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What we read matters: Exploring emotional and cognitive responses of pain science education and biomedical education in older adults with knee osteoarthritis

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ABSTRACT

Educational content can influence how individuals with knee osteoarthritis (KOA) understand and manage their condition. Standard biomedical education often emphasizes joint damage and degeneration, while pain science education (PSE) uses a constructivist approach highlighting the modifiability of pain and promoting self-management. Participants immediate emotional and cognitive responses to these two educational approaches were explored via custom-made websites. This qualitative study was embedded within a pilot randomized trial that recruited 35 adults aged 55 years or older with diagnosed or symptomatic KOA Participants were randomized to receive either standard biomedical education or PSE content provided on custom-made websites. After viewing the content, participants completed a think-aloud task and a semi-structured interview. Using a qualitative descriptive approach, audio-recorded data were transcribed verbatim and analyzed using inductive thematic analysis until thematic saturation. Eighteen transcripts were analyzed with nine per group. Four key themes were constructed: (1) Motivated to move, (2) Knowledge and support, (3) Sentiments and self-recognition, and (4) Perspectives on knee surgery. PSE participants expressed hope, willingness to self-manage, and belief in pain modifiability. Standard biomedical education participants commonly described frustration, emotional distress, and a sense of inevitability regarding disease progression and future surgery. The educational content appeared to shape how people with KOA perceive their condition, emotions, and behavioural intentions. PSE encouraged a positive interpretation of osteoarthritis that enhanced individual empowerment. These findings emphasize the importance of adopting a less biomedical focus in patient education to promote self-management and reduce fear-related beliefs in individuals with KOA.

Perspectives: Pain Science Education presenting osteoarthritis as a modifiable condition appeared to immediately influence patients' perceptions, emotions, and motivation for self-management. Compared with standard biomedical information, pain science education fostered more positive views on physical activity and surgery, highlighting the need for empowering educational resources to support patient engagement.

Knee osteoarthritis (KOA) is a common musculoskeletal condition significantly impacting mobility, quality of life, and psychological well-being, especially among older adults.[1] Traditionally, OA has been understood through a biomedical framework, where joint degeneration is viewed as the primary cause of pain and disability.[2] However, evidence indicates that the pain experience in OA is influenced by a complex interaction of biological, psychological, and social factors, supporting a biopsychosocial approach to its management.[3] A key component of this approach is patient education, which can shape individuals' understanding of their condition, improve treatment adherence, and promote

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positive lifestyle behaviours.[4]

Historically, a biomedical model of OA has underpinned our understanding of the condition, informing educational content.[5] Biomedically-informed patient education about OA often includes information emphasizing joint damage and cartilage loss, which can reinforce fear and helplessness among patients.[6] Pain Science Education (PSE), is a more contemporary approach encompassing neurophysiology and including the context of psychological and social factors.[7] PSE emphasizes that pain is not always an indicator of tissue damage, but is a protective response shaped by various factors including beliefs, emotions, and context.[8] PSE can lead to improved pain knowledge and self-efficacy as well as reduced pain intensity and kinesiophobia in people with chronic pain conditions.[9–14]

Biomedical information is widely available on websites providing OA information [15] despite its lack of guideline support.[16] Previous studies have assessed the effect of pathoanatomical/imaging content in videos and pamphlets showing a negative impact on kinesiophobia and beliefs regarding the need for surgery.[6,17] For example, Egerton et al. (2022) compared the effects of two educational videos on self-efficacy and kinesiophobia in people with knee osteoarthritis, showing how video-based content can influence patient beliefs and attitudes.[17] However, few studies have focused on how standard biomedical education (SBE) and PSE affect patients' understanding of their condition and their emotional and cognitive responses to pain management. This is an important comparison given that SBE appears to be the dominant type of educational content on websites providing OA information.[15] Moreover, there is a gap regarding the *immediate* influence of SBE content commonly found on websites on people’s attitudes toward self-management, physical activity, and surgical options. Gaining a deeper understanding of how website educational content influences patients' perceptions could provide valuable insights for improving online educational interventions and ultimately, enhancing patient outcomes.

The primary aim of this qualitative study was to explore the immediate cognitive and emotional reactions to two custom-made websites informed by PSE and SBE on individuals with KOA. Specifically, the following were explored: 1) participant perceptions of the websites focusing on knowledge and understanding of KOA, pain mechanisms, disease progression, and self-management strategies; 2) the emotional and cognitive responses to the website information; and 3) the potential of the website information to influence participants’ behaviors, including their intended involvement in exercise and attitudes toward surgical interventions.

