages according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement.
- The level of confidence in each review finding will be reported.
- One limitation of the qualitative systematic review is that the synthesis of barriers and facilitators will not be based on the primary data, but on the authors' interpretations of those and on the quotes of the original data that the authors provide.
- The reported barriers and facilitators will be based on patients' experiences and perceptions and will not include health care professionals or other parties

INTRODUCTION

Rationale

Lower limb osteoarthritis (OA) is a common joint disease and one of the main causes of disability in ageing populations[1]. Physical activity (PA) has a key role in the management of OA. There is strong evidence supporting that exercise, which is the structured and purposeful form of physical activity[2], is effective in reducing pain and improving physical function and health-related quality of life in knee and hip OA[3-8]. In addition, sedentary pursuits have been linked to a decline in physical function longitudinally irrespective of the time the patients spent in moderate to vigorous activities[9]. Maintaining a physically active lifestyle is therefore important for people living with lower limb OA[1]. Nonetheless the majority of people with knee or hip OA do not meet the guideline recommendations of at least 150 minutes of moderate to vigorous physical activity per week[10]. Furthermore in the case of existing exercise interventions in this population, PA maintenance is a major issue[11 12].

An emerging question is therefore what are the PA determinants in people with hip or knee OA, so that they can be optimised to improve health outcomes. In a recent quantitative systematic review of factors influencing PA in this population[13], demographic characteristics, physical function and symptom severity were the only PA correlates consistently reported by the studies. There was inconsistent association with psychological factors like mental health. The paucity of studies on social and environmental correlates of PA was highlighted in this review[13]. When it comes to understanding behaviour and behaviour change though, cognitive, behavioural, as well as social and environmental factors are of major importance[14-17]. To date no systematic work has captured these factors, modifying which could bolster interventions promoting the initiation and maintenance of PA in people with OA. Qualitative studies, which offer an in-depth exploration of the human experience, might prove more appropriate in illustrating the variety and interplay of psychosocial and environmental factors that facilitate or hinder PA specifically in people living with lower limb OA.

Two important variables of potential relevance to barriers and facilitators to PA will be addressed in this systematic review. The first is the distinction in barriers and facilitators between structured exercise and lifestyle PA. A recent scoping review has reported barriers and facilitators to intentional exercise in hip and knee OA[18]. Still a gap remains regarding lifestyle PA determinants[19]. Secondly, there is a theoretical and empirical distinction between adoption and long-term maintenance of PA[20] with practical implications when it comes to behavioural interventions. We therefore want to examine if a distinction can be made in PA determinants of the two stages based on the existing qualitative literature.

Objective

To identify, appraise and synthesise the existing qualitative evidence on barriers and facilitators to physical activity uptake and/ or maintenance in people with hip or knee OA based on the patients' perceptions and experiences.

Secondary objectives are to explore differences in barriers and facilitators between (i) exercise and lifestyle PA and (ii) uptake and maintenance of PA.

METHODS

This systematic review was registered with the International Prospective Register of Systematic Reviews (PROSPERO), registration number CRD42016030024, and follows the PRISMA guidelines for reporting systematic reviews[21 22].

Eligibility criteria

The criteria outlined below will be used for study selection (Appendix 1). PICOS (Population- Intervention- Comparison- Outcomes- Study design) was adapted for use in this study. In particular, interventions and comparators were not applicable and the phenomenon of interest will be identified instead.

Population Study participants will be adults who have a physician-made diagnosis of hip or knee OA regardless of radiological evidence; or, radiographic OA using Kellgren and Lawrence grade >=2 at hip or knee; or, meet internationally accepted classification criteria for OA (e.g. American College of Rheumatology). If the study population involves groups of patients with other types of arthritis, e.g. rheumatoid arthritis, they will be included in this study provided that knee and hip OA patients combined are the highest proportion of participants. Studies will be excluded if the study participants are people about to undergo or have undergone total hip or knee arthroplasty.

Outcomes will be barriers and enablers that influence uptake and/ or sustained engagement of physical activity or exercise in people with OA as perceived and reported by the patients.
Studies will be included if (a) they directly explore the factors/ barriers/ enablers/ motivation that correspond to engagement in PA/ exercise (i.e. this is stated in the study objectives or relevant interview questions are included); or (b) they directly address or focus on any aspect of the experience or perceptions of people living with hip or knee OA regarding PA and/ or exercise.
Study designs (1) Qualitative studies using appropriate methods of data collection and data analysis. (2) Mixed methods studies that report qualitative findings.
Language Studies will be excluded if written in a language other than English.
Publication year From inception to 31st of December 2015.

Information sources

The databases MEDLINE (Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present, OVID interface), EMBASE (1974 onwards, OVID interface), PhychINFO (1967 onwards, OVID interface), Web of Science, CINAHL, SPORTDiscus and Scopus will be searched from inception to 31 of December 2015. Also, Grey literature sources will be considered, i.e. OpenGrey, NHS evidence. Hand search of qualitative-research-centred journals, e.g. Qualitative Health Research, Sociology of Health and Illness, will complement the search strategy. Screening of the references of included articles and relevant existing reviews will take place. Lastly, active researchers in the field who have contributed to this literature will be contacted.

Search

The search strategy will comprise comprehensive keyword combinations for each of the four concepts of interest (see Appendix 2 for Medline), i.e. 1) knee and hip osteoarthritis (1-9 in

the Appendix), 2) physical activity/ exercise (10-16), 3) barriers, enablers, motivation, uptake, maintenance (17-24), 4) qualitative study design (25-30).

Study records

The study selection process will be according to the PRISMA flow diagram[23]. Two independent reviewers will run the search and study selection. Endnote software will be used for data management. Citations including abstracts will be imported and duplicates will be removed. Selected articles will be juxtaposed for multiple reports of a single study so that double counting of studies will be avoided.

The pre-determined eligibility criteria will be used in the form of a list (Appendix 1), which will be checked and fine-tuned if necessary by the two reviewers. The reviewers will independently apply the criteria at all stages of the selection process. After title/ abstract screening, full text copies of potentially relevant studies will be obtained. Additional information will be sought from authors if necessary at the stage of full text assessment. Disagreements will be resolved through discussion and where agreement is not reached, a third reviewer will be consulted. At the end of the selection process the Kappa statistic [24] will be used to assess agreement between the reviewers. A supplementary table with information about the selected studies will be provided including study characteristics (first author's name, publication year, method of data collection and data analysis), participant characteristics (age, gender, locus and severity of OA, duration of diagnosis, physical activity profile), and contextual information (country, geographic area, setting if applicable). Data will be entered in and managed with QSR's NVivo software.

Data items

All text under the sections of "results" and "findings" will be considered as data and will be analysed.

OUTCOMES AND PRIORITISATION

Phenomenon of interest

The description and interpretation of OA patients' experiences and perceptions regarding what hinders and what helps and motivates them to engage in PA behaviours constitute the phenomenon of interest. All types of factors reported by the participants will be included, e.g. health-related, psychological, social, cultural, environmental. Subgroups of the phenomenon of interest that will also be explored provided that there is sufficient evidence, are: barriers and facilitators to PA/ exercise adoption, PA/ exercise maintenance; engagement in exercise regimes and engagement in lifestyle PA.

Appraisal of study quality

Since there is no consensus on how to assess qualitative evidence and a single set of criteria might not be applicable to all kinds of qualitative research[25 26], two different approaches to appraisal will be applied.

Firstly the Critical Appraisal Skills Programme Qualitative Checklist, a structured tool commonly employed in SRs of qualitative evidence, will be used. CASP Qualitative Checklist is broadly suitable for various qualitative study designs, is available online and free of

charge. The tool, including introduction, ten questions and prompts, will be used as provided by the CASP-uk.net. Studies will be rated as “high quality” if they meet at least eight of the ten criteria, “medium quality” if they meet five to seven of the criteria and “low quality” if they meet four or less.

Although the CASP tool appraises reporting and methodological quality, it does not address aspects of the research validity[27] and can favour papers that are less insightful as long as they comply with “expectations of research practice”[28]. To address this gap, the evaluative criteria of credibility, transferability, dependability and confirmability[29] will be applied. These criteria widely acknowledge the philosophical stance of qualitative research, focus on the trustworthiness of the study[29 30] and their development was not aimed in particular at the evaluation of interpretive qualitative approaches as other theoretically informed tools, e.g. Popay et. al. [31]. Included studies will be assessed as to whether they apply the techniques that have been suggested for ensuring study quality according to Lincoln and Guba’s criteria[25 32]: prolonged engagement, persistent observation, peer review, triangulation, negative case analysis, referential adequacy and member checking to ensure credibility; thick description for transferability; inquiry audit for dependability; confirmability audit, audit trail, triangulation and reflexivity to ensure confirmability. A more detailed description of the context of the above procedures can be found in Appendix 3. Studies will be rated as “high quality” if they meet at least three of the four criteria, “medium quality” if they meet two of the criteria and “low quality” if they meet one or none.

Two reviewers, one with qualitative research expertise, will independently appraise the selected studies after piloting both tools on two studies and comparing the outcome. The final assessment for each study will be reached through discussion and in case a consensus is not reached, a third researcher will be consulted. A detailed justification of the assessment outcome for the second set of criteria will be available upon publication of the SR.

Data synthesis

Thematic synthesis as described by Thomas & Harden[33] will be applied for data synthesis. Thematic synthesis is a transparent and suitable method for integrating qualitative evidence in a SR[34] and has been used for SRs of barriers and enablers to various behaviours[35-37]. The synthesis involves three stages: (a) free line by line coding, (b) grouping of the codes into “descriptive themes”, which also includes the translation of conceptions from one study to the other, and (c) the formation of analytical themes. At the latter stage barriers and enablers to physical activity in people with hip and knee OA will be inferred from the descriptive themes. The analytical themes and their relation with descriptive themes will be presented in tables. The synthesis will be conducted by one researcher and checked by a second independent reviewer with experience in thematic analysis, to enhance credibility.

Confidence in the synthesised qualitative findings

Assessing the quality of the studies in a SR does not answer the question of how much certainty or trust we can place on each individual review finding. To ensure the potential value of the review in informing its users the assessment of the trust that can be placed on each individual finding is advised[38]. In qualitative evidence syntheses, approaches to confidence in the findings have only recently been developed[30 39]. The ConQual approach[30] will be adopted for assessing the confidence in the findings of this SR.

Dependability and credibility as defined by Guba and Lincoln constitute the two elements of confidence in findings. ConQual is the approach of choice as it offers a clear description of the process of appraisal of each element and overall grading. A Confidence in the Findings Table will be formulated which will include the review finding, the assessments for dependability, credibility, and the overall Confidence score (high, moderate, low, very low).

