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How Do People With Knee Osteoarthritis Conceptualize Knee Confidence? A Qualitative Study

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Title: How do people with knee osteoarthritis conceptualise knee confidence? A qualitative study.

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ABSTRACT (312 WORDS)

Objective: Reduced knee confidence is common in people with knee osteoarthritis and is likely to influence how people with knee osteoarthritis engage with movement and activities. However, there is conflicting evidence surrounding the association between confidence and function. This may be because knee confidence has been assessed via a single questionnaire item that was not developed for people with knee osteoarthritis, and thus may not provide an accurate nor comprehensive assessment of confidence in this population. A better understanding of knee confidence could inform a more thorough assessment of the construct both in clinical and research contexts. Therefore, the aim of this study was to explore the meaning of knee confidence from the perspective of people with knee OA. **Methods:** Fifty-one people with a clinical diagnosis of knee osteoarthritis took part in a one-to-one semi-structured interview. Interviews explored how each participant conceptualised knee confidence. **Reflexive thematic analysis was selected as a flexible approach for identifying patterns of meaning across cases through a combination of data-driven and theory-informed coding of the transcribed data.** **Results:** People with knee osteoarthritis conceptualised confidence with reference to one or more of four themes: (1) symptoms; (2) functional ability; (3) the internal structure of the knee; and (4) knowledge about knee osteoarthritis and its management. Each conceptualisation of confidence was associated with present and future concerns. **Conclusions:** As people with knee osteoarthritis conceptualise knee confidence in different ways, a single-item measure is unlikely to capture all of the aspects of this construct in this population. This may explain the conflicting evidence around the association between reduced knee confidence and function in people with knee osteoarthritis. **Impact Statement:** It's important for clinicians and researchers to understand what knee confidence means to people with knee osteoarthritis as it is likely to influence how these individuals engage with movement and activities. Understanding this relationship may enable more targeted education and functional rehabilitation for people with knee osteoarthritis.

MANUSCRIPT WORD COUNT: 4038 WORDS

INTRODUCTION

Reduced knee confidence is common in people with knee osteoarthritis (OA).[1-3] Given the role of the knee in weight-bearing activity, reduced confidence in the knee is likely to influence how people with knee OA engage with movement and activities. A lack of confidence may lead to an individual adopting protective or avoidant behaviours, modifying the way in which they perform certain tasks, or limiting or avoiding those tasks altogether.[4] These behaviours are thought to lead to a downward spiral of pain-related disability and distress.[5] As such, identifying and addressing reduced knee confidence may be an important treatment target for clinicians working with people with knee OA.

Although the link between knee confidence and function makes intuitive sense, the evidence to date is unclear.[1-3,6-12] While reduced knee confidence has been linked to higher pain levels in knee OA,[1,2,7] there is conflicting evidence surrounding the association between knee confidence and function in this population.[1-3,6-12] The majority of studies exploring the relationship between confidence and function have focussed on self-reported measures of disability, with some studies reporting an association between reduced knee confidence and worse function,[1,3,7,8] and others reporting no relationship.[2,6,8] Contradictory evidence also exists for the association between knee confidence and performance-based measures of function.[1-3,6,7] Worse knee confidence has been associated with less quadriceps strength[1] and worse performance with hopping tasks and single leg sit-to-stand,[7] while other studies have shown no association between knee confidence and objective measures of knee function (quadriceps strength, 20 metre walk test, 30 second chair-stand test).[2,3,6] Three studies have investigated the relationship between knee confidence and motion analysis parameters during gait[1,11,12] and found worse knee confidence to be associated with greater peak knee varus angle,[11] greater dynamic varus-valgus joint motion[1] and greater peak trunk flexion angle[12] during gait, but not associated with any other trunk, hip, knee or ankle kinematics or joint

moments.[11,12] To date, only one study has examined the association between knee confidence and physical activity levels and found no association between the two variables.[9]

One plausible explanation for these contradictory findings may be that knee confidence is not being appropriately assessed in this population. At present, knee confidence is assessed using a single item from the Knee-related Quality of Life subscale of the Knee Injury and Osteoarthritis Outcome Score (KOOS QOL)[13] - *"How much are you troubled with lack of confidence in your knee?"* Although certain aspects of psychometrics of the KOOS have evaluated in a knee OA population,[14] a recent systematic review concluded that there is no evidence for content validity of this questionnaire.[15] In addition, this KOOS item on knee confidence was adopted from the Quality of Life Outcome Measure for Chronic Anterior Cruciate Ligament Deficiency (ACL-QOL)[16] and as such, has not been developed specifically for a knee OA population. Finally, it is unlikely that a single item measure could provide an accurate assessment of an individual's confidence with regard to performing a number of different tasks in a variety of settings. This may explain some of the inconsistencies surrounding the association between knee confidence and function.