Materials and methods

Design and procedures

This qualitative study was embedded within a pilot RCT registered on clinicaltrials.gov (NCT06400329).[18] Briefly, eligible participants were required to be at least 55 years old and have either a clinical diagnosis of KOA or fulfill the National Institute for Health and Care Excellence criteria.[19] Individuals with prior exposure to PSE or corrective lens prescriptions exceeding ±6 diopters were excluded due to incompatibility with the eye tracking device (required for the RCT). Participants were randomly assigned to either SBE or PSE. Participants in the SBE group were provided the PSE information one week after the lab visit to ensure that the correct understanding of OA was received. The target sample size of 36 participants was based on our primary feasibility outcome calculated using the confidence interval method suggested by Thabane et al.[20] Ethical approval was obtained from the Hamilton Integrated Research Ethics Board #16902. All participants provided informed consent.

A qualitative descriptive approach was used to capture participants’ immediate experiences and interpretation of the educational materials. This provides a rich yet straightforward account of participants’ perspectives while minimizing theoretical interpretation [21] and ensuring that the study findings remained closely aligned with their expressed views and experiences. Prior to the start of the study, a single focus group was conducted with patient partners who were not part of the RCT. Participation was voluntary. In this session, participants reviewed both educational materials and provided feedback on readability, clarity, and content presentation, including text and images. Feedback from this focus group was used to refine the materials. After refinement and prior to starting the main trial, both educational materials were piloted with four additional participants (independent of the study sample) who completed the think-aloud task and a brief debriefing interview to further evaluate the educational content. The educational materials were designed to replicate information individuals might encounter when searching for OA-related content online and were presented in a website format free of branding at a computer station, to simulate real-world information-seeking behavior. All qualitative data were collected during a single laboratory visit lasting approximately 45 min. This visit included setup of physiological sensors, a 5-minute baseline rest period, quiet reading of the educational content with continuous ECG monitoring, followed by removal of sensors and a second reading for the think-aloud procedure. Participants were instructed to read the material silently during the first reading to avoid interference with physiological measurements. During the second reading, participants verbalized their thoughts, feelings, and reactions (think-aloud). In a deviation from the original protocol, a semi structured interview consisting of the five questions (see Table 1) immediately followed the think-aloud task. This approach enabled the collection of rich, real-time data, offering insight into participants’ reasoning processes, emotional responses, and interpretation of the material.[22–24] The interview guide was developed by team members and piloted on four individuals. No formal conceptual framework was used; however, pre-planned probes were included to support in-depth discussion**.** Examples of probes used during the interviews included: "Did the content prompt you to consider doing anything differently, or did it mostly confirm what you already believe?", "Did it reinforce, challenge, or add to your existing understanding in any way?", and "Was there anything that stood out as making you pause or rethink something, even briefly?". Probes were applied after participants initial responses to enhance or clarify the impact of the content. Field notes were taken during both the think-aloud and interviews to document contextual observations and were reviewed alongside transcripts during coding and theme development. All think-aloud sessions and interviews were conducted by the author VJ. Each visit lasted approximately 45 min per participant. Audio-recorded data were transcribed verbatim for subsequent analysis, which did not occur concurrently. Analysis continued until thematic saturation. It was recognized that saturation would likely be reached before all 35 were analyzed however since this was part of a pilot and feasibility RCT, it was necessary to expose all participants to all parts of the study to accurately assess its feasibility.

Intervention

Both educational materials consisted of three web pages that included four core components: KOA-related images, facts and myths, disease-related concepts, and patient-doctor statements (see examples in Table 2). Content for the websites was custom-made by the research team, identified through searching of websites previously reported by Goff et al.[15] No formal learning theory or instructional framework was applied; materials were instead based on real-world OA websites. As there was a lack of PSE content on existing websites, this content was supplemented by team members. Both websites are provided as supplementary material. Although the materials were written using plain-language principles, no formal readability assessment was conducted. PSE content presented OA as a manageable condition influenced by pain neurophysiology,[7] encouraging self-management and an active lifestyle through more positive language. In contrast, the SBE content

Table 1
Interview Guide.

