

Patient-centred insights into persistent pain after total knee joint replacement: a qualitative synthesis

Saba Dabhilkar , Julia Hill , Gwyn N. Lewis & Debbie J. Bean

To cite this article: Saba Dabhilkar , Julia Hill , Gwyn N. Lewis & Debbie J. Bean (22 Sep 2026): Patient-centred insights into persistent pain after total knee joint replacement: a qualitative synthesis, *Disability and Rehabilitation*, DOI: [10.1080/09638288.2026.2734805](https://doi.org/10.1080/09638288.2026.2734805)

To link to this article: <https://doi.org/10.1080/09638288.2026.2734805>



© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 22 Sep 2026.



[Submit your article to this journal](#)



[View related articles](#)



[View Crossmark data](#)

Patient-centred insights into persistent pain after total knee joint replacement: a qualitative synthesis

Saba Dabhilkar^a, Julia Hill^a, Gwyn N. Lewis^a and Debbie J. Bean^b

^aPhysiotherapy Department, Auckland University of Technology, Auckland, New Zealand; ^bPerson-Centred Rehabilitation Research Centre, Auckland University of Technology, Auckland, New Zealand

ABSTRACT

Purpose: Approximately 10-30% of people experience persistent pain following total knee replacement (TKR). Understanding the long-term experiences of pain post-TKR is crucial for optimising patient-centred care and guiding management. This study aimed to qualitatively synthesise existing research on patients' lived experiences of persistent pain following TKR.

Materials and methods: A search strategy was implemented across four databases to identify qualitative studies on patient experiences of persistent pain following TKR. The Critical Appraisal Skills Programme checklist was used for quality assessment. Data from selected articles were analysed using a thematic synthesis approach, involving an iterative process of coding, descriptive theme development, and analytical theme development.

Results: Eight studies were included in the synthesis, with four analytical themes constructed: (1) *Unexpected symptoms and unexplained pain*, leading to anxiety and distress, (2) *Loss of embodiment*, related to foreignness and lack of trust in the knee, (3) *Lack of interest from the health system*, highlighting the disconnect with healthcare providers, and (4) *Facilitating acceptance of pain*, describing the personal and healthcare system factors that promote reconceptualisation of pain.

Conclusions: Several individual and system factors are proposed that may break the cycle of pain and distress and facilitate better outcomes.

ARTICLE HISTORY

Received 26 February 2026

Revised 9 September 2026

Accepted 11 September 2026

KEYWORDS

Total knee replacement; chronic pain; thematic synthesis; healthcare system; patient experiences

> IMPLICATIONS FOR REHABILITATION

- Persistent pain following knee joint replacement is common and has a marked detrimental effect on physical and emotional wellbeing
- Pain is often accompanied by loss of embodiment and lack of trust in the knee
- Personal coping strategies that facilitate patients to reconceptualise pain may enable patients to accept and reframe their pain experience more positively
- Supportive healthcare interactions involving empathy, reassurance, and targeted education may reduce pain-related distress

Introduction

Total knee replacement (TKR) is widely regarded as an effective treatment for reducing chronic knee pain and improving physical function in people with advanced arthritis [1,2]. Although most patients experience significant pain relief and functional improvement after TKR [3], a substantial proportion (10-34%) continue to experience moderate pain at 6 months and beyond [4-6], with varied patterns of pain and function recovery occurring up to eight years post-surgery [7,8]. Persistent postsurgical pain is associated with poorer physical function and mental health [9-11], contributing to substantial personal, social, and healthcare costs [12,13]. As the number of knee replacement surgeries continues to rise internationally [14-16], these costs are likely to escalate.

Despite its high prevalence, quantitative research has yet to establish clear predictive factors for persistent postsurgical pain, identify strategies that can mitigate the risk of persistent postsurgical pain, or

CONTACT Gwyn N. Lewis  gwyn.lewis@aut.ac.nz  Physiotherapy Department, Auckland University of Technology, Auckland, New Zealand.

© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

identify effective strategies to treat persistent postsurgical pain following TKR. Systematic reviews and meta-analyses have identified some common risk factors [17,18]; however, their relationship with postsurgical outcomes is generally weak and the few externally validated prediction models developed have had variable success [19,20]. There is also limited evidence supporting the effectiveness of specific interventions to reduce the incidence of chronic pain after TKR. Systematic reviews have found low to moderate quality evidence that preoperative exercise or education interventions do not provide substantial long-term benefits in pain and function outcomes [21–23] and there is a lack of evidence to support any specific surgical techniques for preventing chronic pain [24]. Additionally, two systematic reviews on the treatment of persistent pain after TKR found limited trials and neither reported evidence of effectiveness [25,26]. One recent RCT found improved 12-month outcomes following a multifaceted personalised intervention for people with pain at 3-months post-TKR [27], but no evidence of long-term efficacy has been established [28].

Measures of pain relief, physical function, and other outcomes may be insufficient to capture the complex and multifaceted nature of recovery following TKR. Qualitative research can provide information about the lived experience of pain and how it is situated in a person's life. It can facilitate an understanding of the reality of persistent pain that goes far beyond simple quantitative measures. A previous qualitative synthesis of studies involving patients post-TKR [29] identified several key points around patient expectations, mood, and clinical interactions that influenced the postoperative experience. However, this review included studies with participants experiencing both good and poor outcomes following surgery and did not include several recent studies that have focused on the experiences of people with persistent pain.

A deeper understanding of what persistent pain following TKR means to patients, its impact on their overall well-being, and how it integrates into the broader context of their daily lives may facilitate the development of alternative management strategies that better address patients' needs. Therefore, the aim of this project was to conduct a qualitative synthesis of studies that have detailed patients' experiences with persistent pain following TKR.

Materials and methods

A meta-synthesis approach following the Enhancing Transparency in Reporting the Synthesis of Qualitative Research (ENTREQ) guidelines [30] was used. The review was pre-registered on PROSPERO (CRD42024568283). Qualitative studies exploring patient experiences of chronic pain following TKR were systematically identified, analysed, and synthesised. An interpretivist philosophy was adopted, emphasising that peoples' experiences of pain are subjective and contextual. This approach is appropriate for uncovering rich insights into how people interpret and manage their pain, acknowledging that it is a multidimensional experience influenced by many factors. The research team comprised a postgraduate student (SD) and three academic staff members (JH, GL, DB). The student is a physiotherapist with experience in musculoskeletal care in India and the United Arab Emirates, where she encountered patients with post-surgical concerns, including persistent pain after TKR. This clinical background, combined with exposure to patients whose pain was often dismissed despite significant functional difficulties, informed the study's aim to explore the lived experiences of these individuals. GL is an experienced pain researcher with expertise in pain neurophysiology and cultural meanings of pain. JH is a musculoskeletal physiotherapist who brings complementary perspectives in evidence synthesis, patient-centred care, and chronic pain management. DB is a health psychologist with extensive clinical experience in interdisciplinary chronic pain management and research interests in understanding, preventing and treating chronic pain. While these diverse backgrounds enrich the study's depth and scope, we acknowledge that our professional experiences may influence the interpretation of the findings. To address this, we committed to maintaining a reflexive approach throughout the research process, ensuring that the insights presented accurately reflect the voices of participants within the reviewed studies.

Search strategy

A search strategy was developed to identify relevant studies. The key search terms included combinations of keywords and phrases relevant to knee replacement, qualitative methodologies, and chronic

pain. Below is an example of the search string designed, which was implemented in MEDLINE, CINAHL, PsychInfo, and Scopus databases.

(knee OR “lower limb”) AND
 (TKR OR “replacement” OR TKJR OR TKA OR arthroplasty OR TJR OR “post operative*” OR surgery OR implant) AND
 (experience* OR perspective* OR view* OR satisfaction* OR narrative* OR insight* OR feedback* OR reflection* OR concern* OR Qualitative* OR subjective OR thematic* OR interpretive* OR interview* OR “focus group*” OR “content analysis”) AND
 (chronic OR persistent OR enduring OR lingering OR recurr* OR intractable OR continuous OR “long lasting” OR prolonged OR ongoing OR “long term”) N3 (pain)

The initial search was run in all databases in November 2024. Search results were extracted to EndNote 20 (Clarivate) software, with duplicates automatically and then manually removed. Titles and abstracts were screened for relevance based on the eligibility criteria by one of the researchers (SD). For the remaining articles, full-text reviews were conducted by two authors independently (SD and either JH, GL) for each article to determine final inclusion. Any disagreements were resolved through discussion. An updated search was run in February 2026, with all additional results screened for relevance independently by two authors (SD, GL).