In order to assess knee confidence appropriately, there is a need to better understand what underlies this construct. Although a number of qualitative studies have explored the beliefs of individuals with knee OA,[17-19] to date no studies have specifically explored the meaning of knee confidence in this population. Therefore, the aim of this study was to seek a comprehensive understanding of what knee confidence means to people with knee OA, using a qualitative approach. Gaining a deeper understanding of knee confidence in people with knee OA has the potential to enable more targeted education and functional rehabilitation.

METHODS

Design

This qualitative study was nested within a broader cross-sectional investigation exploring the association between movement and pain-related cognitions and emotions in individuals with knee OA. Reflexive thematic analysis[20] informed the study design. This was selected as a flexible approach for identifying patterns of meaning across cases through a combination of data-driven and theory-informed coding of participants' overt (explicit) and latent (implicit) responses.[21]

Participants

Fifty-one participants with a clinical diagnosis of knee OA were recruited to participate in the broader cross-sectional investigation, and all took part in this qualitative study. Participants were recruited through health practitioners, social media posts and community newspapers between May 2018 and March 2019. Interested individuals contacted the principal researcher (TB) via email and were then screened over the phone for suitability for inclusion in the study. Inclusion and exclusion criteria are detailed in Table 1. The eligibility criteria related to body mass index (BMI) and mobility were necessary as the larger study involved motion analysis. The demographic data of the 51 participants are summarised in Table 2. All participants were provided with a participant information sheet and provided written informed consent. Institutional ethical approval was received and the study was conducted in accordance with the NHMRC National Statement on Ethical Conduct in Research Involving Humans.

Data collection

One-to-one, semi-structured interviews were conducted at Curtin University by a female physiotherapist (TB) with experience in interviewing patients in a clinical setting. The interviewer attended two mentoring sessions with an experienced qualitative researcher (SB) who reviewed a sample interview and provided feedback. The participants were aware that the interviewer was a

physiotherapist with an interest in knee OA and that the study was part of her PhD. Eight of the 51 participants were known to the interviewer prior to the commencement of the study but this was not a dependent relationship (e.g. the interviewer was not their care provider). Interviews lasted approximately 45 minutes and were audio and video recorded. The video recording was only used to assist in the transcription of the interviews when the audio quality was deemed insufficient.

The interview schedule combined cognitive think-aloud and semi-structured interview techniques. First, participants were asked to 'think aloud' while responding to the questionnaire item from the KOOS QOL subscale[13] - *"How much are you troubled with lack of confidence in your knee?"* The think-aloud process enabled the interviewer to identify potential meanings of confidence from the participants' perspectives. The interviewer then engaged in verbal prompting to clarify observed responses and behaviours (e.g. *"I noticed you hesitated. Tell me what you were thinking"*) and clarify understanding (e.g. *"can you repeat the question in your own words?"*). Following this, a semi-structured interview explored the meaning and impact of knee confidence to the participant. An initial interview schedule was built to explore possible meanings of knee confidence. This was informed by: (1) the literature from which the confidence item for the think-aloud was taken[16] (knee instability in ACL-deficient knees); and (2) health belief theory describing how people interpret knee symptoms (e.g. the Common Sense Model of Illness[22,23]). Consistent with the inductive reflexive analysis approach, the interview schedule evolved over the course of the study, with the addition of questions informed by participants' responses to the think-aloud component (Appendix 1). For example, a participant in an early interview had this response to the think-aloud component;

> *'[Confidence] means every single time I perform an activity, my knee performs as I expect it to... It doesn't mean there is no pain. But it means that I know whenever I put my foot down in a certain way, it will be the same pain. Whatever pain I experience, it's going to be the same one each time. It's not going to change.'* - P4 (female, 64 years, 'moderately' troubled)

We therefore added the following question to our interview schedule for use in subsequent interviews;

'Do you feel as though your symptoms are predictable? Tell me more about that.'