1. What, if anything, has the content made you think about the activities that you engage in or how you use your knee in daily life?
2. Do you trust/believe this information about osteoarthritis? Why/why not?
3. Do you have any thoughts about the pictures that you viewed?
4. Do you have any thoughts about the text you read?
5. Were there any parts in particular that caught your attention or elicited an emotional response and why?

focused on structural damage of KOA, using negative language that emphasized joint deterioration as the main cause of pain.[5] It is acknowledged that some statements contradict current guideline recommendations, and these were deliberately included as they appear on websites that patients may access. While patients may not encounter all of these statements in a single website, cumulative exposure to such messaging is common and can influence perceptions.[25]

Qualitative data analysis

A reflexive thematic analysis was conducted following the Braun and Clarke (2006) framework, using an inductive, data-driven approach.[26] Two female researchers (VJ, ED) independently reviewed the transcripts to familiarize themselves with the data and performed initial coding using Quirkos software (Quirkos 2.5.3 [Computer Software] (2023), allowing for the systematic identification of subthemes and overarching themes. Researcher gender is reported in accordance with COREQ and both analysts had prior familiarity with KOA through their training and research experience." VJ, a master's student in Rehabilitation Science and trained corrective exercise specialist, contributed to both data collection and analysis for this study and the pilot RCT. ED, a PhD student in Rehabilitation Science with a Master's in Neuroscience, was involved solely in data analysis. Both received guidance on coding and inductive thematic analysis from LC who has experience with qualitative methods. LC provided methodological guidance on reflexive thematic analysis, including training on analytic principles and maintaining rigour. Reflexive discussions were held to assess thematic saturation, ensuring that no new themes emerged from new participants before finalizing the analysis. When conceptual saturation was achieved, data were reduced to consolidate overriding themes.[27] Through iterative discussions, the thematic structure was refined to enhance coherence and credibility. Final themes were determined through consensus meetings (VJ, ED), during which discrepancies in coding and interpretation were resolved. Verbatim quotes were included to illustrate key themes and provide insight into how individuals processed and reacted to the information. Rigour was addressed in several ways. An audit trail of study processes and decisions was maintained throughout the study. Each transcript was compared to the audiotape for accuracy and completeness. Verification (researchers converge on recognising "identical patterns" in the data) occurred for coding. Referential adequacy (providing enough quotes to ensure the findings fit the data) was conducted.[28]

Results

Participants

A total of 51 individuals were screened for eligibility, of whom 37 met the inclusion criteria and were randomized into SBE (n=18) or PSE (n=19) to ensure complete physiological data, as full data could not be obtained from one participant. One participant from each group withdrew due to lack of time, yielding a final sample of 35 participants with think-aloud tasks and interviews conducted. Although data collection continued for feasibility purposes related to the parent pilot RCT, qualitative analysis was conducted only on transcripts up to the point at which conceptual saturation was reached. Saturation was initially considered after analysis of seven transcripts per group; two additional transcripts per group were subsequently analyzed to confirm this assessment. As no new codes or themes emerged, thematic analysis was concluded after 18 transcripts (9 per group). The remaining transcripts were not included in the thematic analysis. Transcripts were analyzed consecutively. Descriptives of the sample are reported in Table 3.

Themes identified

Four major themes emerged through integration of data from the think-aloud tasks and the one-on-one debriefing interviews: (1) Motivated to move, (2) Knowledge and support, (3) Sentiments and self-recognition, and (4) Perspectives on knee surgery.

Motivated to move

Participants in the PSE group reported increased motivation and confidence to participate in physical activity after learning about its benefits for knee health. The content encouraged them to actively manage their KOA through exercise. This inspired many to renew their commitment to maintaining mobility and joint function.

> *Content made me think about my knee, about getting in the pool more to exercise and continue walking as much as I can on dry land, and I would like to get more physio.*
>
> *-Participant 8*
>
> *I mean, it gives me, that's a little bit more pressure to do more things, walk the dogs for a little bit longer, a little bit farther.*
>
> *-Participant 10*

Similarly, participants in the SBE group expressed frustration to the suggestion that they should reduce physical activity or limit their movement. Some were determined to remain as active as possible despite the messaging that suggested excessive activity could worsen their condition.

> *Sort of laugh at the doctor with his last, saying not to overdo it too much. Not what I'm interested in hearing at this point. I'm quite happy to keep over doing it with the pain until it becomes intolerable.*
>
> *-Participant 9*

This participant described himself as a "glass half full type of person" and highlighted continued participation in sports at age 72, indicating confidence in his ability to manage symptoms.