Eligibility criteria

Studies were included if they focused on adults with persistent pain post-TKR, were qualitative or mixed-methods studies (using interviews, focus groups, or observations), included participants at least 6 months post-TKR, and were published in English. Studies were excluded if they did not distinguish between individuals with and without chronic pain, if the majority of participants had trauma-related osteoarthritis, or if they involved participants with persistent pain from other surgeries (e.g., hip replacements) unless TKR data could be separated. There were no restrictions based on publication date.

Quality appraisal

The Critical Appraisal Skills Programme (CASP) Qualitative Checklist was used to evaluate the quality of the included studies [31]. Each study was independently appraised by two researchers (SD and either JH, GL). Any discrepancies or uncertainties identified during the assessment process were resolved through discussions to ensure consistency and rigour in the evaluations.

Data extraction

Key information from each study was systematically extracted by SD and organised using a structured table. The extracted details included the study title, author(s), location, participant demographics (total number of participants, percentage of females, age range, and ethnicity), methodology, and data collection methods.

Data synthesis was conducted using the three-stage Thomas and Harden [32] thematic synthesis approach. In the first stage, line-by-line coding of data of the results section of each included study was conducted by two authors independently (SD, GL), including participant quotes and descriptive phrases. The discussion and abstract of each study were also checked for relevant data. Each code was recorded in an Excel sheet with its corresponding study number for traceability. In the second stage, the codes were exported to Miro software (Miro, San Francisco, CA) and grouped into categories (SD, GL). These categories were then developed and refined into descriptive themes in an iterative manner involving all authors. This process was conducted collaboratively through discussions with all authors, ensuring that the themes accurately represented the underlying data. The third stage involved developing analytical themes, moving beyond description to generate new insights through interpretation and abstraction through group discussion. The researchers engaged in reorganisation and cross-checking against the original sources to maintain credibility, with the final themes established through consensus-building.

This structured approach ensured a systematic and transparent synthesis, providing deeper insights into patient experiences of chronic pain after TKR.

Following development of the analytical themes, a conceptual model was generated to enable visualisation of the themes and their relationships.

Results

Description of studies

A total of 2605 records were identified through the initial database searches (Figure 1). Two additional studies were identified by citation tracking. These two studies focused on satisfaction and discontentment following TKR, rather than persistent pain; however, it was clear from the findings that these interpretations were based on the experience of ongoing pain. After manually removing 941 duplicates and using automation tools to eliminate 204 duplicate records, 1462 records remained for title and abstract screening. Of these, 1427 were excluded, leaving 35 full-text articles for eligibility assessment. After full-text screening, 27 studies were excluded, resulting in eight studies to be included in the synthesis. One study included participants with and without pain. Data were extracted from the descriptions and quotes related to participants with persistent pain only. The updated search did not identify any additional studies that met the inclusion criteria.

Details of the included studies are shown in Table 1. All eight studies used semi-structured interviews to explore participants' experiences, with one employing a mixed-methods approach that incorporated a quantitative questionnaire [33]. Two studies involved the same participants with a different focus in interview topic [33,34], while an additional two studies involved the same participants with an additional analysis of the interview data [35,36]. Therefore, there were 196 participants in total (62% female) ranging in age from 48 to 93 years. The studies originated from the United Kingdom, Australia, Sweden, and

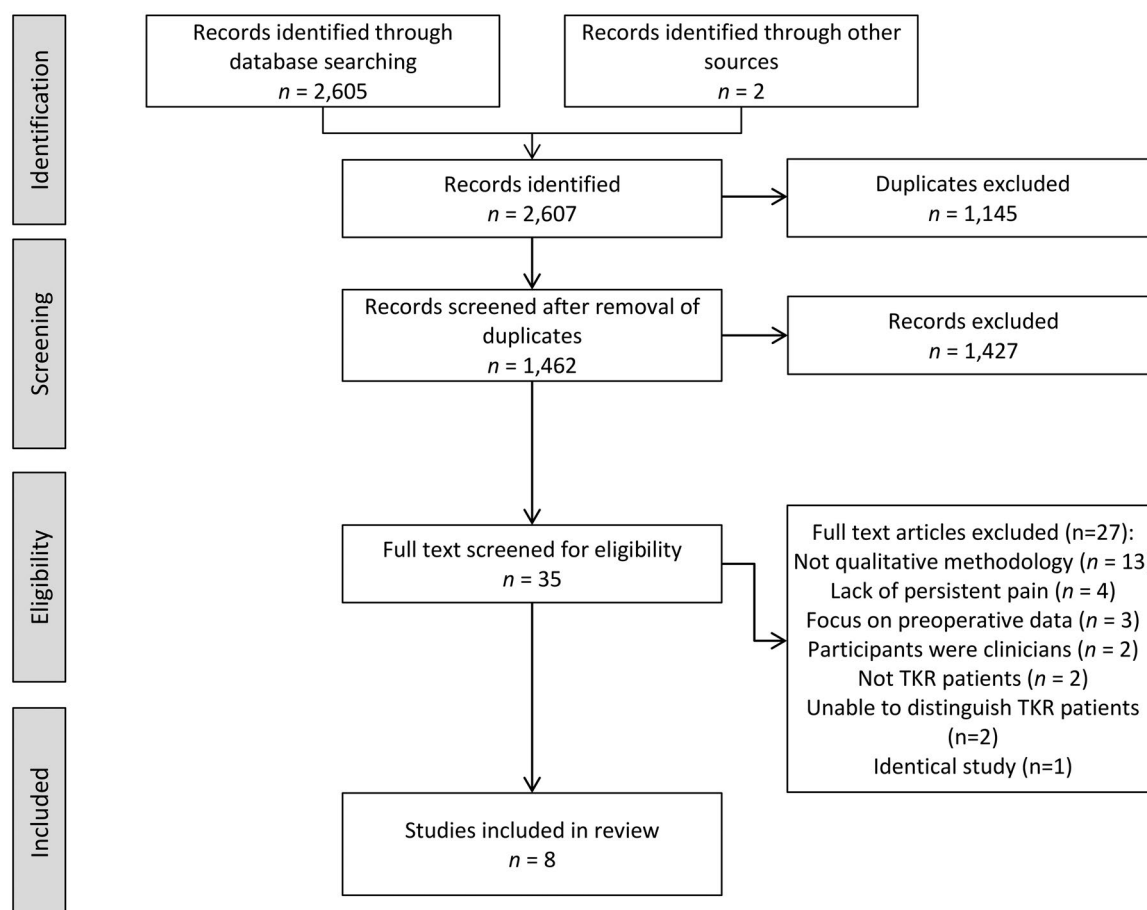


Figure 1. PRISMA flow diagram showing the selection of articles. TKR=total knee replacement.

Table 1. Summary of study characteristics.

Study	Location	Time post-TKR	N (% female), age range	Ethnicity	Methodology	Data collection
[40]	United Kingdom	2–5 years	28 (64%), 57–87 years	NS	NS	Semi-structured interviews
[38]	Australia	1–2 years	40 (71%), 50–>80 years	NS	Constructivist grounded theory	Semi-structured interviews
[39]	Sweden	1 year	44 (64%), 59–88 years	Swedish (93%), non-Swedish (7%)	NS	Semi-structured interviews
[36]	United Kingdom	1–5 years	34 (53%), 55–93 years	NS	NS	Semi-structured interviews
[35]	United Kingdom	1–5 years	34 (53%), 55–93 years	NS	NS	Semi-structured interviews
[37]	United Kingdom	1.3 years	27 (63%), 55–84 years	White (100%)	NS	Semi-structured interviews
[33]	Norway	5–7 years	23 (57%), 48–84 years	NS	Mixed-methods	Semi-structured interviews, questionnaires
[34]	Norway	5–7 years	23 (57%), 48–84 years	NS	Explorative-descriptive	Semi-structured interviews

TKR: total knee replacement; NS: not specified.