Data Analysis

Interviews were transcribed verbatim and uploaded to MAXQDA (VERBI Software, 2019, Berlin, Germany) for analysis. Data analysis was performed using a reflexive thematic analysis approach,[20] which involved a six-phase, recursive process; data familiarisation, coding, generating initial themes, reviewing themes, defining and naming themes and writing up.[24] After familiarisation with the data set, one author (TB) applied inductive coding techniques to the entire data set, through her lens as a musculoskeletal physiotherapist with an interest in knee OA. Cross coding was performed by team members (AS and POS) as well as a qualitative researcher with a background in social sciences, and this informed the development of the coding framework. The coding framework generated was then reviewed by the authorship team. Through this process, codes were collapsed and expanded resulting in a refined coding framework which was then reapplied to the data set. A second team member (AS) applied the final coding framework to two transcripts selected at random in order to confirm the stability of the framework and representativeness of the codes. Three authors (TB, AS and POS) then met to discuss coded data, and emerging interpretations were formulated and challenged in the context of clinical practice and the existing literature. Through this process, initial themes and subthemes were generated based on the participants' meaning of 'knee confidence'. Engaging in constant comparative analysis, initial themes were then reviewed against the entire data set and further refined. An example of this process is presented in Appendix 2. Once themes had been refined, one author (TB) identified the salient theme(s) for each participant, based on her interpretation of salience (rather than the frequency of codes appearing in the transcript). The

salient theme(s) for each participant were discussed, challenged and agreed upon by the authorship team.

RESULTS

The outcome of the analytic process is presented in Table 3. Four key themes were identified: (1) confidence related to the presence or lack of symptoms; (2) confidence related to functional ability; (3) confidence related to the internal structure of the knee; and (4) confidence related to knowledge about knee OA and its management. Themes are described below, with supporting quotes (Q1, Q2 etc) presented in Table 4. Themes are further illustrated within the conceptual representation of knee confidence in Figure 1.

Approximately half of the participants conceptualised confidence as being related to a single theme. The remaining participants' conceptualisations related to a combination of different themes, and it was common for these individuals to report different levels of confidence for each of the different themes. For example, P42 conceptualised confidence as being related to both symptoms and function. He reported being 'moderately' troubled with lack of confidence because although he had full confidence in the stability of his knee (symptoms) he lacked confidence about his future mobility (function):

> *"Lack of confidence to me means, am I worried my knee is going to give way, and I'm going to fall over or collapse? So, I am not very worried about my knee collapsing on me, but I'm a little worried that the condition of my knee will continue to deteriorate to the degree that I won't be able to move around as I'd like to. So, lack of confidence? I'd probably say, moderately."* - P42 (male, 70 years, 'moderately' troubled)

Confidence related to symptoms

Over half of the participants conceptualised confidence as being related to the presence or absence of symptoms. Some participants reported lacking confidence due to symptoms they were currently experiencing such as pain (Q1), instability (Q2), weakness (Q3) and reduced balance (Q4), while others reported having confidence due a lack of symptoms (Q5, Q6). Some associated confidence with symptom predictability (Q7), while others associated confidence with symptom control (Q8, Q9). There were also a few participants who lacked confidence because of concerns about their future symptoms. For example, one participant lacked confidence because he was worried about bringing on an acute pain episode (Q10), while others were worried about their symptoms worsening over time (Q11), or worried about experiencing a symptom set-back (Q12) (see Table 4, quotes 1-12).

Confidence related to functional ability

It was common for participants to conceptualise confidence as being related to their functional ability. A number of participants defined confidence as having the ability to do everything that they wanted to do (Q13) and of these participants, some reported having confidence (Q14), while others reported lacking confidence (Q15). Some participants were more specific about their conceptualisation of confidence, and felt confidence related either to their ability perform their daily activities (Q16), participate in their hobbies (Q17), complete their work duties (Q18) or perform specific tasks (Q19) in the present day and/or the future (Q20, Q21). Some participants lacked confidence because they felt as though they were living with vigilance - that they were always thinking about their knee and felt as though they needed to move with caution to protect the knee. To these participants, confidence meant being able to do things without having to consider the knee (Q22). Other participants reported lacking confidence in the capability of the knee joint, and felt as though they couldn't rely on the knee during certain activities (Q23), while others felt confident in the knee and its ability to 'hold up' in most situations (Q24). There was a small group of

participants who lacked confidence with specific tasks (usually descending stairs) due to a fear of falling (Q25), and while these participants didn't feel their lack of knee confidence was solely responsible for this fear, they did feel as though it was a contributing factor. Finally, there were participants who reported feeling confident in their knee because they understood their limitations and they operated within those narrow limits (Q26) (see Table 4, quotes 13-26).