> *I think that helps by exercise. I've been doing that exercise redoing, so that's what I just continue to do. Exercise does help, help a lot.*
>
> *-Participant 4*

In summary, the PSE group felt motivated and confident to stay active after learning about the benefits of exercise, whereas the SBE group showed mixed reactions, with some frustrated by advice to limit activity but were still determined to keep moving.

Knowledge and support

Participants in the PSE group appeared to gain an understanding of KOA and its pain as a multifactorial condition. Many participants were surprised to learn that OA is not solely a result of one cause (e.g., wear

Table 2
Sample Content from Both Educational Materials.

		PSE	SBE
Page One	Text	Osteoarthritis is the most common type of knee arthritis. It is not just a disease of aging, nor an 'older persons' disease. Osteoarthritis that limits how much we move and reduces our quality of life is NOT inevitable. Rather, osteoarthritis is associated with a number of factors, including genetic, mechanical, hormonal and inflammatory factors. Research has shown that understanding how pain works, and understanding your unique contributors, can help you to re-engage with valued life activities.	Knee Osteoarthritis is a consequence of wear and tear on the knee joint. Cartilage breaks down and bone spurs develop over time, causing increased friction and pain. Diminished synovial fluid (lubricating fluid) makes these issues worse, leading to inflammation (swelling), and further deterioration of the soft tissue.
	Image	fx1	fx2
Page Two	Text	Having osteoarthritis does not mean a joint replacement is inevitable. In fact, only about 1/3 of people with osteoarthritis have joint replacement surgery which means the majority of people are able to continue living with a good quality of life.	Arthritis is inevitable as we age and is a natural consequence of the normal deterioration that occurs. The bones rub against one another, causing knee pain and stiffness. Bony spurs and cysts also form. Ultimately, as the disease advances, leg deformities may become noticeable, contributing to difficulties walking and performing daily activities.
	Image	fx3	fx4
Page Three	Text	Research shows that in people with osteoarthritis changes in the nervous system and immune system have important influences on pain, making our systems more sensitive. This means you hurt more with less activity. Importantly, this increased sensitivity can be reduced with slow but sure increases in physical activity that allows your system to adapt so that you can do more with less pain.	Well, your joints are experiencing a considerable level of wear and tear, leading to a 'bone on bone' scenario and obvious cartilage damage. Knowing the severity of your joint condition is the first step to develop a comprehensive plan so we can explore ways to cope with and alleviate these challenges. In the meantime, try not to overdo it with too much activity as that will only make your pain worse.
	Image	fx5	fx6

Table 3
Descriptives of the Samples.

Characteristics	SBE(N=9)	PSE(N=9)
Age (years) mean (sd)	67.9 (±8.1)	66.1 (±8.3)
BMI kg/m^2 mean (sd)	31.5(±7.2)	28.8(±6.5)
Sex/Gender		
Female/Woman n (%)	5.0 (55.6%)	7.0 (78.8%)
Ethnicity		
Caucasian n (%)	9.0 (100.0%)	9.0 (100.0%)
Education Level		
College n (%)	8.0 (88.9%)	9 (100%)
Marital Status		
Married n (%)	7.0 (77.8%)	8.0 (88.9%)

and tear, weight) or aging. This broader perspective helped participants see pain as modifiable rather than an inevitable consequence of aging.

This reminded me when I see my little 3-year-old grand nephew, you know my pain is almost non-existent. When he visits, I'm being so buoyed by his presence, a little boy, so I don't have the pain.

-Participant 8

I didn't realize that the nervous system and immune system were involved in the osteoarthritis. Knowledge is a treasure. I mean, the more knowledge you have, the better it is.

-Participant 2

Conversely, the SBE materials reinforced perceived incurability of KOA. The negative framing in their educational material led them to believe that KOA was a progressive disease.

Yeah, that osteoarthritis is not curable, and the pain is inevitable, this is the sad truth. But, you know, that's what we have to face right, so yeah, doctors and therapists can do little to help. It does also kind of make me a little nervous about like, being too active for fear of making things worse.

-Participant 3

In the PSE group, participants sought knowledge, reflected on potential self-management approaches, specifically about pain management strategies to help them regain control over their condition. The educational material appeared to encourage them to wanting to actively seek ways to reduce pain and improve function.