Table 2. Risk of bias evaluation of included studies using the Critical Appraisal Skills Programme (CASP) checklist.

Study	1. Was there a clear statement of the aims of the research?	2. Is a qualitative methodology appropriate?	3. Was the research design appropriate to address the aims of the research?	4. Was the recruitment strategy appropriate to the aims of the research?	5. Was the data collected in a way that addressed the research issue?	6. Has the relationship between researcher and participants been adequately considered?	7. Have ethical issues been taken into consideration?	8. Was the data analysis sufficiently rigorous?	9. Is there a clear statement of findings?	10. How valuable is the research?
[40]	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes
[38]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
[39]	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
[35]	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes
[35]	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes
[36]	Yes	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes
[33]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
[34]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Norway and were published between 2011 and 2023. Participants were from 6 months to several years post-TKR.

Study quality

The included studies demonstrated overall methodological rigour, with clear research aims, effective data collection strategies aligned with their research questions, appropriate ethical considerations, rigorous data analysis, and clear presentation of findings (Table 2). However, some studies did not state and/or justify their research methodology or explicitly address the researcher-participant relationship. Despite this, collectively, the study quality was adequate to provide meaningful insights into persistent pain following TKR.

Qualitative synthesis

The evidence synthesis generated 16 categories and four descriptive themes (Table 3). Together, these gave rise to four analytical themes: (1) *Unexpected symptoms and unexplained pain*, (2) *Loss of embodiment*, (3) *Lack of interest from the health system*, and (4) *Facilitating acceptance of pain*. These themes are discussed in more detail below.

Theme 1: Unexpected symptoms and unexplained pain

This theme described the unexpectedly high and ongoing nature of pain following surgery that restricted physical activity and return to hobbies. The absence of an explanation for their symptoms created uncertainty and anxiety for participants, often leading to a sense of vulnerability and hopelessness.

Table 3. Generation of the descriptive and analytical themes.

Categories/subthemes	Descriptive themes	Analytical themes
Constant high intensity pain	Physical pain and impaired daily activities	Unexpected symptoms and unexplained pain
Abnormal sensations		Lack of embodiment
Knee feels foreign		Perceived lack of interest from health system
Lack of control and confidence in knee		Multiple cognitive factors can facilitate acceptance
Restrictions to everyday activities	Uncertainty, distress, and anxiety	
Uncertainty about pain		
Frustration, anxiety, fear		
Sleep disruption, social isolation		
Comorbidities and previous trauma	Lack of care and lack of options	
Lack of options		
Lack of care from health system		
Surgeons have a mechanical view of success		
Need to accept pain	Need to re-evaluate and accept pain	
Satisfaction is determined by comparison		
Need to take responsibility		
Choose not to have further healthcare		

Across all studies, participants consistently reported unexpectedly high levels of pain following surgery. For some, the pain was described as horrendous, overwhelming, and unrelenting. Moore, Wylde, et al. [37] commented that even those who had previously had TKR on their other knee were surprised with the intensity of pain. Participants in some studies also described uncomfortable sensations in their new knee, such as heaviness, tightness, swelling, and pressure. The ongoing nature of pain and other sensations had a detrimental impact on participants' movement and physical function. While this commonly centred on walking, even sitting for extended periods of time was challenging for some [38]. Participants complained they had been unable to re-engage in hobbies and the ongoing pain *"hindered them from valued activities"* [39]. Sellevold et al. [34] also described that *"after work they had no energy left, leaving them isolated and excluded from participating in social activities with the important people in their lives"*, highlighting the additional effect this had on meaningful social engagements.

Perhaps more striking was the deep psychological impact of the persistent pain. Pain disrupted sleep, created fear and anger, and in some cases instilled a sense of hopelessness and an inability to cope. Participants reported feeling trapped and isolated by their pain, further impacting their mood: *"Depressed, totally depressed, sad, miserable, charred off, all the things that go with that that you can think of"* [40]. Previous unresolved trauma and the presence of comorbidities added to the distress around their new knee. Sellevold et al. [34] highlighted the burden for participants of living with suppressed grief and anxiety from past events, which seemed to surface as a result of the stress from their ongoing knee pain. Participants described that the addition of knee pain compounded the burden of existing pain and other comorbidities, which often interfered with rehabilitation. In two studies [38,40], participants reported suicidal ideation brought on by the unrelenting nature of their pain.

The unexplained nature of pain was particularly distressing for participants. Participants reported they were unable to get reassurance about their symptoms or specific information about how much pain should be expected in the longer term. The importance of explanations regarding pain was highlighted by Moore, Wylde et al. [37], with the authors describing one participant *"feeling 'fortunate' to know the reason for her pain, rather than 'going mad' with uncertainty"*. Several authors also reported participants were uncertain why treatments they were expecting to reduce pain, such as medication and physiotherapy, were ineffective. Overall, this uncertainty and lack of reassurance caused substantial anxiety and distress.

Theme 2: Loss of embodiment

This theme highlighted the disembodiment some participants felt about their knee, or the view that the artificial knee was not fully incorporated as part of their body. This feeling of foreignness contributed to lack of trust in the new knee and fear related to trips and falls. Although the implant itself was not visible, its presence created an ongoing sense of unfamiliarity or unease, further complicating the participants' adaptation to the knee replacement.

Participants in some studies reported a sense of disconnection with their artificial knee [35,37,39]. Several participants in Moore et al. [35] described a profound sense of separation from their affected

limb, perceiving the prosthetic joint as inorganic and distinct from their sense of self. There was a similar concern by participants in Mahdi et al. [39] about the presence of “foreign material” in their body. This perception appeared to hinder their ability to fully accept the artificial joint as part of their body. One participant in Moore, Eccleston et al. [35] vividly expressed this sentiment: *“It feels like it’s someone else in me. Yeah, that’s how I feel about it. Yes. It doesn’t belong to me”* while another participant likened the prosthetic joint to an “alien knee”, stating *“Well, the best way when I think about it is to say it—I know it’s not my knee. It’s an alien knee in there. I don’t really feel connected to it”*. Such statements emphasise the participants lacked connection to the new knee joint.

This sense of alienation extended to how participants perceived the functionality of their prosthetic knee joint. Many participants in Moore et al. [35] experienced a sense of detachment, viewing their artificial knee as an independent entity beyond their control. One participant expressed frustration, acknowledging the physiotherapist’s efforts but attributing their difficulties to the knee itself, which, in their view, refused to cooperate despite rehabilitation attempts. Furthermore, these experiences of alienation were closely linked to challenges in movement. Participants described how their lack of connection with the prosthetic knee joint made their movements feel unnatural and effortful. One participant in Moore et al. [35] explained:

If I was to walk across there now and... because [of the dog] on the floor, whereas any normal person would walk along and step over him, I have to stop and think about stepping. My knee won’t let me do that.

A lack of trust in the new knee led to fear of movement, particularly around the risk of falls. Participants expressed a lack of enjoyment of walking [33] but described it as an inevitable movement in everyday life, emphasising the unavoidable nature of having to trust their knee [39]. Some participants described resorting to using aids and walking devices to increase confidence in their knee and reduce the perceived risk of falling [35,38,39].

Theme 3: Lack of interest from the health system

This theme describes the participants’ view that surgeons and other healthcare providers were primarily interested in the mechanical aspects of their new knee and often dismissed reports of ongoing pain, leaving them feeling abandoned by the healthcare system. The limited range of options available to manage their pain caused participants distress, contributed to a perceived lack of choice other than to put up with pain, and made it difficult for acceptance of their ongoing pain to occur.

Healthcare providers were described as prioritising mechanical and functional integrity of the replaced knee over participants’ reports and experiences of pain, leading to feelings of abandonment. One participant from Jeffery et al. [40] expressed this disconnect: *“I mean, it’s all the surgeon is concerned with—providing the x-rays are all perfect, everything’s joined up together properly...”*. When no mechanical cause for pain was found, patients were left with uncertainty about their recovery.