DISCUSSION

This systematic review will be the first to synthesise and report barriers and facilitators of PA in people with hip or knee OA based on qualitative evidence and also differentiate between determinants of lifestyle PA and exercise engagement, as well as between adoption and maintenance of PA. The review findings will inform our understanding of factors enabling or inhibiting participation in physical activity and provide information of how to optimise behaviour change in the targeted population.

Contributions

JLD, AMK, AR, RK and AA contributed to the development of the study design and search strategy. KR and AA provided expertise on the selection criteria. AR provided expertise on the methodological issues related to systematic reviews. AK developed the SR protocol and all authors provided feedback and approved the final protocol.

Amendments

Should amendments need to be made for this protocol, they will be reported in detail in this section and will not be incorporated in the protocol.

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Competing interests

The authors declare no competing interests

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Appendix 1

Title:…… …… Author(s) and date: …… *Study should be deemed eligible if responses to all items are under the "yes" column.*		
	Yes	**No**
1. Qualitative study design or mixed methods design.		
2. Participants are adults with a physician's diagnosis of hip or knee osteoarthritis, regardless of radiographic evidence. If the study sample also involves groups of patients with other types of arthritis, then the group with the highest proportion of patients should be that of knee and/ or hip OA.		
3. (a) The study directly (i.e. it is stated so in the study aims or, relevant interview questions are included) explores the factors/ barriers/ enablers/motivation that correspond to engagement/ adoption/ maintenance of PA/ exercise. Or (b) the study directly addresses or focuses on any aspect of the experience or perceptions of people living with hip or knee OA regarding PA and/ or exercise.		
4. Participants have not undergone and are not about to undergo hip or knee arthroplasty.		
5. Written in English.		

Appendix 2

Draft MEDLINE search- Ovid interface

1	osteoarthritis.mp. or exp Osteoarthritis, Hip/ or exp Osteoarthritis/ or exp Osteoarthritis, Knee/
2	(osteoarthriti* or osteo-arthriti* or osteoarthrotic or osteoarthros*).ti,ab.
3	(coxarthrosis or gonarthrosis).ti,ab.
4	"knee pain".mp.
5	"hip pain".mp.
6	"lower limb".mp.
7	exp Lower Extremity/ or "lower extremit*".mp.
8	(degenerative adj2 arthritis).ti,ab.
9	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8
10	physical activity.mp. or exp Motor Activity/
11	exp Exercise/ or exp Exercise Therapy/ or exercise.mp.
12	exp Sports/ or sports.mp.
13	exp Life Style/ or exp Sedentary Lifestyle/ or sedentary.mp.
14	"non-exercis*".ti,ab.
15	"activities of daily living".mp. or exp "Activities of Daily Living"/
16	10 or 11 or 12 or 13 or 14 or 15
17	(maintain* or maintenance or support* or ongoing or "on-going" or adherence or reinforc* or comply* or compliance or "long-term" or adoption or engagement or avoidance or boost* or refresh* or remind* or promotion or promot* or "physical activity uptake" or "behavio* change" or "lifestyle change").ti,ab.
18	(barrier* or impediment or limit* or facilitator* or enablers or enabl* or motivators or motivat* or influenc* or factors or determinants).ti,ab.
19	facilitator*.mp.
20	barrier*.mp.
21	adherence.mp.
22	exp Motivation/ or motivators.mp.
23	social support.mp. or exp Social Support/
24	17 or 18 or 19 or 20 or 21 or 22 or 23
25	exp Qualitative Research/ or qualitative.mp.
26	(interview* or theme* or experience).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]
27	("content analysis" or "grounded theory" or "thematic analysis" or "phenomenological analysis" or phenomenolog* or narrative* or discourse or ethnograph*).ti,ab.
28	(("semi-structured" or semistructured or unstructured or informal or "in-depth" or indepth or "face-to-face" or structured or guide) adj3 (interview* or discussion* or questionnaire*)).ti,ab.

29 (focus group* or interview* or fieldwork or "field work" or triangulation or "data saturation" or "key informant").ti,ab.

30 25 or 26 or 27 or 28 or 29

31 9 and 16 and 24 and 30

Appendix 3

Criteria for trustworthiness based on Creswell (2007) and Cohen & Crabtree (2006). Title: …… Author(s) and date: …… Study No: ……..	Reviewer's assessment (Technique applied? How?)
Credibility	
Prolonged engagement and persistent observation. Do the researchers spend sufficient time in the field, observe, talk to different people, build relationships, check for misinformation stemming from the researcher or the informants?	
Triangulation. Do the researchers make use of multiple data sources, investigators, theories to enhance understanding and ensure a rich and robust account of the study inquiry?	
Peer review or debriefing. "External check of the research process" (Creswell, 2007; p.208) or exposition of the research process to an unaffected peer. Do sessions between the researcher and a peer take place? Are written accounts of these sessions being kept?	
Negative case analysis. Do the researchers take account of the data that do not fit with emerging patterns or explanations? Do they revise the initial hypotheses and analysis until it accounts for the majority of cases?	
Referential adequacy. "Identifying a portion of data to be archived, but not analysed. The researcher then conducts the data analysis on the remaining data and develops preliminary findings. The researcher then returns to this archived data and analyses it as a way to test the validity of his or her findings" (Cohen & Crabtree, 2006).	
Member checking. Do the researchers take data, analyses, interpretations, conclusions back to the participants to evaluate the truthfulness of the account?	
Transferability	
Thick description refers to "describing and interpreting observed social action (or behaviour) within its particular context" (Ponterotto, 2006) Does the author achieve to give a sense of verisimilitude? Does the author describe in detail each part of the study (fully describing the study participants; settings and procedures, such as location and length of the interviews, recording procedures, interviewer's and interviewee's reactions; results, e.g. long quotes from the participants or the interview dialogue; successfully bringing together the participants' experiences with the researchers' interpretation of those in discussion)?	
Dependability	
External audit ("inquiry audit") Is there an "external consultant", who is not part of the study, examining the process and product of the study?	
Confirmability	
External audit ("confirmability audit")	
Reflexivity (clarification of researcher bias). Are the authors reflexive, i.e. do they "identify the perspectives they bring to their studies as insiders and/ or outsiders" and ways through which those affect "how they analyse, interpret and report the findings" (Sparkes & Smith, 2014: p 181-3). Is there a "critical friend" to help in this process?	
Triangulation	
Audit trail. Is the process of the study transparent and trackable? Do the	

researchers provide descriptions of the decision making process in detail?	

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Barriers and facilitators to physical activity in people with hip or knee osteoarthritis: Protocol for a systematic review of qualitative evidence.

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ABSTRACT

Introduction This protocol aims to describe the objective and methods to be followed in a systematic review of qualitative studies on barriers and facilitators to physical activity (PA) in people with hip or knee osteoarthritis (OA).

Methods and analysis MEDLINE, EMBASE, PsychINFO, Web of Science, CINAHL, SPORTDiscus, Scopus and grey literature sources will be electronically searched. Hand search of qualitative-research-centred journals, reference screening of relevant reviews and inquiries to researchers active in the field will complement the search. Studies will be selected if they apply qualitative or mixed-methods designs to directly explore factors that correspond to engagement in PA/ exercise or, the perceptions regarding PA/ exercise in people with hip or knee OA. The Critical Appraisal Skills Programme Qualitative Checklist and the evaluative criteria of credibility, transferability, dependability and confirmability will be applied for the study appraisal. Two independent reviewers will perform the search, study selection and study appraisal. Thematic synthesis will be used for synthesising the findings of the primary studies and the process and product of the synthesis will be checked by a second researcher. ConQual approach will be used for assessing the confidence in the qualitative findings.

Ethics and dissemination This systematic review will inform our understanding of the physical activity determinants and how to optimise behaviour change in people living with hip or knee OA. The review findings will be reported in a peer-reviewed journal and presented at national or international conferences. The study raises no ethical issues.

Registration number PROSPERO CRD42016030024

Keywords: osteoarthritis, physical activity, barriers, facilitators, systematic review protocol

Strengths and limitations:

- To the best of our knowledge this is the first systematic review of qualitative evidence on barriers and facilitators of physical activity in people with hip or knee OA. Further, differences in barriers and facilitators between (i) exercise and lifestyle PA and (ii) uptake and maintenance of PA will be explored. This will largely contribute to our understanding of PA behaviours and provide information on how to optimise behaviour change in the population of interest.
- Rigorous methods will be applied informed by the Centre for Reviews and Dissemination and Cochrane Qualitative Research Methods Group guidelines and reported at all stages in line with the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) Statement.
- The level of confidence in each review finding will be reported.
- One limitation of this systematic review is that only papers written in English will be included.

INTRODUCTION

Rationale

Osteoarthritis (OA) is a common joint disease and one of the main causes of disability in ageing populations[1]. Physical activity (PA) has a key role in the management of OA. For instance, exercise, which is a structured and purposeful form of PA[2], is effective in reducing pain and improving physical function and health-related quality of life in knee and hip OA[3-8]. In addition, sedentary pursuits have been linked to a decline in physical function irrespective of the time the patients spent in moderate to vigorous activities[9]. Maintaining a physically active lifestyle (i.e. time spent in leisure and non-leisure physical activities, not limited to engagement in exercise) is therefore important for people living with lower limb OA[1]. Nonetheless the majority of people with knee or hip OA do not meet the guideline recommendations of at least 150 minutes of moderate to vigorous physical activity per week and are reported to be less physically active than their counterparts without OA[10 11]. Furthermore in the case of existing exercise interventions in this population, PA maintenance post intervention is a major issue[12 13].

An emerging question is therefore what are the PA determinants in people with hip or knee OA, so that they can be optimally applied in health care practice and policy making to improve health outcomes. Existing narrative[14 15] and systematic[16 17] reviews have addressed this question. In the most up-to-date quantitative systematic review of factors influencing PA in this population[16], demographic characteristics, physical function and symptom severity were the only PA correlates consistently reported by the studies. There was inconsistent association with psychological factors like mental health. The paucity of studies on social and environmental correlates of PA was highlighted in this review[16]. When it comes to understanding behaviour and behaviour change though, personal (e.g. cognitions attitudes), as well as social and environmental factors are of major importance[18-21].