The exercise, you're right, it's completely safe for joints. I think the problem I find or the challenge I find is doing the right exercise for the right amount of time. Knowing what the right activity is, is critical to supporting and ensuring that you can continue to have a healthy lifestyle, even though you have osteoarthritis.

-Participant 17

The one thing that sort of tweaked my mind a little bit was healthy diet. You know, I think I eat a healthy diet, but I'm not sure, because you're always hearing, well, these are the five foods that you shouldn't eat if you've got arthritis. So I never listen to them, but you know whether that has any effect on flare ups or not. I just don't know that one.

-Participant 2

In the SBE group, their interaction with the material appeared to reinforce a belief that KOA is degenerative, leading them to look for medical explanations rather than self-management strategies.

I don't understand why the cartilage is being pushed out. Is it my excessive weight that's pushing down on the bone and causing the cartilage to bulge?

-Participant 12

I really want to know, like, what's the worst thing that can happen if you have bone on bone like for the rest of your life?

-Participant 15

Both groups expressed a desire for more support from healthcare professionals for their KOA.

I had to wait almost 10 months for an MRI, and then 6 months to see the doctor, to be told. Yeah, nothing we can do other than a shot. To be told they can't fix it until it is much worse. The big tears.

-Participant 11/ SBE

I've not been told by my doctor what state my knee is in. She just says you've got osteoarthritis, and I've had it now for probably close to eight to 10 years, maybe eight years, I think. And I have not had any progress update or anything with X-ray to tell me what state it's at now.

-Participant 6/ PSE

Overall, the PSE group gained a more accurate/contemporary understanding of KOA and felt more in control. In contrast, the SBE group saw OA as a worsening condition with little they could do to improve it.

Sentiment and self-recognition

In the PSE group, participants expressed a sense of hopefulness and positivity, emphasizing that the information provided an optimistic outlook on their condition. They felt reassured that KOA was manageable and that they had a role in improving their symptoms.

Feeling the positive whole positivity and hope. Yeah, so you're feeling that you can still live a good life.

-Participant 8

I'm very happy to hear that it can be managed better so I can continue being physical. I've not been told that before. That does make me more hopeful because I didn't think that before

-Participant 6

In contrast, the SBE group expressed sadness and frustration, feeling disheartened by the depiction of KOA as an unavoidable and worsening condition. Some participants also reported increased anxiety and worry about the long-term impact of KOA on their daily lives.

Osteoarthritis changed who I am, turning me into someone who watches life instead of being part of it, that really rings a bell with me, and I do see that in myself.

-Participant 3

The notion that it's permanent, and the deterioration continues, it's disheartening. Like I tell my children. I know you're only 30, but when you're my age you might have trouble

-Participant 11

Overall, the PSE group reacted positively to the PSE, while the SBE group showed emotional distress and concerns about future disability.

Perspectives on knee surgery

In the PSE group, participants expressed a hope that surgery was not necessarily inevitable. They acknowledged that lifestyle changes, exercise, and pain management strategies could potentially reduce the need for surgical intervention. This perspective fostered a proactive approach to managing KOA.

This is about the joint replacement. That was good. Like I said, I think I had been almost sort of expecting I'd have to do that, but now I'm thinking perhaps not, which would be awesome.

-Participant 10

I fully believe that the joint replacement is not in that boat and inevitable, and I will do almost anything not to have to do that.

-Participant 2

Conversely, the SBE group generally viewed knee surgery as unavoidable. The educational material reinforced the idea that joint deterioration would progress to a point where surgery was the only option.

And at that point I'd probably be trying to push my doctor a little harder for the knee replacement, or some sort of surgery, if at all possible, to at least address the pain.

-Participant 9

There's nothing they can really do except replacement, which is a big surgery and yeah, I'm gonna have it, which is what my doctor said to me.

-Participant 11

These findings suggest that participants in the PSE group had a proactive approach in managing KOA. In contrast, the SBE group saw surgery as a solution.

Discussion

The findings of this qualitative study highlight the potential benefits of fostering a proactive approach to managing OA and suggest that the type of information and the way it is communicated can have an *immediate* influence on individuals' perceptions of OA. In general, participants who received PSE viewed OA from a more positive perspective as a modifiable condition that can be self-managed through exercise, physical activity, weight management and valuable social relationships. In contrast, those in the SBE group agreed with the description of OA as a degenerative disease and that little could be done to avoid knee replacement surgery. These findings align with previous studies that have explored the negative impact of biomedical education or the effect of a positive approach reflective of current evidence.[6,17,29,30] The team is unaware of other studies that have compared PSE to SBE, however a previous review found that most interventions for KOA were poorly described,[31] making it difficult to determine their content, theoretical basis, or how they differed from one another.