In several studies, participants felt that their persistent pain was not taken seriously by healthcare providers, describing instances where it was dismissed as a normal part of recovery or met with reluctance [36,38–40]. Participants in Jeffery et al. [40] reported that their surgeons provided minimal acknowledgment, investigation, or support. A participant in Moore and Gooberman-Hill [36] described being repeatedly reassured that the pain would improve over time: *“They just kept saying, ‘Give it a year and it should improve,’ and it never did”*. Being told that nothing was wrong with their knee was distressing for participants and left them feeling degraded and disrespected. The participants conveyed a sense of being frustrated by this dismissal of their concerns, *“...he said, ‘Well, there’s nothing wrong,’ and I said, ‘Well, tell my knee that, please’”* [40]. These exchanges show that when healthcare providers relied solely on biomedical markers while disregarding patients’ personal reports, it led to feelings of invalidation and neglect.

Many participants across the studies expressed frustration over the limited and often discouraging options presented to them when seeking help for their persistent pain. One participant recalled being told that they simply had to accept and live with their pain, implying that no further medical intervention was possible [36]. In some cases, options presented by healthcare professionals were viewed as lacking empathy and understanding. One participant in Moore and Gooberman-Hill [36] reported that a

physiotherapist suggested that *“The only way we can cure that is to take your leg off”*, while another recalled the following conversation:

The last time I saw the registrar at the hospital [about 15 months after surgery], he said to me, “You’ve got two options: we can either take that joint out, have a look, see what’s happening, put a new joint in—it might improve the situation, it might not. It might make it worse. The other option is just leave it as it is until it gets to the stage where it’s totally unbearable and we’ve got to replace it”.

These quotes highlight the bleak options afforded to participants. Jeffery et al. [40] emphasised the need for options outside the medical model, yet such suggestions did not appear across the studies.

Theme 4: Facilitating acceptance of pain

This theme describes several individual and health system factors that facilitated the reconceptualisation or acceptance of pain following TKR. These factors contributed to greater satisfaction with outcomes and reduced distress.

Acceptance of pain sometimes emerged as a form of resignation, where individuals pragmatically adjusted to their circumstances rather than continuing to resist their condition [36–38,40]. Some participants expressed this acceptance explicitly, *“...it’s just a case of you’ve gotta face up to it and you’ve gotta get on with life and you’ve gotta accept it”* [40]. Others framed acceptance by necessity rather than choice, *“Well, there’s no alternative. If you could tell me an alternative to not accepting the fact”* [36]. Jeffery et al. [40] posited that participants who had accepted their pain did not spend much time thinking about it, while those who were unable to accept pain were more likely to express distress and felt unable to cope.

Numerous individual factors facilitated acceptance. Participants’ interpretations of their pain were frequently guided by comparisons, both to themselves prior to their TKR and to others. Across studies, the acceptance of pain was more likely if pain was perceived as being better than prior to surgery [33,36,38], with some participants describing this as an important sign of progress and that not all pain needed to be relieved in order to be satisfied [40]. These comparisons highlight perceived recovery milestones as critical in reframing the pain experience. Gratitude also emerged as a significant psychological resource, exemplified by one participant reflecting that *“there’s a lot of people that are a lot, lot worse off than me”* [38]. Recognising that others face worse conditions fostered a sense of relative well-being and participants felt grateful their pain was not worse [40]. It was also common to compare to others of the same age without TKR. Seeing friends and peers dealing with chronic pain and undergoing similar medical procedures reinforced a sense of normalcy around their condition [38,40]. One participant said: *“...most of our friends have got pain anyway... one we know had two hip replacements, another one’s had one, somebody else’s had two knees and two shoulders, oh most of them have their aches and pains”* [40]. However, social comparison was not so positive for younger participants, who were more likely to be bothered by physical limitations of their knee and their inability to engage in higher impact activities [33,40].

In several studies, participants talked of taking self-responsibility for their pain, indicating it had been their choice to have the TKR [36] or blaming themselves for recovery not going as planned [37,40]. Some participants viewed enduring pain and associated physical sensations as an essential part of their recovery journey, believing that pushing through discomfort was necessary for progress [37]. In two studies where participants had received their TKR through a public health system [36,38], participants explained they had received their fair share of healthcare resource and that others were more deserving of clinician time, implying a need to take self-responsibility. Others did not want further surgery due to the perceived inconvenience, risk of further pain, or their older age, so they chose to accept their current situation [36]. Humour was also noted as a coping mechanism that facilitated acceptance. Despite years of suffering from painful comorbid conditions, some participants in Sellevold et al. [34] shared their stories with a sense of humour, often using it to cope with and make sense of their painful experiences. This approach allowed them to reframe their situation, lightening the emotional burden of chronic pain and helped them to manage the ongoing challenge with a more positive outlook. Klem et al. [38] also described the ability of participants to reconceptualise the meaning of pain meant that it was not perceived as threatening, and was instead associated with greater satisfaction of outcomes.

There were also health system factors that facilitated cognitive change and acceptance of pain. Participants in Moore, Wylde, et al. [37] felt reassured when they were provided with an explanation for their ongoing pain, clarifying that knowledge and reassurance may facilitate pain acceptance. The importance of knowledge was evident in other studies where participants expressed a strong desire for more comprehensive education and information during their recovery process. Some participants suggested a need for more preoperative information regarding the level of pain they might experience [37], while others desired more structured follow-up care beyond the initial recovery period [40]. Participants also sought overall guidance on lifestyle choices, such as continuing work, and how these factors might impact their individual recovery [27,40]. In addition to education and reassurance, psychological support and a feeling of being cared for by clinicians was appreciated. One participant in Moore, Wylde, et al. [37] explained that feeling “*looked after*” meant that she increased her self-motivation as she felt obliged to reciprocate the effort by healthcare staff.

Conceptual model of distress and acceptance

Based on the themes described above, a conceptual model of long-term pain following TKR was developed (Figure 2). The model shows that ongoing pain leads to a cycle of distress, helplessness, fear, and activity avoidance. Person and system factors are shown to both contribute to and break the pain cycle. Person factors that contribute to and facilitate the pain cycle include discordant expectations, lack of knowledge, knee disembodiment, a history of trauma, and the presence of comorbidities. Addressing those factors, such as developing positive outcome comparisons, managing co-existing trauma/distress, embodying the knee, or a positive appraisal of the health system, help to break the cycle of pain. Similarly, system factors, including a lack of reassurance and/or information, low empathy from health providers, and a lack of alternative treatment pathways contribute to the pain cycle, while reassurance and education from health providers can help break the cycle. Breaking out from the cycle of pain leads to separate cycle of reconceptualisation and acceptance of pain, reduced distress, and improved activity and life engagement.

Discussion

This is the first review to synthesise findings from studies focusing on the lived experience of people with long-term pain following TKR. The themes centred around unexpected and unexplained symptoms that caused distress, disembodiment of the knee, a lack of care from the health system, and several factors that promote acceptance of pain. While many of these concepts align with previous research (outlined below), the review has enabled the development of a new understanding of long-term pain

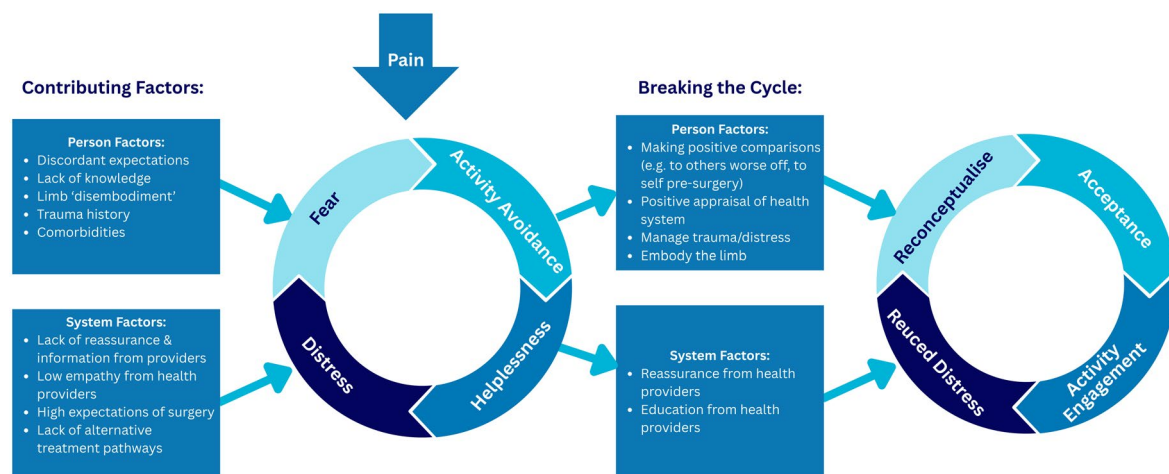


Figure 2. Conceptual model of persistent pain following total knee replacement. The model shows person and system factors that contribute to and break the cycle of persistent pain, leading to more positive outcomes.

following TKR, including the factors that contribute to it and those that may promote acceptance and more favourable outcomes. Similar to Webster et al. [41], who proposed that the interplay of psychological, social, relational, and physiological experiences influences return to activity post-TKR, our model suggests that the interpretation and meaning of persistent pain in the long-term following surgery are influenced by a range of both personal and healthcare system factors.