To date no systematic work has captured these factors, with those identified which are modifiable potentially contributing to the development of interventions to promote the initiation and maintenance of PA in people with OA. Qualitative studies, which offer an in-depth exploration of the human experience, might prove more appropriate in illustrating the variety and interplay of psychosocial and environmental factors that facilitate or hinder PA specifically in people living with lower limb OA. A recent scoping review of both quantitative and qualitative studies[22] has mapped modifiable factors linked to exercise participation in hip and knee OA patients using the Theoretical Domains Framework. This systematic review of qualitative evidence will move one step further by applying rigorous methodology, such as quality appraisal of the included studies and confidence in the reported findings. Confidence in the reported findings is directly relevant to how informative and useful they can be in practice. In addition, two important distinctions of potential relevance to barriers and facilitators to PA will also be addressed in this systematic review. The first is a discrimination between barriers and facilitators to exercise and “lifestyle” PA. The second is about the theoretical and empirical distinction between uptake and maintenance of PA, i.e. whether PA is a newly introduced or re-introduced behaviour in a person’s life or its regular engagement is part of one’s lifestyle[23]. Different factors can act as barriers and facilitators at different stages of behavioural change (in particular, when the focus is on adoption or maintenance), which holds practical implications when it comes to identifying key elements of behavioural interventions.

Objectives

To identify, appraise and synthesise the existing qualitative evidence on barriers and facilitators to PA uptake and/ or maintenance in people with hip or knee OA based on the patients' perceptions and experiences.

Secondary objectives are to explore differences in barriers and facilitators between (i) exercise and lifestyle PA and (ii) uptake and maintenance of PA.

METHODS

This systematic review protocol follows the Preferred Reporting Items for Systematic Review and Meta-analysis Protocols (PRISMA-P) 2015 statement (Appendix 1)[24 25]. The systematic review was registered with the International Prospective Register of Systematic Reviews (PROSPERO), registration number CRD42016030024. It will be informed by the Centre for Reviews and Dissemination[26] and Cochrane Qualitative Research Methods Group[27 28] guidelines and will follow the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ)[29] and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[30] Statements for reporting systematic reviews (Appendix 2). In the case of sections applicable to qualitative systematic reviews that are included in PRISMA, but are not covered by ENTREQ, these will also be reported.

Eligibility criteria

The criteria outlined below will be used for study selection (Appendix 3). PICOS (Population- Intervention- Comparison- Outcomes- Study design), which is an established tool for defining key components of research questions[31], was adapted for use in this study. In particular, interventions and comparators were not applicable and the phenomenon of interest will be identified instead.

Population Study participants will be adults who have physician diagnosed hip or knee OA; or, radiographic OA using Kellgren and Lawrence grade >=2 at hip or knee; or, meet internationally accepted classification criteria for OA (e.g. American College of Rheumatology). If the study population involves groups of patients with other types of arthritis, e.g. rheumatoid arthritis, they will be included in this study provided that knee and hip OA patients combined are the highest proportion of participants. Studies will be excluded if the study participants are people about to undergo or have undergone total hip or knee arthroplasty.

Outcomes will be barriers and facilitators that influence uptake and/ or maintenance of PA in people with OA as perceived and reported by the patients.
Studies will be included if (a) they directly explore the factors/ barriers/ facilitators/ motivation that correspond to engagement in PA/ exercise (i.e. this is stated in the study objectives or relevant interview questions are included); or (b) they directly address or focus on any aspect of the experience or perceptions of people living with hip or knee OA regarding PA and/ or exercise.

Study designs (1) Qualitative studies using appropriate methods of data collection and data analysis. (2) Mixed methods studies that report qualitative findings.

Language Studies will be excluded if written in a language other than English.
Publication year From database inception to 31st of December 2015.

Information sources

The databases MEDLINE (Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present, OVID interface), EMBASE (1974 onwards, OVID interface), PhychINFO (1967 onwards, OVID interface), Web of Science, CINAHL, SPORTDiscus and Scopus will be searched from inception to 31 of December 2015. Also, Grey literature sources will be considered, i.e. OpenGrey, NHS evidence. Hand search of qualitative-research-centred journals, e.g. Qualitative Health Research, Sociology of Health and Illness, will complement the search strategy. Screening of the references of included articles and relevant existing reviews will take place. Lastly, active researchers in the field who have contributed to this literature will be contacted.

Search

The search strategy will comprise comprehensive keyword combinations for each of the four concepts of interest (see Appendix 4 for Medline), i.e. 1) knee and hip osteoarthritis (1-9 in the Appendix), 2) PA/ exercise (10-16), 3) barriers, facilitators, motivation, uptake, maintenance (17-24), 4) qualitative study design (25-30). Free text search (.mp) will be applied for the basic search terms for each concept (e.g. "osteoarthritis" for population; "physical activity", "exercise" for phenomenon of interest; "barrier*", "facilitator*", "motivation" for outcomes; "qualitative" for study design), supplemented by a wide array of alternative terms searched for in the title/ abstract section or free text search. Within each group of concepts the keyword combinations will be mutually inclusive ("OR" operator). The combination of the four groups was applied in the latter stage using the AND operator.

Study records

The study selection process will be according to the PRISMA flow diagram[30]. Two independent reviewers will run the search and study selection. Endnote X7 software will be used for data management. Citations including abstracts will be imported and duplicates will be removed. Selected articles will be juxtaposed for multiple reports of a single study so that double counting of studies is avoided.

The pre-determined eligibility criteria will be used in the form of a list (Appendix 3), which will be checked and fine-tuned if necessary by the two reviewers. The reviewers will independently apply the criteria at all stages of the selection process. After title/ abstract screening, full text copies of potentially relevant studies will be obtained. Additional information will be sought from authors if necessary at the stage of full text assessment. Where the information provided is insufficient for study selection, assessment and synthesis, the respective studies will not be included in the synthesis but will be referenced in the discussion section. Consensus will be reached through discussion and where agreement is not reached, a third reviewer will be consulted. At the end of the selection process the Kappa statistic [32] will be used to assess the chance corrected agreement between the reviewers in assessing the full text articles as included, excluded or unclear. A supplementary table with information about the selected studies will be provided including study characteristics (first author's name, publication year, method of data collection and data analysis), participant

characteristics (age, gender, locus and severity of OA, duration of diagnosis, physical activity profile), and contextual information (country, geographic area, setting if applicable). Data will be entered in and managed with NVivo 11 qualitative data analysis software (QSR International).

Data items

All text under the sections of "results" and "findings" will be considered as data and will be analysed. If findings and discussion are presented together, then discussion will also be considered as a data item.

OUTCOMES AND PRIORITISATION

Phenomenon of interest

The description and interpretation of OA patients' experiences and perceptions regarding what hinders and what facilitates and motivates them to engage in PA behaviours constitute the phenomenon of interest. All types of factors reported by the participants will be included, e.g. health-related, psychological, social, cultural, environmental. Subgroups of the phenomenon of interest will also be explored, provided that there is sufficient evidence. These are: barriers and facilitators to PA uptake and PA maintenance; engagement in exercise and engagement in lifestyle PA.

Appraisal of study quality

Since there is no consensus on how to assess qualitative evidence and a single set of criteria might not be applicable to all kinds of qualitative research[33 34], two different approaches to appraisal will be applied.

Firstly the Critical Appraisal Skills Programme (CASP) Qualitative Checklist, a structured tool commonly employed in SRs of qualitative evidence, will be used. CASP Qualitative Checklist is broadly suitable for various qualitative study designs, is available online and free of charge. The tool, including introduction, ten questions and prompts, will be used as provided by the CASP-uk.net. Studies will be rated as "high quality" if they meet at least eight of the ten criteria, "medium quality" if they meet five to seven of the criteria and "low quality" if they meet four or less.

Although the CASP tool appraises reporting and methodological quality, it does not address aspects of the research validity[35] and can favour papers that are less insightful as long as they comply with "expectations of research practice"[36]. To address this gap, the evaluative criteria of credibility, transferability, dependability and confirmability[37] will be applied. These criteria widely acknowledge the philosophical stance of qualitative research, focus on the trustworthiness of the study[37 38] and their development was not aimed in particular at the evaluation of interpretive qualitative approaches as other theoretically informed tools, e.g. Popay et al.[39]. Included studies will be assessed as to whether they apply the techniques suggested for ensuring study quality according to Lincoln and Guba's criteria[33 40]: prolonged engagement, persistent observation, peer review, triangulation, negative case analysis, referential adequacy and member checking to ensure credibility; thick description for transferability; inquiry audit for dependability; confirmability audit, audit trail, triangulation and reflexivity to ensure confirmability. A more detailed description of the

context of the above procedures can be found in Appendix 5. Studies will be rated as “high quality” if they meet at least three of the four criteria, “medium quality” if they meet two of the criteria and “low quality” if they meet one or none.

Two reviewers will independently appraise the selected studies. First, the appraisal process will be piloted, i.e. the reviewers will independently apply the two sets of criteria on two studies and criteria and then compare the outcome and discuss the process they followed, so that potential discrepancies in applying the criteria are resolved. The final assessment for each study will be reached through discussion and in case a consensus is not reached, a third researcher will be consulted. A detailed justification of the assessment outcome for the second set of criteria will be available upon publication of the SR.

Data synthesis

Thematic synthesis as described by Thomas & Harden[41] will be applied for data synthesis. Thematic synthesis is a transparent and suitable method for integrating qualitative evidence in a SR[42] and has been used for SRs of barriers and facilitators to various behaviours[43-45]. The synthesis involves three stages: (a) free line by line coding, (b) grouping of the codes into “descriptive themes”, which also includes the translation of conceptions from one study to the other (i.e. the codes from all included studies will be compared with each other in an iterative process, the codes/ quotes describing the same concept will be merged under one code and those expressing a similar concept will be grouped together), and (c) the formation of analytical themes. At the latter stage barriers and facilitators to PA in people with hip and knee OA will be inferred from the descriptive themes; i.e. the research questions, which are put aside during the data driven first two stages, will be introduced at this point to inform the formation of analytical themes. The analytical themes and their relation with descriptive themes will be presented in tables. The synthesis will be conducted by one researcher and checked by a second independent reviewer with experience in thematic analysis, to enhance credibility.

Confidence in the synthesised qualitative findings

Assessing the quality of the studies in a SR does not answer the question of how much certainty or trust we can place on each individual review finding. To ensure the potential value of the review in informing its users the assessment of the trust that can be placed on each individual finding is advised[46]. In qualitative evidence syntheses, approaches to confidence in the findings have only recently been developed[38 47]. The ConQual approach[38] will be adopted for assessing the confidence in the findings of this SR. Dependability and credibility as defined by Guba and Lincoln constitute the two elements of confidence in findings. ConQual is the approach of choice as it offers a clear description of the process of appraisal of each element and overall grading. A Confidence in the Findings Table will be formulated which will include the review finding, the assessments for dependability, credibility, and the overall Confidence score (high, moderate, low, very low).