A surprising finding was that the SBE group appeared to reject information suggesting the need to limit physical activity and joint stress. Both groups shared similar attitudes towards exercise and physical activity despite differences in messaging. The PSE group expressed a strong sense of motivation to participate in exercise to manage their symptoms which aligns with previous findings that PSE can improve self-management and adherence to physical rehabilitation protocols.[32] Similarly, the SBE group maintained a strong belief in the importance of staying active. Confidence in the benefits of physical activity may be attributed to past or perceived positive impact of physical activity on health and well-being.[33] People with KOA tend to weigh the positive impacts of physical activity (mood, weight management, and overall health) against its potential harm (short term muscle soreness and increase in pain).[34] The importance of exercise and staying physically active, particularly as we age, has been a consistent message of the 'Exercise is Medicine' campaign [35] and is guideline recommended for several chronic conditions.[36]

Although the type of educational content appeared to have a strong and immediate impact on how participants understood KOA, the duration of this impact was unable to be determined and whether it affected behaviour. Those in the PSE group seemed to develop a broader, biopsychosocial understanding of pain, recognizing how psychological, physiological, and social factors plays a role in shaping their condition. This shift in perspective appeared to foster greater curiosity, and motivation to integrate in self-management strategies which may have been facilitated by an understanding of having some degree of control over their pain. In contrast, participants in the SBE group interpreted OA through a pathoanatomical lens. Their feedback reflected a belief that OA is a degenerative and irreversible condition, described in the

literature as the “impairment discourse,” where joint damage is emphasized, and the condition is viewed as progressive and incurable.[17] Impairment discourse may contribute to reduced involvement in conservative management strategies and a higher likelihood of viewing surgery as the only effective solution.[17,34] However, the literature broadly suggests that the impact of educational content on behaviour change is unclear and inconsistent.[37]

Evidence from other health conditions suggests that pain science–based education can positively influence pain beliefs, emotional responses, and self-management.[38,39] Systematic reviews in oncology and chronic musculoskeletal conditions, including low back pain, show that pain-focused educational interventions improve pain-related understanding and coping, particularly in individuals with persistent or centrally mediated pain.[38–40] These findings support the broader applicability of pain science–informed approaches beyond osteoarthritis.

Notably, both groups expressed a strong desire for more information aligned with what they had been exposed to. This reinforces the powerful role that educational content potentially plays in shaping patients' beliefs, treatment preferences, and health behaviours. Unfortunately, many healthcare providers continue to focus primarily on structural explanations of OA, with participants reporting poor communication, limited feedback or treatment updates.[41] Without clear, ongoing conversations about the nature of OA and its management options, patients may feel confused, discouraged, or uninvolved [42,43] leading to greater seeking of information online. With many reputable websites still presenting OA primarily from a biomedical perspective,[15] it is crucial to update publicly available information to reflect the current understanding of the disease. In particular, there is little information available in these online resources regarding the complexity of pain and its biopsychosocial origins.[15]

The difference in educational framing had contrasting effects on emotional responses. Participants in the PSE group generally reported feelings of hope and empowerment, whereas those in the SBE group often described emotions of sadness, frustration, and anxiety. This is also consistent with people exposed to OA biomedical education reporting negative feeling and beliefs about OA and its management.[6,44–47] The positive and reassuring language used in PSE materials likely contributed to greater optimism about the potential for symptom improvement. Such emotional responses may be key mediators of successful self-management: specifically, use of an educational video with an empowerment discourse has been shown to be effective in improving self-efficacy and reducing kinesiophobia in people with KOA compared to videos based on an impairment discourse focused on joint pathology.[17] PSE and empowerment discourse likely share similar aspects in promoting resilience and a focus on self-management, whereas PSE uniquely provides greater detail regarding the complexity of pain.