Two of the key person factors contributing to the cycle of distress and helplessness in our model centred on knowledge and expectations. Previous work has highlighted the unexpected intensity and duration of pain post-surgery [42,43], and the anxiety and sense of helplessness that it brings [44]. It is clear from these studies that high acute postoperative pain can occur in those who have good recovery in the long-term, indicating that initial high postoperative pain is not restricted to those who go on to experience persistent pain. Provision of knowledge and assurance appear to be critical to relieving the stress and anxiety that this pain and other unexpected symptoms bring following surgery [43,45]. Despite preoperative education about the postoperative period being standard practice, clinicians report that patients persist with expectations of immediate pain relief and improved function following TKR and feel there is not enough time to educate patients properly prior to surgery [46]. Others have suggested that cognitive dissonance and confirmation bias mean that patients dismiss information that challenges their pre-existing beliefs [42].

Our model identifies several other person factors that contribute to the ongoing cycle of pain and distress following TKR. These include poor embodiment of the new knee, the presence of comorbidities, and unresolved previous trauma. Descriptions of lack of embodiment primarily featured in Moore et al. [35] but contributed substantially to a perceived lack of control and trust in the knee. Previous studies have reported similar feelings of disconnection following knee or hip joint replacement, with participants perceiving the new joint as not truly part of their body [41,47]. This experience of disembodiment led to distrust, fear of falling, and reduced participation in activities perceived as risky, likely contributing to poor outcomes following TKR. Body perception disturbance and neglect are also evident in other chronic pain conditions, such as complex regional pain syndrome [48], fibromyalgia [49], neuropathic pain [50], post-stroke pain [51], and hand osteoarthritis [52], as well as after anterior cruciate ligament repair [53]. In these conditions, body perception disturbances are usually associated with higher pain intensity [54] and treatment aimed at reducing the disturbances generally relieves pain [55]. The presence of comorbidities also was primarily regarded as complicating recovery and adding to the burden of stress by participants within the review. Comorbidities have previously been recognised as challenging to manage in people pre- and post-TKR [41,56,57], and the presence of comorbidities is one of the variables more consistently associated with poor long-term outcomes from TKR in quantitative studies [18,58,59]. The final factor raised, the negative impact of unresolved trauma, was predominantly evident in Sellevold et al. [34], who specifically talked to participants about presurgical stress. Their findings support much previous research that a history of physical or psychological trauma increases the chances of developing chronic pain [60,61]. Many strategies for coping post-trauma involve suppression of trauma memories, e.g., through distraction or keeping busy. Such strategies may be less able to be accessed in the initial post-TKR period due to reduced physical and social participation [62–64], so the removal of these coping mechanisms combined with the helplessness of TKR recovery may create an environment of far increased distress.

In support of our model's system factors that contribute to distress and helplessness, patients in many previous studies have been critical of the support received from healthcare professionals and the health system after a TKR [29,43,44,56]. This includes complaints of clinicians being dismissive of pain [43] and a lack of options to manage their ongoing pain [29]. In fact, there is limited evidence-based guidance for managing persistent postoperative pain, and clinicians themselves may be frustrated with the options that are available within the health system [46]. However, what patients appear to value most are healthcare professionals who are empathic and caring; feeling supported is seen as critical by patients to face the sense of vulnerability and helplessness that TKR can instil [41,43,44]. Without this care and reassurance, others have shown that unexplained pain can lead to a state of constant worry [45,56] that is likely to perpetuate the impact of pain and disability.

Our model also demonstrates that multiple cognitive and emotional factors could help patients reconceptualise pain and promote acceptance, breaking the cycle of distress and leading to the perception of better outcomes. In addition to caring and informative healthcare professionals, person factors such as promoting favourable comparisons of pain, re-examination of meaningful activities, and positively

evaluating the health system could help to break the cycle of pain and distress. Participants in Klem et al. [38] who had more favourable outcomes despite ongoing pain made positive light of their symptoms in comparison to others who had undergone TKR, who they perceived as worse off, or to themselves prior to TKR. Prioritising favourable comparisons meant they focussed on the benefits of their TKR and appears to align with the concept of optimistic realism, which has been suggested to promote acceptance of outcomes following total hip replacement [65]. Additionally, some participants in Klem et al. [38] described re-framing or altering what was meaningful activity for them, so they were able to engage in enjoyable activities while avoiding pain. This aligns with acceptance and commitment (ACT) models of chronic pain [66] and has been described previously in qualitative studies involving people with primary [67] or revision TKR [56]. Fulfilling expectations is strongly associated with outcome satisfaction following joint replacement [68], although expectations is a fluid concept that can be altered along the surgical and recovery journey. Satisfaction might be promoted by re-framing expectations around what are meaningful activities to those that are more likely to be fulfilled in the current situation.

The final person factor that promoted favourable interpretation of outcomes was a view that individuals had received their fair share of the health system, and that there were others who were more in need of physician time and care. This view facilitated participants' acceptance of their situation and, in some cases, may promote them to take charge and responsibility of their own rehabilitation [29].

Strengths and limitations

The strengths of this review include our rigorous search strategy and analysis procedures, and the development of a conceptual model that highlights potential areas for intervention. The primary limitation was the relatively few studies identified that focussed on people with persistent pain. There were also overlaps in the participants among some of the studies that may have restricted the diversity of data available for synthesis. Finally, all of the studies were based in high income Western countries. Therefore, the findings may not be translatable to populations from non-Western cultures where there may be different expectations around TKR outcomes [69], language barriers [70], or alternative interpretations of pain and preferences for pain management [71].

Clinical recommendations

Based on the conceptual model of distress and acceptance shown in Figure 2, we have developed five specific recommendations that may break the cycle and could be evaluated in future research. The first is to more carefully manage patient expectations of pain through education and reassurance [72]. Presenting and discussing realistic expectations of pain and re-visiting these expectations during the surgery and recovery journey may reduce discordant expectations. Second, prioritising an empathetic relationship with patients, such as focusing on listening and validation of patient concerns, may enhance the therapeutic relationship, reduce distress, and facilitate a positive appraisal of the health system [73]. Third, in the acute post-operative period where many patients experience a high intensity of pain, assessment and treatment of fear-avoidance, pain beliefs, and pain-related anxiety could be implemented. For those with high fear-avoidance or anxiety, more targeted education could be delivered with clear contacts or networks for ongoing clinical or peer support. Fourth, for people who develop persistent pain, healthcare practitioners could assist with reconceptualisation of pain through biopsychosocial approaches such as psychologically informed physiotherapy [74] or behaviour change approaches (e.g., [75]), as well as specific psychological support to address any previous trauma or distress. Finally, for those with impaired embodiment of the knee joint, interventions to enhance integration and acceptance of the knee joint could be explored [55].

Author contributions

CRedit: **Saba Dabhilkar**: Conceptualization, Data curation, Formal analysis, Methodology, Writing – original draft, Writing – review & editing; **Julia Hill**: Conceptualization, Formal analysis, Methodology, Supervision, Writing – review & editing; **Gwyn N. Lewis**: Conceptualization, Formal analysis, Methodology, Supervision, Writing – original draft, Writing – review & editing; **Debbie J. Bean**: Formal analysis, Writing – review & editing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

No funding was received.