DISCUSSION

This systematic review will be the first to synthesise and report barriers and facilitators of PA in people with hip or knee OA based on qualitative evidence. Following the emerging evidence on the independent role of sedentary pursuits on health and mortality[48 49] and the shifting of health guidelines and policies from exercise promotion to physical activity

promotion, we will further explore differences between determinants of lifestyle PA and exercise, as there is a pronounced gap in the literature regarding the former[50]. Additionally we will explore differences reported in the literature between uptake and maintenance of PA. The review findings will inform our understanding of factors facilitating or inhibiting participation in physical activity and provide information on how to optimise behaviour change at different stages (i.e. uptake or maintenance) in the targeted population.

This protocol serves to provide a detailed account of the rational and methods to be used in the proposed systematic review to ensure the transparency of the process[24]. In case any deviation from the protocol takes place, it will be justified and discussed in the systematic review upon publication.

Ethics and dissemination

The review findings will be reported in a peer-reviewed journal and presented at national or international conferences. The study raises no ethical issues.

Contributions

JLD, AMK, AR, RK and AA contributed to the development of the study design and search strategy. KR and AA provided expertise on the selection criteria. AR provided expertise on the methodological issues related to systematic reviews. AK developed the SR protocol and all authors provided feedback and approved the final protocol.

Amendments

Should amendments need to be made for this protocol, they will be reported in detail in this section and will not be incorporated in the protocol.

Funding statement

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Competing interests

The authors declare no competing interests.

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: Recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	Reported (Section)
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	Yes (Title)
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	N/a
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	Yes (Abstract, Registration number)
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	Yes (Title page)
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	Yes (Contributions)
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	Yes (Amendments)
Support:			
Sources	5a	Indicate sources of financial or other support for the review	Yes (Funding statement)
Sponsor	5b	Provide name for the review funder and/or sponsor	Yes (Funding statement)
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	N/a
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	Yes (Introduction, Rationale)
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	Yes (Introduction, Objectives)

METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	Yes (Methods, Eligibility criteria)
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	Yes (Methods, Information sources)
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	Yes (Methods, Search)
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	Yes (Methods, Study records)
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	Yes (Methods, Study records)
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	Yes (Methods, Study records)
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	Yes (Methods, Data items)
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	Phenomenon of interest is defined. (Outcomes and prioritisation, Phenomenon of interest)
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	Appraisal of study quality is described. (Outcomes and prioritisation, Appraisal of study quality)
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	N/a
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ)	N/a

	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	N/a
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	Thematic synthesis will be applied. (Outcomes and prioritisation; Data synthesis)
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	N/a
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	The ConQual approach will be adopted. (Outcomes and prioritisation; Confidence in the synthesised qualitative findings)

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (or the when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

Appendix 2.

ENTREQ Statement: Recommended items to address in a synthesis of qualitative research

No	Item	Guide and description
1	Aim	State the research question the synthesis addresses.
2	Synthesis methodology	Identify the synthesis methodology or theoretical framework which underpins the synthesis, and describe the rationale for choice of methodology.
3	Approach to searching	Indicate whether the search was pre-planned or iterative.
4	Inclusion criteria	Specify the inclusion/exclusion criteria.
5	Data sources	Describe the information sources used and when the searches conducted; provide the rationale for using the data sources.
6	Electronic Search strategy	Describe the literature search.
7	Study screening methods	Describe the process of study screening and sifting.
8	Study characteristics	Present the characteristics of the included studies.
9	Study selection results	Identify the number of studies screened and provide reasons for study exclusion.
10	Rationale for appraisal	Describe the rationale and approach used to appraise the included studies or selected findings.
11	Appraisal items	State the tools, frameworks and criteria used to appraise the studies or selected findings.
12	Appraisal process	Indicate whether the appraisal was conducted independently by more than one reviewer and if consensus was required.
13	Appraisal results	Present results of the quality assessment and indicate which articles, if any, were weighted/excluded based on the assessment and give the rationale.
14	Data extraction	Indicate which sections of the primary studies were analysed and how were the data extracted from the primary studies.
15	Software	State the computer software used, if any.

16	Number of reviewers	Identify who was involved in coding and analysis.
17	Coding	Describe the process for coding of data.
18	Study comparison	Describe how were comparisons made within and across studies.
19	Derivation of themes	Explain whether the process of deriving the themes or constructs was inductive or deductive.
20	Quotations	Provide quotations from the primary studies to illustrate themes/constructs, and identify whether the quotations were participant quotations of the author's interpretation.
21	Synthesis output	Present rich, compelling and useful results that go beyond a summary of the primary studies.

From: Tong A, Flemming K, McInnes E, Oliver S, Craig .(2012). Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. BMC Medical Research Methodology, 12(1):181.

PRISMA Statement: Recommended items to address in Systematic Reviews and Meta-Analyses

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	

Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present the main results of the review. If meta-analyses are done, include for each, confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	

Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

Appendix 3. Eligibility criteria

Title:.
……
……

Author(s) and date: ……

Study should be deemed eligible if responses to all items are under the "yes" column.

	Yes	No
1. Qualitative study design or mixed methods design.		
2. Participants are adults with a physician's diagnosis of hip or knee osteoarthritis, regardless of radiographic evidence. If the study sample also involves groups of patients with other types of arthritis, then the group with the highest proportion of patients should be that of knee and/ or hip OA.		
3. (a) The study directly (i.e. it is stated so in the study aims or, relevant interview questions are included) explores the factors/ barriers/ enablers/motivation that correspond to engagement/ adoption/ maintenance of PA/ exercise. Or (b) the study directly addresses or focuses on any aspect of the experience or perceptions of people living with hip or knee OA regarding PA and/ or exercise.		
4. Participants have not undergone and are not about to undergo hip or knee arthroplasty.		
5. Written in English.		

Appendix 4. Medline Search Strategy

Draft MEDLINE search- Ovid interface

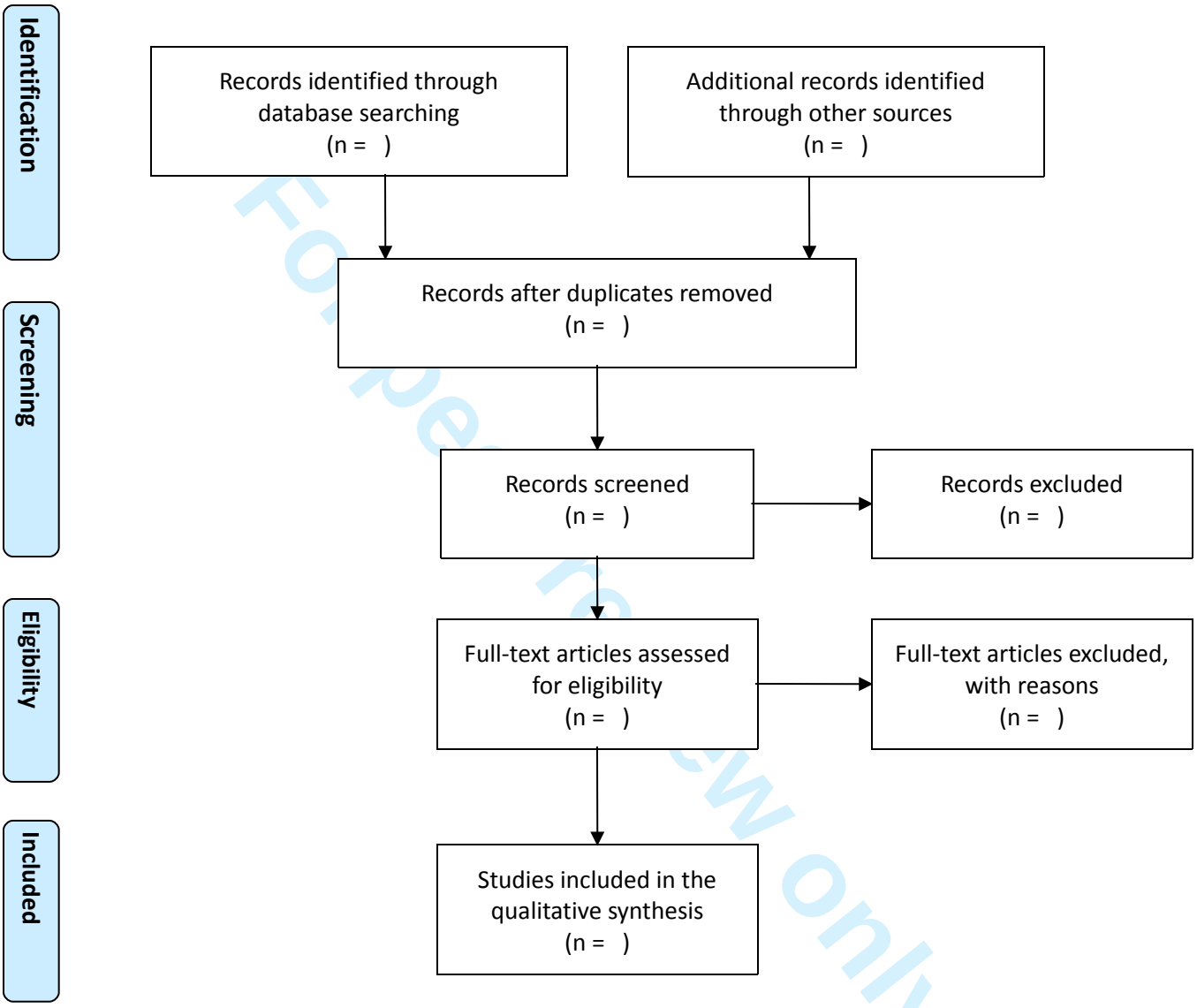
1	osteoarthritis.mp. or exp Osteoarthritis, Hip/ or exp Osteoarthritis/ or exp Osteoarthritis, Knee/
2	(osteoarthriti* or osteo-arthriti* or osteoarthrotic or osteoarthros*).ti,ab.
3	(coxarthrosis or gonarthrosis).ti,ab.
4	"knee pain".mp.
5	"hip pain".mp.
6	"lower limb".mp.
7	exp Lower Extremity/ or "lower extremit*".mp.
8	(degenerative adj2 arthritis).ti,ab.
9	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8
10	physical activity.mp. or exp Motor Activity/
11	exp Exercise/ or exp Exercise Therapy/ or exercise.mp.
12	exp Sports/ or sports.mp.
13	exp Life Style/ or exp Sedentary Lifestyle/ or sedentary.mp.
14	"non-exercis*".ti,ab.
15	"activities of daily living".mp. or exp "Activities of Daily Living"/
16	10 or 11 or 12 or 13 or 14 or 15
17	(maintain* or maintenance or support* or ongoing or "on-going" or adherence or reinforc* or comply* or compliance or "long-term" or adoption or engagement or avoidance or boost* or refresh* or remind* or promotion or promot* or "physical activity uptake" or "behavio* change" or "lifestyle change").ti,ab.
18	(barrier* or impediment or limit* or facilitator* or enablers or enabl* or motivators or motivat* or influenc* or factors or determinants).ti,ab.
19	facilitator*.mp.
20	barrier*.mp.
21	adherence.mp.
22	exp Motivation/ or motivators.mp.
23	social support.mp. or exp Social Support/
24	17 or 18 or 19 or 20 or 21 or 22 or 23
25	exp Qualitative Research/ or qualitative.mp.
26	(interview* or theme* or experience).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]
27	("content analysis" or "grounded theory" or "thematic analysis" or "phenomenological analysis" or phenomenolog* or narrative* or discourse or ethnograph*).ti,ab.
28	(("semi-structured" or semistructured or unstructured or informal or "in-depth" or indepth or "face-to-face" or structured or guide) adj3 (interview* or discussion* or questionnaire*)).ti,ab.