Our findings suggest that the framing of OA-related information could influence decision-making regarding surgical interventions. Participants in the PSE group appeared to have hope that lifestyle changes could impact the need for total joint replacement (TJR) surgery, while those in the SBE group viewed surgery as an inevitable outcome of OA. Similarly, Darlow et. al. found that individuals holding biomedical beliefs strongly perceive surgery as the ultimate solution for knee conditions.[34] Moreover, Egerton et. al. reported that a biomedically-focused video led to higher perceived need for surgery in participants with KOA.[17] Less than 40% of people with KOA receive conservative guideline recommended treatment [48] and 40% of those waiting for TJR have not received first-line care.[49] Importantly, TJR does not guarantee complete symptom resolution; recent evidence indicates that approximately 13–15% of individuals continue to experience persistent pain following total knee replacement, even up to two years post-surgery.[50] Without the provision of information that aligns with the current understanding of the disease, patients cannot be expected to understand their treatment options, including the fact that only approximately one third of people living with KOA will have TJR.[51] Supporting patients with educational strategies that explore conservative treatment options to make informed decisions before considering surgery is imperative.

Clinical and research implications

Our finding highlights the importance of incorporating PSE content into routine patient education, particularly for individuals with KOA. Healthcare providers should consider integrating PSE as a standard component of interdisciplinary care based on the cognitive and emotional needs of each patient. Given the variability in the accuracy and quality of online health information, clinicians have an important responsibility to guide patients toward credible, evidence-based educational resources. Future research should investigate the long-term effects of PSE on health outcomes, such as physical activity levels, pain intensity, and healthcare utilization. Importantly, our study illustrates a need for publicly available information to be consistent with current evidence.

Strengths and limitations

A key strength of this study is its investigation of the immediate effects of educational content through qualitative analysis. By capturing participants’ real-time responses to educational material using the think-aloud technique, unique insights were provided into how different perspectives on OA influence patients’ beliefs and behavioral intentions. Furthermore, the use of a custom-made website format enhances ecological validity, reflecting the way individuals typically seek OA-related information online.

However, several limitations should be acknowledged. First, it is likely that participants possessed some prior knowledge of KOA, so no one approached the content as a blank slate which could have influenced their understanding and interpretation of the educational material. Moreover, participants’ responses during the debriefing interviews may have been influenced by their prior participation in the think-aloud task, which could have shaped the articulation of certain reflections. Second, the study’s sample size, while sufficient for qualitative analysis, may limit the generalizability of the findings, particularly given the lack of racial diversity and education level within the sample. Thus, future studies should consider including a sample with greater racial diversity and with a broader range of educational backgrounds. Third, both coders were aware of participants’ group assignments (SBE or PSE), which may have introduced interpretive bias despite efforts to maintain analytic neutrality. Additionally, the short-term nature of the study means that the long-term effects of these educational interventions remain unknown.

Conclusion

Our study demonstrated that the way OA-related educational content is framed can immediately shape patients’ perceptions, emotional responses, and motivation for self-management. PSE encouraged more positive views on physical activity and surgery. These findings support the need for a paradigm shift toward empowering OA educational content. Our brief intervention suggests that online resources need significant improvement to support this change.

CRediT authorship contribution statement

VH, ED – formal analysis, investigation, data curation, writing-original and revision; FB, TS, LM, NP, MH, – conceptualization, methodology, formal analysis, writing original; LCC - conceptualization, methodology, validation, formal analysis, writing original and revision, supervision.

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Declaration of Competing Interest

NP is owner and director of Pain Care U Education Inc and Neil Pearson Physiotherapist Corporation which provide continuing education, conference presentations and instructional materials for health care professionals working with and educating people living in pain. TRS receives speaker fees for lectures relating to pain and rehabilitation and has had travel/accommodation costs covered by numerous societies/associations. She also receives royalties from NOIGroup for a book written on osteoarthritis pain and rehabilitation, and is affiliated with NOIGroup, which promotes patient self-education (PSE). TRS is a member of various scientific program committees relating to pain and holds leadership roles in arthritis- related not-for-profit associations (e.g., Arthritis Australia, The Hospital Research Foundation Group – Arthritis). FAB is supported by Medical Research Future Fund Clinical Trials Activity grant (ID 2023048) and was supported by the John Stuart Colville Fellowship via The Hospital Research Foundation - Arthritis. FAB has been reimbursed travel costs and has received speaker fees for lectures/presentations on pain and pain education. FAB is a member of the Scientific Programming Committee for the Australian Pain Society. LCC is supported by an Arthritis Society STARS award and holds an Arthritis Society Innovation grant.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jpain.2026.106229.

Data availability

The data that support the findings of this study are available on request from the corresponding author LCC.

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