References

- [1] Carr AJ, Robertsson O, Graves S, et al. Knee replacement. *Lancet*. 2012;379(9823):1331–1340. doi: [10.1016/S0140-6736\(11\)60752-6](https://doi.org/10.1016/S0140-6736(11)60752-6).
- [2] Räsänen P, Paavolainen P, Sintonen H, et al. Effectiveness of hip or knee replacement surgery in terms of quality-adjusted life years and costs. *Acta Orthop*. 2007;78(1):108–115. doi: [10.1080/17453670610013501](https://doi.org/10.1080/17453670610013501).
- [3] Lange JK, Lee Y-Y, Spiro SK, et al. Satisfaction rates and quality of life changes following total knee arthroplasty in age-differentiated cohorts. *J Arthroplasty*. 2018;33(5):1373–1378. doi: [10.1016/j.arth.2017.12.031](https://doi.org/10.1016/j.arth.2017.12.031).
- [4] Cheng H-Y, Beswick AD, Bertram W, et al. What proportion of people have long-term pain after total hip or knee replacement? An update of a systematic review and meta-analysis. *BMJ Open*. 2025;15(5):e088975. doi: [10.1136/bmjopen-2024-088975](https://doi.org/10.1136/bmjopen-2024-088975).
- [5] Petersen KK, Simonsen O, Laursen MB, et al. Chronic postoperative pain after primary and revision total knee arthroplasty. *Clin J Pain*. 2015;31(1):1–6. doi: [10.1097/ajp.0000000000000146](https://doi.org/10.1097/ajp.0000000000000146).
- [6] Sugiyama Y, Iida H, Amaya F, et al. Prevalence of chronic postsurgical pain after thoracotomy and total knee arthroplasty: a retrospective multicenter study in Japan (Japanese Study Group of Subacute Postoperative Pain). *J Anesth*. 2018;32(3):434–438. doi: [10.1007/s00540-018-2481-0](https://doi.org/10.1007/s00540-018-2481-0).
- [7] Lewis GN, Rice DA, Rashid U, et al. Trajectories of pain and function outcomes up to 5 to 8 years following total knee arthroplasty. *J Arthroplasty*. 2023;38(8):1516–1521. doi: [10.1016/j.arth.2023.02.020](https://doi.org/10.1016/j.arth.2023.02.020).
- [8] Wylde V, Penfold C, Rose A, et al. Variability in long-term pain and function trajectories after total knee replacement: A cohort study. *Orthop Traumatol Surg Res*. 2019;105(7):1345–1350. doi: [10.1016/j.otsr.2019.08.014](https://doi.org/10.1016/j.otsr.2019.08.014).
- [9] Howells N, Murray J, Wylde V, et al. Persistent pain after knee replacement: do factors associated with pain vary with degree of patient dissatisfaction? *Osteoarthritis Cartilage*. 2016;24(12):2061–2068. doi: [10.1016/j.joca.2016.07.012](https://doi.org/10.1016/j.joca.2016.07.012).
- [10] Pinto PR, McIntyre T, Ferrero R, et al. Persistent pain after total knee or hip arthroplasty: differential study of prevalence, nature, and impact. *J Pain Res*. 2013;6:691–703. doi: [10.2147/JPR.S45827](https://doi.org/10.2147/JPR.S45827).
- [11] Wylde V, Hewlett S, Learmonth ID, et al. Persistent pain after joint replacement: Prevalence, sensory qualities, and postoperative determinants. *Pain*. 2011;152(3):566–572. doi: [10.1016/j.pain.2010.11.023](https://doi.org/10.1016/j.pain.2010.11.023).
- [12] Kassam A, Dieppe P, Toms AD. An analysis of time and money spent on investigating painful Total Knee Replacements. *Br J Med Pract*. 2012;5(3):36–39.
- [13] Marsh J, Joshi I, Somerville L, et al. Health care costs after total knee arthroplasty for satisfied and dissatisfied patients. *Can J Surg*. 2022;65(5):E562–e566. doi: [10.1503/cjs.006721](https://doi.org/10.1503/cjs.006721).
- [14] Ackerman IN, Bohensky MA, Zomer E, et al. The projected burden of primary total knee and hip replacement for osteoarthritis in Australia to the year 2030. *BMC Musculoskelet Disord*. 2019;20(1):90. doi: [10.1186/s12891-019-2411-9](https://doi.org/10.1186/s12891-019-2411-9).
- [15] Matharu G, Culliford D, Blom A, et al. Projections for primary hip and knee replacement surgery up to the year 2060: an analysis based on data from The National Joint Registry for England, Wales, Northern Ireland and the Isle of Man. *Ann R Coll Surg Engl*. 2022;104(6):443–448. doi: [10.1308/rcsann.2021.0206](https://doi.org/10.1308/rcsann.2021.0206).
- [16] Shichman I, Roof M, Askew N, et al. Projections and epidemiology of primary hip and knee arthroplasty in Medicare patients to 2040–2060. *JB JS Open Access*. 2023;8(1):112. doi: [10.2106/jbjs.Oa.22.00112](https://doi.org/10.2106/jbjs.Oa.22.00112).
- [17] Ashoorion V, Sadeghirad B, Wang L, et al. Predictors of persistent post-surgical pain following total knee arthroplasty: a systematic review and meta-analysis of observational studies. *Pain Med*. 2023;24(4):369–381. doi: [10.1093/pm/pnac154](https://doi.org/10.1093/pm/pnac154).
- [18] Lewis GN, Rice DA, McNair PJ, et al. Predictors of persistent pain after total knee arthroplasty: a systematic review and meta-analysis. *Br J Anaesth*. 2015;114(4):551–561. doi: [10.1093/bja/aeu441](https://doi.org/10.1093/bja/aeu441).
- [19] Anis HK, Strnad GJ, Klika AK, et al. Developing a personalized outcome prediction tool for knee arthroplasty. *Bone Joint J*. 2020;102-B(9):1183–1193. doi: [10.1302/0301-620x.102b9.Bjj-2019-1642.R1](https://doi.org/10.1302/0301-620x.102b9.Bjj-2019-1642.R1).
- [20] Sanchez-Santos MT, Garriga C, Judge A, et al. Development and validation of a clinical prediction model for patient-reported pain and function after primary total knee replacement surgery. *Sci Rep*. 2018;8(1):3381. doi: [10.1038/s41598-018-21714-1](https://doi.org/10.1038/s41598-018-21714-1).
- [21] Dennis J, Wylde V, Gooberman-Hill R, et al. Effects of presurgical interventions on chronic pain after total knee replacement: a systematic review and meta-analysis of randomised controlled trials. *BMJ Open*. 2020;10(1):e033248. doi: [10.1136/bmjopen-2019-033248](https://doi.org/10.1136/bmjopen-2019-033248).