29 (focus group* or interview* or fieldwork or "field work" or triangulation or "data saturation" or "key informant").ti,ab.

30 25 or 26 or 27 or 28 or 29

31 9 and 16 and 24 and 30

PRISMA 2009 Flow Diagram



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Appendix 5. Evaluative criteria for quality appraisal

Criteria for trustworthiness based on Creswell (2007) and Cohen & Crabtree (2006). Title: …… Author(s) and date: …… Study No: ……	Reviewer's assessment (Technique applied? How?)
Credibility	
Prolonged engagement and persistent observation. Do the researchers spend sufficient time in the field, observe, talk to different people, build relationships, check for misinformation stemming from the researcher or the informants?	
Triangulation. Do the researchers make use of multiple data sources, investigators, theories to enhance understanding and ensure a rich and robust account of the study inquiry?	
Peer review or debriefing. "External check of the research process" (Creswell, 2007; p.208) or exposition of the research process to an unaffected peer. Do sessions between the researcher and a peer take place? Are written accounts of these sessions being kept?	
Negative case analysis. Do the researchers take account of the data that do not fit with emerging patterns or explanations? Do they revise the initial hypotheses and analysis until it accounts for the majority of cases?	
Referential adequacy. "Identifying a portion of data to be archived, but not analysed. The researcher then conducts the data analysis on the remaining data and develops preliminary findings. The researcher then returns to this archived data and analyses it as a way to test the validity of his or her findings" (Cohen & Crabtree, 2006).	
Member checking. Do the researchers take data, analyses, interpretations, conclusions back to the participants to evaluate the truthfulness of the account?	
Transferability	
Thick description refers to "describing and interpreting observed social action (or behaviour) within its particular context" (Ponterotto, 2006) Does the author achieve to give a sense of verisimilitude? Does the author describe in detail each part of the study (fully describing the study participants; settings and procedures, such as location and length of the interviews, recording procedures, interviewer's and interviewee's reactions; results, e.g. long quotes from the participants or the interview dialogue; successfully bringing together the participants' experiences with the researchers' interpretation of those in discussion)?	
Dependability	
External audit ("inquiry audit") Is there an "external consultant", who is not part of the study, examining the process and product of the study?	
Confirmability	
External audit ("confirmability audit")	
Reflexivity (clarification of researcher bias). Are the authors reflexive, i.e. do they "identify the perspectives they bring to their studies as insiders and/ or outsiders" and ways through which those affect "how they analyse, interpret and report the findings" (Sparkes & Smith, 2014: p 181-3). Is there a "critical friend" to help in this process?	
Triangulation	
Audit trail. Is the process of the study transparent and trackable? Do the	

researchers provide descriptions of the decision making process in detail?	

BMJ Open

Barriers and facilitators to physical activity in people with hip or knee osteoarthritis: Protocol for a systematic review of qualitative evidence.

Journal:	*BMJ Open*
Manuscript ID	bmjopen-2016-012049.R2
Article Type:	Protocol
Date Submitted by the Author:	15-Sep-2016
Complete List of Authors:	Kanavaki, Archontissa; University of Birmingham, School of Sport, Exercise and Rehabilitation Sciences Rushton, Alison; University of Birmingham, School of Sport, Exercise & Rehabilitation Sciences Klocke, Rainer; 2 Dudley Group NHS Foundation Trust, Department of Rheumatology Abhishek, Abhishek; 3 University of Nottingham, Academic Rheumatology Unit School of Clinical Sciences, Faculty of Medicine and Health Sciences Duda, Joan; University of Birmingham, School of Sport, Exercise & Rehabilitation Sciences
Primary Subject Heading:	Rheumatology
Secondary Subject Heading:	Research methods
Keywords:	knee osteoarthritis, hip osteoarthritis, physical activity, barriers, facilitators, systematic review protocol

Barriers and facilitators to physical activity in people with hip or knee osteoarthritis: Protocol for a systematic review of qualitative evidence.

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Word count: 2.889

ABSTRACT

Introduction This protocol aims to describe the objective and methods to be followed in a systematic review of qualitative studies on barriers and facilitators to physical activity (PA) in people with hip or knee osteoarthritis (OA).

Methods and analysis MEDLINE, EMBASE, PsychINFO, Web of Science, CINAHL, SPORTDiscus, Scopus and grey literature sources will be electronically searched. Hand search of qualitative-research-centred journals, reference screening of relevant reviews and inquiries to researchers active in the field will complement the search. Studies will be selected if they apply qualitative or mixed-methods designs to directly explore factors that correspond to engagement in PA/ exercise or, the perceptions regarding PA/ exercise in people with hip or knee OA. The Critical Appraisal Skills Programme Qualitative Checklist and the evaluative criteria of credibility, transferability, dependability and confirmability will be applied for the study appraisal. Two independent reviewers will perform the search, study selection and study appraisal. Thematic synthesis will be used for synthesising the findings of the primary studies and the process and product of the synthesis will be checked by a second researcher. ConQual approach will be used for assessing the confidence in the qualitative findings.

Ethics and dissemination This systematic review will inform our understanding of the physical activity determinants and how to optimise behaviour change in people living with hip or knee OA. The review findings will be reported in a peer-reviewed journal and presented at national or international conferences. The study raises no ethical issues.

Registration number PROSPERO CRD42016030024

Keywords: osteoarthritis, physical activity, barriers, facilitators, systematic review protocol

Strengths and limitations:

- To the best of our knowledge this is the first systematic review of qualitative evidence on barriers and facilitators of physical activity in people with hip or knee OA. Further, differences in barriers and facilitators between (i) exercise and lifestyle PA, and (ii) uptake and maintenance of PA will be explored. This will largely contribute to our understanding of PA behaviours and provide information on how to optimise behaviour change in the population of interest.
- Rigorous methods will be applied informed by the Centre for Reviews and Dissemination and Cochrane Qualitative Research Methods Group guidelines and reported at all stages in line with the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) Statement.
- The level of confidence in each review finding will be reported.
- One limitation of this systematic review is that only papers written in English will be included.

INTRODUCTION

Rationale

Osteoarthritis (OA) is a common joint disease and one of the main causes of disability in ageing populations[1]. Physical activity (PA) has a key role in the management of OA. For instance, exercise, which is a structured and purposeful form of PA[2], is effective in reducing pain and improving physical function and health-related quality of life in knee and hip OA[3-8]. In addition, sedentary pursuits have been linked to a decline in physical function irrespective of the time the patients spent in moderate to vigorous activities[9]. Maintaining a physically active lifestyle (i.e. time spent in leisure and non-leisure physical activities, not limited to engagement in exercise) is therefore important for people living with lower limb OA[1]. Nonetheless the majority of people with knee or hip OA do not meet the guideline recommendations of at least 150 minutes of moderate to vigorous physical activity per week and are reported to be less physically active than their counterparts without OA[10 11]. Furthermore in the case of existing exercise interventions in this population, PA maintenance post intervention is a major issue[12 13].

An emerging question is therefore what are the PA determinants in people with hip or knee OA, so that they can be optimally applied in health care practice and policy making to improve health outcomes. Existing narrative[14 15] and systematic[16 17] reviews have addressed this question. In the most up-to-date quantitative systematic review of factors influencing PA in this population[16], demographic characteristics, physical function and symptom severity were the only PA correlates consistently reported by the studies. There was inconsistent association with psychological factors like mental health. The paucity of studies on social and environmental correlates of PA was highlighted in this review[16]. When it comes to understanding behaviour and behaviour change though, personal (e.g. cognitions, attitudes), as well as social and environmental factors are of major importance[18-21].

To date no systematic work has captured these factors, with those identified which are modifiable potentially contributing to the development of interventions to promote the initiation and maintenance of PA in people with OA. Qualitative studies, which offer an in-depth exploration of the human experience, might prove more appropriate in illustrating the variety and interplay of psychosocial and environmental factors that facilitate or hinder PA specifically in people living with lower limb OA. A recent scoping review of both quantitative and qualitative studies[22] has mapped modifiable factors linked to exercise participation in hip and knee OA patients using the Theoretical Domains Framework. This systematic review of qualitative evidence will move one step further by applying rigorous methodology, such as quality appraisal of the included studies and confidence in the reported findings. Confidence in the reported findings is directly relevant to how informative and useful they can be in practice. In addition, two important distinctions of potential relevance to barriers and facilitators to PA will also be addressed in this systematic review. The first is a discrimination between barriers and facilitators to exercise and “lifestyle” PA. The second is about the theoretical and empirical distinction between uptake and maintenance of PA, i.e. whether PA is a newly introduced or re-introduced behaviour in a person’s life or its regular engagement is part of one’s lifestyle[23]. Different factors can act as barriers and facilitators at different stages of behavioural change (in particular, when the focus is on adoption or maintenance),

which holds practical implications when it comes to identifying key elements of behavioural interventions.

Objectives

To identify, appraise and synthesise the existing qualitative evidence on barriers and facilitators to PA uptake and/ or maintenance in people with hip or knee OA based on the patients' perceptions and experiences.

Secondary objectives are to explore differences in barriers and facilitators between (i) exercise and lifestyle PA and (ii) uptake and maintenance of PA.