- [22] Gränicher P, Mulder L, Lenssen T, et al. Prehabilitation improves knee functioning before and within the first year after total knee arthroplasty: a systematic review with meta-analysis. *J Orthop Sports Phys Ther.* 2022;52(11):709–725. doi: [10.2519/jospt.2022.11160](https://doi.org/10.2519/jospt.2022.11160).
- [23] Karimijashni M, Yoo S, Barnes K, et al. Prehabilitation in patients at risk of poorer outcomes following total knee arthroplasty: a systematic review. *J Arthroplasty.* 2025;40(5):1367–1376. doi: [10.1016/j.arth.2024.10.132](https://doi.org/10.1016/j.arth.2024.10.132).
- [24] Wainwright TW, Gill M, McDonald DA, et al. Consensus statement for perioperative care in total hip replacement and total knee replacement surgery: enhanced recovery after surgery (ERAS®) Society recommendations. *Acta Orthop.* 2020;91(1):3–19. doi: [10.1080/17453674.2019.1683790](https://doi.org/10.1080/17453674.2019.1683790).
- [25] Beswick AD, Wylde V, Gooberman-Hill R. Interventions for the prediction and management of chronic postsurgical pain after total knee replacement: systematic review of randomised controlled trials. *BMJ Open.* 2015;5(5):e007387. doi: [10.1136/bmjopen-2014-007387](https://doi.org/10.1136/bmjopen-2014-007387).
- [26] Johns N, Naylor JM, McKenzie D, et al. A systematic review of the effectiveness of rehabilitation programmes or strategies to treat people with persistent knee pain following a total knee replacement. *Musculoskeletal Care.* 2024;22(3):e1945. doi: [10.1002/msc.1945](https://doi.org/10.1002/msc.1945).
- [27] Wylde V, Bertram W, Sanderson E, et al. The STAR care pathway for patients with pain at 3 months after total knee replacement: a multicentre, pragmatic, randomised, controlled trial. *Lancet Rheumatol.* 2022;4(3):e188–e197. doi: [10.1016/S2665-9913\(21\)00371-4](https://doi.org/10.1016/S2665-9913(21)00371-4).
- [28] Bertram W, Wylde V, Howells N, et al. The STAR care pathway for patients with chronic pain after total knee replacement: four-year follow-up of a randomised controlled trial. *BMC Musculoskelet Disord.* 2023;24(1):972. doi: [10.1186/s12891-023-07099-x](https://doi.org/10.1186/s12891-023-07099-x).
- [29] Taylor CEV, Murray CM, Stanton TR. Patient perspectives of pain and function after knee replacement: a systematic review and meta-synthesis of qualitative studies. *Pain Rep.* 2022;7(3):e1006. doi: [10.1097/pr9.0000000000001006](https://doi.org/10.1097/pr9.0000000000001006).
- [30] Tong A, Flemming K, McInnes E, et al. Enhancing transparency in reporting the synthesis of qualitative research: ENTREQ. *BMC Med Res Methodol.* 2012;12(1):181. doi: [10.1186/1471-2288-12-181](https://doi.org/10.1186/1471-2288-12-181).
- [31] Critical Appraisal Skills Programme. CASP checklist: for qualitative research; 2024. <https://casp-uk.net/casp-checklists/CASP-checklist-qualitative-2024.pdf>.
- [32] Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic reviews. *BMC Med Res Methodol.* 2008;8:45. doi: [10.1186/1471-2288-8-45](https://doi.org/10.1186/1471-2288-8-45) 18616818.
- [33] Sellevold VB, Steindal SA, Lindberg MF, et al. Patients with persistent pain 1 year after TKA report improvement by 5 to 7 years: A mixed-methods study. *Clin Orthop Relat Res.* 2022;480(11):2075–2088. doi: [10.1097/CORR.0000000000002183](https://doi.org/10.1097/CORR.0000000000002183).
- [34] Sellevold VB, Olsen U, Lindberg MF, et al. “I am accustomed to something in my body causing pain”: a qualitative study of knee replacement non-improvers’ stories of previous painful and stressful experiences. *BMC Musculoskelet Disord.* 2023;24(1):305. doi: [10.1186/s12891-023-06423-9](https://doi.org/10.1186/s12891-023-06423-9).
- [35] Moore A, Eccleston C, Gooberman-Hill R. “It’s not my knee”: understanding ongoing pain and discomfort after total knee replacement through re-embodiment. *Arthritis Care Res.* 2022;74(6):975–981. doi: [10.1002/acr.24534](https://doi.org/10.1002/acr.24534).
- [36] Moore AJ, Gooberman-Hill R. Why don’t patients seek help for chronic post-surgical pain after knee replacement? A qualitative investigation. *Health Expect.* 2020;23(5):1202–1212. doi: [10.1111/hex.13098](https://doi.org/10.1111/hex.13098).
- [37] Moore A, Wylde V, Bruce J, et al. Experiences of recovery and a new care pathway for people with pain after total knee replacement: qualitative research embedded in the STAR trial. *BMC Musculoskelet Disord.* 2022;23(1):451. doi: [10.1186/s12891-022-05423-5](https://doi.org/10.1186/s12891-022-05423-5).
- [38] Klem NR, Smith A, O’Sullivan P, et al. What influences patient satisfaction after TKA? A qualitative investigation. *Clin Orthop Relat Res.* 2020;478(8):1850–1866. doi: [10.1097/corr.0000000000001284](https://doi.org/10.1097/corr.0000000000001284).
- [39] Mahdi A, Svantesson M, Wretenberg P, et al. Patients’ experiences of discontentment one year after total knee arthroplasty- a qualitative study. *BMC Musculoskelet Disord.* 2020;21(1):29. doi: [10.1186/s12891-020-3041-y](https://doi.org/10.1186/s12891-020-3041-y).
- [40] Jeffery AE, Wylde V, Blom AW, et al. It’s there and I’m stuck with it’: patients’ experiences of chronic pain following total knee replacement surgery. *Arthritis Care Res.* 2011;63(2):286–292. doi: [10.1002/acr.20360](https://doi.org/10.1002/acr.20360).
- [41] Webster F, Perruccio AV, Jenkinson R, et al. Understanding why people do or do not engage in activities following total joint replacement: a longitudinal qualitative study. *Osteoarthritis Cartilage.* 2015;23(6):860–867. doi: [10.1016/j.joca.2015.02.013](https://doi.org/10.1016/j.joca.2015.02.013).
- [42] Bunzli S, O’Brien P, Klem N, et al. Misconceived expectations: patient reflections on the total knee replacement journey. *Musculoskeletal Care.* 2020;18(4):415–424. doi: [10.1002/msc.1475](https://doi.org/10.1002/msc.1475).
- [43] Goldsmith LJ, Suryaprakash N, Randall E, et al. The importance of informational, clinical and personal support in patient experience with total knee replacement: a qualitative investigation. *BMC Musculoskelet Disord.* 2017;18(1):127. doi: [10.1186/s12891-017-1474-8](https://doi.org/10.1186/s12891-017-1474-8).
- [44] Pryce R, Langan E, Tector K, et al. Patients’ experiences following total knee arthroplasty: a qualitative evidence synthesis. *Disabil Rehabil.* 2024;46(2):214–231. doi: [10.1080/09638288.2022.2159548](https://doi.org/10.1080/09638288.2022.2159548).
- [45] Leggett H, Lister J, Hewitt C, et al. Patients’ and staffs’ experiences of clinical support after a lower limb reconstruction: an interview study. *Clin Rehabil.* 2025;39(4):536–548. doi: [10.1177/02692155251317500](https://doi.org/10.1177/02692155251317500).
- [46] MacKichan F, Wylde V, Gooberman-Hill R. Pathways through care for long-term pain after knee replacement: a qualitative study with healthcare professionals. *Musculoskeletal Care.* 2015;13(3):127–138. doi: [10.1002/msc.1093](https://doi.org/10.1002/msc.1093).

- [47] Lape EC, Hudak P, Davis AM, et al. Body-self unity with a new hip or knee: understanding total joint replacement within an embodiment framework. *ACR Open Rheumatol*. 2019;1(2):90–96. doi: [10.1002/acr2.1014](https://doi.org/10.1002/acr2.1014).
- [48] Lewis JS, Schweinhardt P. Perceptions of the painful body: the relationship between body perception disturbance, pain and tactile discrimination in complex regional pain syndrome. *Eur J Pain*. 2012;16(9):1320–1330. doi: [10.1002/j.1532-2149.2012.00120.x](https://doi.org/10.1002/j.1532-2149.2012.00120.x).
- [49] Martínez E, Aira Z, Buesa I, et al. Embodied pain in fibromyalgia: disturbed somatopresentations and increased plasticity of the body schema. *PLoS One*. 2018;13(4):e0194534. doi: [10.1371/journal.pone.0194534](https://doi.org/10.1371/journal.pone.0194534).
- [50] Donegan T, Ryan BE, Sanchez-Vives MV, et al. Altered bodily perceptions in chronic neuropathic pain conditions and implications for treatment using immersive virtual reality. *Front Hum Neurosci*. 2022;16:1024910. doi: [10.3389/fnhum.2022.1024910](https://doi.org/10.3389/fnhum.2022.1024910).
- [51] Haslam BS, Butler DS, Moseley GL, et al. “My hand is different”: altered body perception in stroke survivors with chronic pain. *Brain Sci*. 2022;12(10):1331. doi: [10.3390/brainsci12101331](https://doi.org/10.3390/brainsci12101331).
- [52] Magni N, Collier J, Rice D, et al. Neglect-like symptoms and their relationships with other clinical features in people with hand osteoarthritis: an exploratory study. *Musculoskelet Sci Pract*. 2022;62:102662. doi: [10.1016/j.msksp.2022.102662](https://doi.org/10.1016/j.msksp.2022.102662).
- [53] Amundsen O, Starcevich C, Frisell EJ, et al. Does body scanning through visual imagery improve perception and function in patients after anterior cruciate ligament-reconstruction? An exploratory study. *Physiother Theory Pract*. 2022;38(12):1996–2006. doi: [10.1080/09593985.2021.1901328](https://doi.org/10.1080/09593985.2021.1901328).
- [54] Shigetoh H, Koga M, Tanaka Y, et al. Pain qualities associated with body perception disturbances: insights from machine learning and SHapley additive exPlanations. *Arch Phys Med Rehabil*. 2026;107(7):1623–1628. doi: [10.1016/j.apmr.2025.11.021](https://doi.org/10.1016/j.apmr.2025.11.021).
- [55] Matamala-Gomez M, Diaz Gonzalez AM, Slater M, et al. Decreasing pain ratings in chronic arm pain through changing a virtual body: different strategies for different pain types. *J Pain*. 2019;20(6):685–697. doi: [10.1016/j.jpain.2018.12.001](https://doi.org/10.1016/j.jpain.2018.12.001).
- [56] Nicolson PJA, Toye F, Sabah SA, et al. The experience of patients undergoing aseptic, elective revision knee joint replacement surgery: a qualitative study. *BMC Musculoskelet Disord*. 2024;25(1):676. doi: [10.1186/s12891-024-07778-3](https://doi.org/10.1186/s12891-024-07778-3).
- [57] Webster F, Perruccio AV, Jenkinson R, et al. Where is the patient in models of patient-centred care: a grounded theory study of total joint replacement patients. *BMC Health Serv Res*. 2013;13:531. doi: [10.1186/1472-6963-13-531](https://doi.org/10.1186/1472-6963-13-531).
- [58] Li J, Guan T, Zhai Y, et al. Risk factors of chronic postoperative pain after total knee arthroplasty: a systematic review. *J Orthop Surg Res*. 2024;19(1):320. doi: [10.1186/s13018-024-04778-w](https://doi.org/10.1186/s13018-024-04778-w).
- [59] Wylde V, Beswick A, Bruce J, et al. Chronic pain after total knee arthroplasty. *EFORT Open Rev*. 2018;3(8):461–470. doi: [10.1302/2058-5241.3.180004](https://doi.org/10.1302/2058-5241.3.180004).
- [60] Fishbain DA, Pulikal A, Lewis JE, et al. Chronic pain types differ in their reported prevalence of post-traumatic stress disorder (PTSD) and there is consistent evidence that chronic pain is associated with PTSD: an evidence-based structured systematic review. *Pain Med*. 2017;18(4):711–735. doi: [10.1093/pm/pnw065](https://doi.org/10.1093/pm/pnw065).
- [61] Mills SEE, Nicolson KP, Smith BH. Chronic pain: a review of its epidemiology and associated factors in population-based studies. *Br J Anaesth*. 2019;123(2):e273–e283. doi: [10.1016/j.bja.2019.03.023](https://doi.org/10.1016/j.bja.2019.03.023).
- [62] Davis AM, Perruccio AV, Ibrahim S, et al. The trajectory of recovery and the inter-relationships of symptoms, activity and participation in the first year following total hip and knee replacement. *Osteoarthritis Cartilage*. 2011;19(12):1413–1421. doi: [10.1016/j.joca.2011.08.007](https://doi.org/10.1016/j.joca.2011.08.007).
- [63] Hylkema TH, Brouwer S, Stewart RE, et al. Two-year recovery courses of physical and mental impairments, activity limitations, and participation restrictions after total knee arthroplasty among working-age patients. *Disabil Rehabil*. 2022;44(2):291–300. doi: [10.1080/09638288.2020.1766583](https://doi.org/10.1080/09638288.2020.1766583).
- [64] Rubio-Morales M, Miralles-Muñoz FA, Gonzalez-Parreño S, et al. A relevant number of patients do not increase their engagement in physical, social and leisure activities at the medium-term after total knee arthroplasty: a prospective cohort study. *Knee Surg Sports Traumatol Arthrosc*. 2023;31(3):1011–1017. doi: [10.1007/s00167-022-07165-2](https://doi.org/10.1007/s00167-022-07165-2).
- [65] Kästner A, Ng Kuet Leong VSC, Petzke F, et al. The virtue of optimistic realism - expectation fulfillment predicts patient-rated global effectiveness of total hip arthroplasty. *BMC Musculoskelet Disord*. 2021;22(1):180. doi: [10.1186/s12891-021-04040-y](https://doi.org/10.1186/s12891-021-04040-y).
- [66] Hayes SC, Luoma JB, Bond FW, et al. Acceptance and commitment therapy: model, processes and outcomes. *Behav Res Ther*. 2006;44(1):1–25. doi: [10.1016/j.brat.2005.06.006](https://doi.org/10.1016/j.brat.2005.06.006).
- [67] Wylde V, Jeffery A, Dieppe P, et al. The assessment of persistent pain after joint replacement. *Osteoarthritis Cartilage*. 2012;20(2):102–105. doi: [10.1016/j.joca.2011.11.011](https://doi.org/10.1016/j.joca.2011.11.011).
- [68] Hafkamp FJ, Gosens T, de Vries J, et al. Do dissatisfied patients have unrealistic expectations? A systematic review and best-evidence synthesis in knee and hip arthroplasty patients. *EFORT Open Rev*. 2020;5(4):226–240. doi: [10.1302/2058-5241.5.190015](https://doi.org/10.1302/2058-5241.5.190015).
- [69] Alvarez PM, McKeon JF, Spitzer AI, et al. Race, utilization, and outcomes in total hip and knee arthroplasty: a systematic review on health-care disparities. *JBJS Rev*. 2022;10(3):161. doi: [10.2106/JBJS.RVW.21.00161](https://doi.org/10.2106/JBJS.RVW.21.00161).
- [70] Dowsey MM, Broadhead ML, Stoney JD, et al. Outcomes of total knee arthroplasty in English-versus non-English-speaking patients. *Journal of Orthopaedic Surgery*. 2009;17(3):305–309. doi: [10.1177/230949900901700312](https://doi.org/10.1177/230949900901700312).

- [71] Yoshikawa K, Brady B, Perry MA, et al. Sociocultural factors influencing physiotherapy management in culturally and linguistically diverse people with persistent pain: a scoping review. *Physiotherapy*. 2020;107:292–305. doi: [10.1016/j.physio.2019.08.002](https://doi.org/10.1016/j.physio.2019.08.002).
- [72] Ghomrawi HMK, Lee L, Nwachukwu BU, et al. Preoperative expectations associated with postoperative dissatisfaction after total knee arthroplasty: a cohort study. *J Am Acad Orthop Surg*. 2020;28(4):e145–e150. doi: [10.5435/JAAOS-D-18-00785](https://doi.org/10.5435/JAAOS-D-18-00785).
- [73] Kinney M, Seider J, Beaty AF, et al. The impact of therapeutic alliance in physical therapy for chronic musculoskeletal pain: a systematic review of the literature. *Physiother Theory Pract*. 2020;36(8):886–898. doi: [10.1080/09593985.2018.1516015](https://doi.org/10.1080/09593985.2018.1516015).
- [74] Main CJ, George SZ. Psychologically informed practice for management of low back pain: future directions in practice and research. *Phys Ther*. 2011;91(5):820–824. doi: [10.2522/ptj.20110060](https://doi.org/10.2522/ptj.20110060).
- [75] Johns N, McKenzie D, Brady B, et al. A pilot randomised controlled trial of an online self-management programme for people with persistent pain post-knee replacement (Kneed). *Clin Rehabil*. 2025;39(11):1438–1451. doi: [10.1177/02692155251375382](https://doi.org/10.1177/02692155251375382).