METHODS

This systematic review protocol follows the Preferred Reporting Items for Systematic Review and Meta-analysis Protocols (PRISMA-P) 2015 statement (Appendix 1)[24 25]. The systematic review was registered with the International Prospective Register of Systematic Reviews (PROSPERO), registration number CRD42016030024. It will be informed by the Centre for Reviews and Dissemination[26] and Cochrane Qualitative Research Methods Group[27 28] guidelines and will follow the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ)[29] and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)[30] Statements for reporting systematic reviews (Appendix 2). In the case of sections applicable to qualitative systematic reviews that are included in PRISMA, but are not covered by ENTREQ, these will also be reported.

Eligibility criteria

The criteria outlined below will be used for study selection (Appendix 3). PICOS (Population- Intervention- Comparison- Outcomes- Study design), which is an established tool for defining key components of research questions[31], was adapted for use in this study. In particular, interventions and comparators were not applicable and the phenomenon of interest will be identified instead.

Population Study participants will be adults who have physician diagnosed hip or knee OA; or, radiographic OA using Kellgren and Lawrence grade >=2 at hip or knee; or, meet internationally accepted classification criteria for OA (e.g. American College of Rheumatology classification criteria). If the study population involves groups of patients with other types of arthritis, e.g. rheumatoid arthritis, they will be included in this study provided that knee and hip OA patients combined are the highest proportion of participants. Studies will be excluded if the study participants are people about to undergo or have undergone total hip or knee arthroplasty.

Outcomes will be barriers and facilitators that influence uptake and/ or maintenance of PA in people with OA as perceived and reported by the patients.
Studies will be included if (a) they directly explore the factors/ barriers/ facilitators/ motivation that correspond to engagement in PA/ exercise (i.e. this is stated in the study objectives or relevant interview questions are included); or (b) they directly address or focus on any aspect of the experience or perceptions of people living with hip or knee OA regarding PA and/ or exercise.

Study designs (1) Qualitative studies using appropriate methods of data collection and data analysis. (2) Mixed methods studies that report qualitative findings.

Language Studies will be excluded if written in a language other than English.
Publication year From database inception to 31st of December 2015.

Information sources

The databases MEDLINE (Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present, OVID interface), EMBASE (1974 onwards, OVID interface), PhychINFO (1967 onwards, OVID interface), Web of Science, CINAHL, SPORTDiscus and Scopus will be searched from inception to 31 of December 2015. Also, Grey literature sources will be considered, i.e. OpenGrey, NHS evidence. Hand search of qualitative-research-centred journals, e.g. Qualitative Health Research, Sociology of Health and Illness, will complement the search strategy. Screening of the references of included articles and relevant existing reviews will take place. Lastly, active researchers in the field who have contributed to this literature will be contacted.

Search

The search strategy will comprise comprehensive keyword combinations for each of the four concepts of interest (see Appendix 4 for Medline), i.e. 1) knee and hip osteoarthritis (1-9 in the Appendix), 2) PA/ exercise (10-16), 3) barriers, facilitators, motivation, uptake, maintenance (17-24), 4) qualitative study design (25-30). Free text search (.mp) will be applied for the basic search terms for each concept (e.g. “osteoarthritis” for population; “physical activity”, “exercise” for phenomenon of interest; “barrier*”, “facilitator*”, “motivation” for outcomes; “qualitative” for study design), supplemented by a wide array of alternative terms searched for in the title/ abstract section or free text search. Within each group of concepts the keyword combinations will be mutually inclusive (“OR” operator). The combination of the four groups was applied in the latter stage using the AND operator.

Study records

The study selection process will be according to the PRISMA flow diagram[30] (Appendix 5). Two independent reviewers will run the search and study selection. Endnote X7 software will be used for data management. Citations including abstracts will be imported and duplicates will be removed. Selected articles will be juxtaposed for multiple reports of a single study so that double counting of studies is avoided.

The pre-determined eligibility criteria will be used in the form of a list (Appendix 3), which will be checked and fine-tuned if necessary by the two reviewers. The reviewers will independently apply the criteria at all stages of the selection process. After title/ abstract screening, full text copies of potentially relevant studies will be obtained. Additional information will be sought from authors if necessary at the stage of full text assessment. Where the information provided is insufficient for study selection, assessment and synthesis, the respective studies will not be included in the synthesis but will be referenced in the discussion section. Consensus will be reached through discussion and where agreement is not reached, a third reviewer will be consulted. At the end of the selection process the Kappa statistic [32] will be used to assess the chance corrected agreement between the reviewers in

assessing the full text articles as included, excluded or unclear. A supplementary table with information about the selected studies will be provided including study characteristics (first author's name, publication year, method of data collection and data analysis), participant characteristics (age, gender, locus and severity of OA, duration of diagnosis, physical activity profile), and contextual information (country, geographic area, setting if applicable). Data will be entered in and managed with NVivo 11 qualitative data analysis software (QSR International).

Data items

All text under the sections of "results" and "findings" will be considered as data and will be analysed. If findings and discussion are presented together, then discussion will also be considered as a data item.

OUTCOMES AND PRIORITISATION

Phenomenon of interest

The description and interpretation of OA patients' experiences and perceptions regarding what hinders and what facilitates and motivates them to engage in PA behaviours constitute the phenomenon of interest. All types of factors reported by the participants will be included, e.g. health-related, psychological, social, cultural, environmental. Subgroups of the phenomenon of interest will also be explored, provided that there is sufficient evidence. These are: barriers and facilitators to PA uptake and PA maintenance; engagement in exercise and engagement in lifestyle PA.

Appraisal of study quality

Since there is no consensus on how to assess qualitative evidence and a single set of criteria might not be applicable to all kinds of qualitative research[33 34], two different approaches to appraisal will be applied (Appendix 6).

Firstly the Critical Appraisal Skills Programme (CASP) Qualitative Checklist, a structured tool commonly employed in SRs of qualitative evidence, will be used. CASP Qualitative Checklist is broadly suitable for various qualitative study designs, is available online and free of charge. The tool, including introduction, ten questions and prompts, will be used as provided by the CASP-uk.net. Studies will be rated as "high quality" if they meet at least eight of the ten criteria, "medium quality" if they meet five to seven of the criteria and "low quality" if they meet four or less.

Although the CASP tool appraises reporting and methodological quality, it does not address aspects of the research validity[35] and can favour papers that are less insightful as long as they comply with "expectations of research practice"[36]. To address this gap, the evaluative criteria of credibility, transferability, dependability and confirmability[37] will be applied. These criteria widely acknowledge the philosophical stance of qualitative research, focus on the trustworthiness of the study[37 38] and their development was not aimed in particular at the evaluation of interpretive qualitative approaches as other theoretically informed tools, e.g. Popay et al.[39]. Included studies will be assessed as to whether they apply the techniques suggested for ensuring study quality according to Lincoln and Guba's criteria[33 40]: prolonged engagement, persistent observation, peer review, triangulation,

negative case analysis, referential adequacy and member checking to ensure credibility; thick description for transferability; inquiry audit for dependability; confirmability audit, audit trail, triangulation and reflexivity to ensure confirmability. A more detailed description of the context of the above procedures can be found in Appendix 6. Studies will be rated as "high quality" if they meet at least three of the four criteria, "medium quality" if they meet two of the criteria and "low quality" if they meet one or none.

Two reviewers, both with qualitative research training and experience (AMK/ NE) and one with additional experience in qualitative systematic reviews (NE), will independently appraise the selected studies. First, the appraisal process will be piloted, i.e. the reviewers will independently apply the two sets of criteria on two studies and criteria and then compare the outcome and discuss the process they followed, so that potential discrepancies in applying the criteria are resolved. The final assessment for each study will be reached through discussion and in case a consensus is not reached, a third researcher will be consulted. A detailed justification of the assessment outcome for the second set of criteria will be available upon publication of the SR.

Data synthesis

Thematic synthesis as described by Thomas & Harden[41] will be applied for data synthesis. Thematic synthesis is a transparent and suitable method for integrating qualitative evidence in a SR[42] and has been used for SRs of barriers and facilitators to various behaviours[43-45]. The synthesis involves three stages: (a) free line by line coding, (b) grouping of the codes into "descriptive themes", which also includes the translation of conceptions from one study to the other (i.e. the codes from all included studies will be compared with each other in an iterative process, the codes/ quotes describing the same concept will be merged under one code and those expressing a similar concept will be grouped together), and (c) the formation of analytical themes. At the latter stage barriers and facilitators to PA in people with hip and knee OA will be inferred from the descriptive themes; i.e. the research questions, which are put aside during the data driven first two stages, will be introduced at this point to inform the formation of analytical themes. Therefore, the synthesis will combine both an inductive (at first stages) and a deductive (latter stage) approach. The analytical themes and their relation with descriptive themes will be presented in tables. The synthesis will be conducted by one researcher (AMK) and checked by a second independent reviewer with experience in thematic analysis (NE), to enhance credibility.

Confidence in the synthesised qualitative findings

Assessing the quality of the studies in a SR does not answer the question of how much certainty or trust we can place on each individual review finding. To ensure the potential value of the review in informing its users the assessment of the trust that can be placed on each individual finding is advised[46]. In qualitative evidence syntheses, approaches to confidence in the findings have only recently been developed[38 47]. The ConQual approach[38], which was developed by qualitative research experts from the Joanna Briggs Institute in Adelaide, will be adopted for assessing the confidence in the findings. ConQual assesses the confidence in findings, i.e. truth value, based on two elements: dependability and credibility (Appendix 7). ConQual is the approach of choice as it offers a clear operationalisation of each element and description of the appraisal process. A Confidence in the Findings Table will be formulated which will include the review finding, the assessments

for dependability, credibility, and the overall Confidence score (high, moderate, low, very low).

DISCUSSION

This systematic review will be the first to synthesise and report barriers and facilitators of PA in people with hip or knee OA based on qualitative evidence. Following the emerging evidence on the independent role of sedentary pursuits on health and mortality[48 49] and the shifting of health guidelines and policies from exercise promotion to physical activity promotion, we will further explore differences between determinants of lifestyle PA and exercise, as there is a pronounced gap in the literature regarding the former[50]. Additionally, we will explore differences reported in the literature between uptake and maintenance of PA. The review findings will inform our understanding of factors facilitating or inhibiting participation in physical activity and provide information on how to optimise behaviour change at different stages (i.e. uptake or maintenance) in the targeted population.

This protocol serves to provide a detailed account of the rational and methods to be used in the proposed systematic review to ensure the transparency of the process[24]. In case any deviation from the protocol takes place, it will be justified and discussed in the systematic review upon publication.

Ethics and dissemination

The review findings will be reported in a peer-reviewed journal and presented at national or international conferences. The study raises no ethical issues.

Contributions

JLD, AMK, AR, RK and AA contributed to the development of the study design and search strategy. KR and AA provided expertise on the selection criteria. AR provided expertise on the methodological issues related to systematic reviews. AK developed the SR protocol and all authors provided feedback and approved the final protocol.

Amendments

Should amendments need to be made for this protocol, they will be reported in detail in this section and will not be incorporated in the protocol.

Funding statement

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Competing interests

The authors declare no competing interests.

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PRISMA-P (Preferred Reporting Items for Systematic review and Meta-Analysis Protocols) 2015 checklist: Recommended items to address in a systematic review protocol*

Section and topic	Item No	Checklist item	Reported (Section)
ADMINISTRATIVE INFORMATION			
Title:			
Identification	1a	Identify the report as a protocol of a systematic review	Yes (Title)
Update	1b	If the protocol is for an update of a previous systematic review, identify as such	N/a
Registration	2	If registered, provide the name of the registry (such as PROSPERO) and registration number	Yes (Abstract, Registration number)
Authors:			
Contact	3a	Provide name, institutional affiliation, e-mail address of all protocol authors; provide physical mailing address of corresponding author	Yes (Title page)
Contributions	3b	Describe contributions of protocol authors and identify the guarantor of the review	Yes (Contributions)
Amendments	4	If the protocol represents an amendment of a previously completed or published protocol, identify as such and list changes; otherwise, state plan for documenting important protocol amendments	Yes (Amendments)
Support:			
Sources	5a	Indicate sources of financial or other support for the review	Yes (Funding statement)
Sponsor	5b	Provide name for the review funder and/or sponsor	Yes (Funding statement)
Role of sponsor or funder	5c	Describe roles of funder(s), sponsor(s), and/or institution(s), if any, in developing the protocol	N/a
INTRODUCTION			
Rationale	6	Describe the rationale for the review in the context of what is already known	Yes (Introduction, Rationale)
Objectives	7	Provide an explicit statement of the question(s) the review will address with reference to participants, interventions, comparators, and outcomes (PICO)	Yes (Introduction, Objectives)

METHODS			
Eligibility criteria	8	Specify the study characteristics (such as PICO, study design, setting, time frame) and report characteristics (such as years considered, language, publication status) to be used as criteria for eligibility for the review	Yes (Methods, Eligibility criteria)
Information sources	9	Describe all intended information sources (such as electronic databases, contact with study authors, trial registers or other grey literature sources) with planned dates of coverage	Yes (Methods, Information sources)
Search strategy	10	Present draft of search strategy to be used for at least one electronic database, including planned limits, such that it could be repeated	Yes (Methods, Search)
Study records:			
Data management	11a	Describe the mechanism(s) that will be used to manage records and data throughout the review	Yes (Methods, Study records)
Selection process	11b	State the process that will be used for selecting studies (such as two independent reviewers) through each phase of the review (that is, screening, eligibility and inclusion in meta-analysis)	Yes (Methods, Study records)
Data collection process	11c	Describe planned method of extracting data from reports (such as piloting forms, done independently, in duplicate), any processes for obtaining and confirming data from investigators	Yes (Methods, Study records)
Data items	12	List and define all variables for which data will be sought (such as PICO items, funding sources), any pre-planned data assumptions and simplifications	Yes (Methods, Data items)
Outcomes and prioritization	13	List and define all outcomes for which data will be sought, including prioritization of main and additional outcomes, with rationale	Phenomenon of interest is defined. (Outcomes and prioritisation, Phenomenon of interest)
Risk of bias in individual studies	14	Describe anticipated methods for assessing risk of bias of individual studies, including whether this will be done at the outcome or study level, or both; state how this information will be used in data synthesis	Appraisal of study quality is described. (Outcomes and prioritisation, Appraisal of study quality)
Data synthesis	15a	Describe criteria under which study data will be quantitatively synthesised	N/a
	15b	If data are appropriate for quantitative synthesis, describe planned summary measures, methods of handling data and methods of combining data from studies, including any planned exploration of consistency (such as I^2, Kendall's τ)	N/a

	15c	Describe any proposed additional analyses (such as sensitivity or subgroup analyses, meta-regression)	N/a
	15d	If quantitative synthesis is not appropriate, describe the type of summary planned	Thematic synthesis will be applied. (Outcomes and prioritisation; Data synthesis)
Meta-bias(es)	16	Specify any planned assessment of meta-bias(es) (such as publication bias across studies, selective reporting within studies)	N/a
Confidence in cumulative evidence	17	Describe how the strength of the body of evidence will be assessed (such as GRADE)	The ConQual approach will be adopted. (Outcomes and prioritisation; Confidence in the synthesised qualitative findings)

*** It is strongly recommended that this checklist be read in conjunction with the PRISMA-P Explanation and Elaboration (and cite when available) for important clarification on the items. Amendments to a review protocol should be tracked and dated. The copyright for PRISMA-P (including checklist) is held by the PRISMA-P Group and is distributed under a Creative Commons Attribution Licence 4.0.**

From: Shamseer L, Moher D, Clarke M, Ghersi D, Liberati A, Petticrew M, Shekelle P, Stewart L, PRISMA-P Group. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. BMJ. 2015 Jan 2;349(jan02 1):g7647.

Appendix 2.

ENTREQ Statement: Recommended items to address in a synthesis of qualitative research

No	Item	Guide and description
1	Aim	State the research question the synthesis addresses.
2	Synthesis methodology	Identify the synthesis methodology or theoretical framework which underpins the synthesis, and describe the rationale for choice of methodology.
3	Approach to searching	Indicate whether the search was pre-planned or iterative.
4	Inclusion criteria	Specify the inclusion/exclusion criteria.
5	Data sources	Describe the information sources used and when the searches conducted; provide the rationale for using the data sources.
6	Electronic Search strategy	Describe the literature search.
7	Study screening methods	Describe the process of study screening and sifting.
8	Study characteristics	Present the characteristics of the included studies.
9	Study selection results	Identify the number of studies screened and provide reasons for study exclusion.
10	Rationale for appraisal	Describe the rationale and approach used to appraise the included studies or selected findings.
11	Appraisal items	State the tools, frameworks and criteria used to appraise the studies or selected findings.
12	Appraisal process	Indicate whether the appraisal was conducted independently by more than one reviewer and if consensus was required.
13	Appraisal results	Present results of the quality assessment and indicate which articles, if any, were weighted/excluded based on the assessment and give the rationale.
14	Data extraction	Indicate which sections of the primary studies were analysed and how were the data extracted from the primary studies.
15	Software	State the computer software used, if any.

16	Number of reviewers	Identify who was involved in coding and analysis.
17	Coding	Describe the process for coding of data.
18	Study comparison	Describe how were comparisons made within and across studies.
19	Derivation of themes	Explain whether the process of deriving the themes or constructs was inductive or deductive.
20	Quotations	Provide quotations from the primary studies to illustrate themes/constructs, and identify whether the quotations were participant quotations of the author's interpretation.
21	Synthesis output	Present rich, compelling and useful results that go beyond a summary of the primary studies.

From: Tong A, Flemming K, McInnes E, Oliver S, Craig .(2012). Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. BMC Medical Research Methodology, 12(1):181.

PRISMA Statement: Recommended items to address in Systematic Reviews and Meta-Analyses

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	

Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present the main results of the review. If meta-analyses are done, include for each, confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	

Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

Appendix 3. Eligibility criteria

Title:.
……
……

Author(s) and date: ……

Study should be deemed eligible if responses to all items are under the "yes" column.

	Yes	No
1. Qualitative study design or mixed methods design.		
2. Participants are adults with a physician's diagnosis of hip or knee osteoarthritis, regardless of radiographic evidence. If the study sample also involves groups of patients with other types of arthritis, then the group with the highest proportion of patients should be that of knee and/ or hip OA.		
3. (a) The study directly (i.e. it is stated so in the study aims or, relevant interview questions are included) explores the factors/ barriers/ enablers/motivation that correspond to engagement/ adoption/ maintenance of PA/ exercise. Or (b) the study directly addresses or focuses on any aspect of the experience or perceptions of people living with hip or knee OA regarding PA and/ or exercise.		
4. Participants have not undergone and are not about to undergo hip or knee arthroplasty.		
5. Written in English.		

Appendix 4. Medline Search Strategy

Draft MEDLINE search- Ovid interface

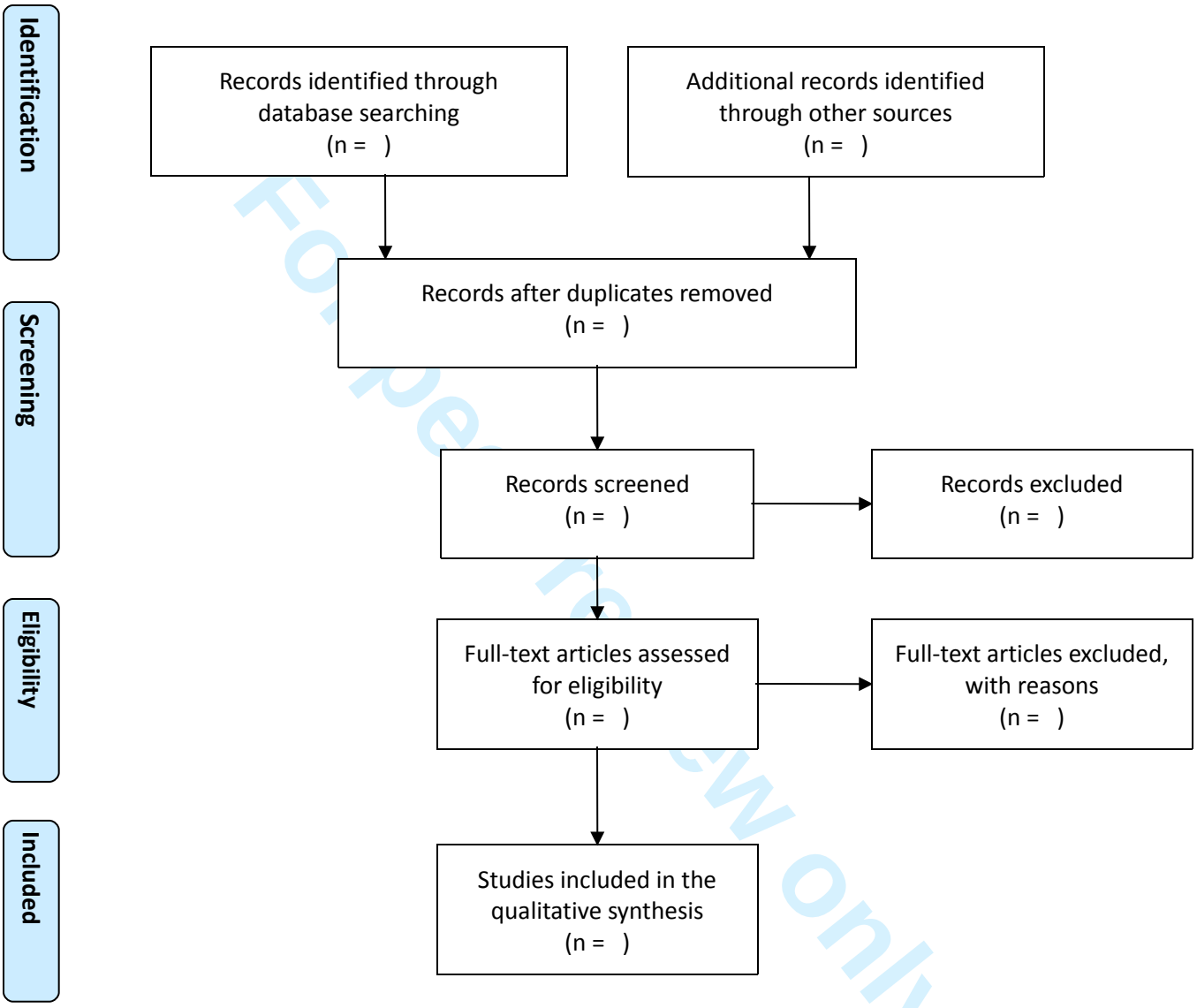
1	osteoarthritis.mp. or exp Osteoarthritis, Hip/ or exp Osteoarthritis/ or exp Osteoarthritis, Knee/
2	(osteoarthriti* or osteo-arthriti* or osteoarthrotic or osteoarthros*).ti,ab.
3	(coxarthrosis or gonarthrosis).ti,ab.
4	"knee pain".mp.
5	"hip pain".mp.
6	"lower limb".mp.
7	exp Lower Extremity/ or "lower extremit*".mp.
8	(degenerative adj2 arthritis).ti,ab.
9	1 or 2 or 3 or 4 or 5 or 6 or 7 or 8
10	physical activity.mp. or exp Motor Activity/
11	exp Exercise/ or exp Exercise Therapy/ or exercise.mp.
12	exp Sports/ or sports.mp.
13	exp Life Style/ or exp Sedentary Lifestyle/ or sedentary.mp.
14	"non-exercis*".ti,ab.
15	"activities of daily living".mp. or exp "Activities of Daily Living"/
16	10 or 11 or 12 or 13 or 14 or 15
17	(maintain* or maintenance or support* or ongoing or "on-going" or adherence or reinforc* or comply* or compliance or "long-term" or adoption or engagement or avoidance or boost* or refresh* or remind* or promotion or promot* or "physical activity uptake" or "behavio* change" or "lifestyle change").ti,ab.
18	(barrier* or impediment or limit* or facilitator* or enablers or enabl* or motivators or motivat* or influenc* or factors or determinants).ti,ab.
19	facilitator*.mp.
20	barrier*.mp.
21	adherence.mp.
22	exp Motivation/ or motivators.mp.
23	social support.mp. or exp Social Support/
24	17 or 18 or 19 or 20 or 21 or 22 or 23
25	exp Qualitative Research/ or qualitative.mp.
26	(interview* or theme* or experience).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept word, rare disease supplementary concept word, unique identifier]
27	("content analysis" or "grounded theory" or "thematic analysis" or "phenomenological analysis" or phenomenolog* or narrative* or discourse or ethnograph*).ti,ab.
28	(("semi-structured" or semistructured or unstructured or informal or "in-depth" or indepth or "face-to-face" or structured or guide) adj3 (interview* or discussion* or questionnaire*)).ti,ab.

29 (focus group* or interview* or fieldwork or "field work" or triangulation or "data saturation" or "key informant").ti,ab.

30 25 or 26 or 27 or 28 or 29

31 9 and 16 and 24 and 30

PRISMA 2009 Flow Diagram



From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

For more information, visit www.prisma-statement.org.

Appendix 6. Quality appraisal: CASP Qualitative Checklist and Evaluative criteria for Trustworthiness.

Title: …… Author(s) and date: …… Study No: …… **Critical Appraisal Skills Programme Qualitative Checklist.**	**Yes**	**No**	**Can't answer**
1. Was there a clear statement of the aims of the research? *What was the goal of the research? Why it was thought important?*			
2. Is a qualitative methodology appropriate? *If the research seeks to interpret or illuminate the actions and/or subjective experiences of research participants. Is qualitative research the right methodology for addressing the research goal?*			
3. Was the research design appropriate to address the aims of the research? *If the researcher has justified the research design (e.g. have they discussed how they decided which method to use)?*			
4. Was the recruitment strategy appropriate to the aims of the research? *If the researcher has explained how the participants were selected. If they explained why the participants they selected were the most appropriate to provide access to the type of knowledge sought by the study. If there are any discussions around recruitment (e.g. why some people chose not to take part).*			
5. Was the data collected in a way that addressed the research issue? *If the setting for data collection was justified. If the researcher has justified the methods chosen. If the researcher has made the methods explicit (e.g. for interview method, is there an indication of how interviews were conducted, or did they use a topic guide)? If the methods were modified during the study. If so, has the researcher explained how and why? If the form of data is clear (e.g. tape recordings, video material, notes etc). If the form of data is clear (e.g. tape recordings, video material, notes etc). if the researcher has discussed saturation of data.*			
6. Has the relationship between researcher and participants been adequately considered? *If the researcher critically examined their own role, potential bias and influence during (a) Formulation of the research questions (b) Data collection, including sample recruitment and choice of location How the researcher responded to events during the study and whether they considered the implications of any changes in the research design.*			
7. Have ethical issues been taken into consideration? *If there are sufficient details of how the research was explained to participants for the reader to assess whether ethical standards were maintained If the researcher has discussed issues raised by the study (e.g. issues around informed consent or confidentiality or how they have handled the effects of the study on the participants during and after the study). If approval has been soughtfrom the ethics committee.*			
8. Was the data analysis sufficiently rigorous? *If there is an in-depth description of the analysis process If thematic analysis is used. If so, is it clear how the categories/themes were derived from the data? Whether the researcher explains how the data presented were selected from the original sample to demonstrate the analysis process. If sufficient data are presented to support the findings. To what extent contradictory data are taken into account. Whether the researcher critically examined their own role, potential bias and influence during analysis and selection of data for presentation.*			
9. Is there a clear statement of findings? *If the findings are explicit If there is adequate discussion of the evidence both for and against the researchers' arguments. If the researcher has discussed the credibility of their findings (e.g. triangulation, respondent validation, more than one analyst). If the findings are discussed in relation to the original research question.*			
10. How valuable is the research? *If the researcher discusses the contribution the study makes to existing knowledge or understanding e.g. do they consider the findings in relation to current practice or policy or relevant research-based literature? If they identify new areas where research is necessary If the researchers have discussed*			

whether or how the findings can be transferred to other populations or considered other ways the research may be used.			
Criteria for trustworthiness based on Creswell (2007) and Cohen & Crabtree (2006)	Reviewer's assessment (Technique applied? How?)		
Credibility			
Prolonged engagement and persistent observation. Do the researchers spend sufficient time in the field, observe, talk to different people, build relationships, check for misinformation stemming from the researcher or the informants?			
Triangulation. Do the researchers make use of multiple data sources, investigators, theories to enhance understanding and ensure a rich and robust account of the study inquiry?			
Peer review or debriefing. "External check of the research process" (Creswell, 2007; p.208) or exposition of the research process to an unaffected peer. Do sessions between the researcher and a peer take place? Are written accounts of these sessions being kept?			
Negative case analysis. Do the researchers take account of the data that do not fit with emerging patterns or explanations? Do they revise the initial hypotheses and analysis until it accounts for the majority of cases?			
Referential adequacy. "Identifying a portion of data to be archived, but not analysed. The researcher then conducts the data analysis on the remaining data and develops preliminary findings. The researcher then returns to this archived data and analyses it as a way to test the validity of his or her findings" (Cohen & Crabtree, 2006).			
Member checking. Do the researchers take data, analyses, interpretations, conclusions back to the participants to evaluate the truthfulness of the account?			
Transferability			
Thick description refers to "describing and interpreting observed social action (or behaviour) within its particular context" (Ponterotto, 2006) Does the author achieve to give a sense of verisimilitude? Does the author describe in detail each part of the study (fully describing the study participants; settings and procedures, such as location and length of the interviews, recording procedures, interviewer's and interviewee's reactions; results, e.g. long quotes from the participants or the interview dialogue; successfully bringing together the participants' experiences with the researchers' interpretation of those in discussion)?			
Dependability			
External audit. ("Inquiry audit") Is there an "external consultant", who is not part of the study, examining the process and product of the study?			
Confirmability			
External audit ("confirmability audit")			
Reflexivity. (Clarification of researcher bias) Are the authors reflexive, i.e. do they "identify the perspectives they bring to their studies as insiders and/ or outsiders" and ways through which those affect "how they analyse, interpret and report the findings" (Sparkes & Smith, 2014: p 181-3). Is there a "critical friend" to help in this process?			
Triangulation (as above)			
Audit trail. Is the process of the study transparent and trackable? Do the researchers provide descriptions of the decision making process in detail?			

Appendix 7. ConQual criteria for assessing Confidence in the synthesised findings

Dependability. *When the five criteria for dependability are not met across the included studies the synthesised finding is downgraded based on the aggregated level of dependability.*
1. Is there congruity between the research methodology and the research question or objectives? 2. Is there congruity between the research methodology and the methods used to collect data? 3. Is there congruity between the research methodology and the representation and analysis of data? 4. Is there a statement locating the researcher culturally or theoretically? 5. Is the influence of the researcher on the research, andvice-versa, addressed?
Credibility. *When not all the findings included in a synthesised finding are considered unequivocal downgrading may occur.*
Unequivocal (findings accompanied by an illustration that is beyond reasonable doubt and; therefore not open to challenge). Equivocal (findings accompanied by an illustration lacking clear association with it and therefore open to challenge). Unsupported (findings are not supported by the data).

*From: Munn Z, Porritt K, Lockwood C, et al. Establishing confidence in the output of qualitative research synthesis: the ConQual approach. BMC Medical Research Methodology 2014;**14**(1):1-7.*