Confidence related to the internal structure of the knee

Some participants conceptualised confidence as being related to the internal structure of their knee. These participants reported lacking confidence because they felt as though the internal structure of the knee was compromised - that their knee was 'bone on bone' (Q27), not 'normal' (Q28) or not 'structurally sound' (Q29) - or because they were worried about damaging their knee (Q30, Q31). A number of these participants also expressed their concern about the future status of their joint and reported lacking confidence because they were worried about making the 'bone on bone' worse (Q32) or causing further damage over time (Q33) (see Table 4, quotes 27-33).

Confidence related to knowledge about knee OA and its management

For some participants, confidence was related to a lack of knowledge and feelings of uncertainty. They reported lacking confidence due to diagnostic uncertainty (Q34), because they felt unsure about the meaning of their pain (Q35), or because they didn't know how to best manage their knee (Q36). There were also a number of participants who lacked confidence because they were uncertain about their future prognosis (Q37). Participants who conceptualised confidence in this way felt their confidence would improve if they felt informed and they had some certainty (Q38, Q39). For these participants, a lack of knowledge meant a lack of confidence (see Table 4, quotes 34-39).

DISCUSSION

The results of this qualitative study demonstrate that knee confidence is a multifaceted construct, and that people with knee OA conceptualise knee confidence with reference to one or more of four themes: (1) the presence or lack of symptoms; (2) functional ability; (3) the internal structure of the knee; and (4) knowledge about knee OA and its management. Each conceptualisation of confidence was associated with present and future concerns. While some individuals held conceptualisations related to a single theme, others held conceptualisations related to multiple themes. In those participants who held multiple conceptualisations of confidence, it was common for them to report different levels of confidence for each of their conceptualisations suggesting that knee confidence is highly individualised.

This is the first study to investigate specifically what knee confidence means to people living with knee OA. Although there are a number of qualitative studies exploring the beliefs of individuals with knee OA,[17-19] none of these studies have sought to understand the meaning of knee confidence in this population. In fact, the meaning of confidence across different clinical populations has not been well investigated to date. Outside of this study, only two qualitative studies have aimed to gain a better understanding of the meaning of confidence in their study populations - one study explored the meaning of confidence from the perspective of older people living with frailty[26] and the other aimed to better understand what confidence means to stroke patients, in order to inform the development of a confidence assessment tool.[27]

Our finding that confidence is a multifaceted construct is supported by previous research demonstrating associations between knee confidence (as currently measured by the single KOOS item), symptoms[1,2,4,8] and function,[3,7,8,10] as well as qualitative studies exploring the beliefs of individuals with knee OA.[17-19] Previous quantitative studies have demonstrated a link between confidence and symptoms, with worse knee confidence being associated with higher pain levels,[2,4]

greater self-reported instability[1,2] and a greater occurrence of knee buckling.[8] In addition, although there are studies showing no association between knee confidence and self-reported function in people with knee OA,[2,6] a number of studies do support an association.[3,7,8,10] Cross-sectionally, those with worse knee confidence have been shown to have lower scores on the KOOS Activities of Daily Living (KOOS ADL) and Sport and Recreation (KOOS S/R) subscales[7,10] (indicating greater functional limitations) and longitudinally, worse knee confidence at baseline has been associated with greater risk of poor function outcomes.[3,8] Finally, a number of qualitative studies exploring the beliefs of individuals with knee OA[17-19] have shown that individuals with knee OA commonly describe their knee as being 'bone on bone', attribute their knee pain to the rubbing together of bony surfaces and feel they need to protect their joint from further 'wear and tear' by limiting or avoiding activities and adopting behaviours that reduce stress on the knee.[17,19] Another qualitative study exploring patients' beliefs about their knee pain found that uncertainty was a common theme for individuals with knee OA.[17] Although these participants expressed certainty about the anatomical and pathological changes within their knee (i.e. 'bone on bone' and 'wear and tear'), they often expressed uncertainty about the inconsistency and variability of their symptoms, the progression of the disease and the best management strategies.[17] Given that these beliefs are common in people with knee OA, it makes sense that some participants in our study reported lacking confidence in loading their knee, due to their structural beliefs or their lack of knowledge about knee OA.

Are we assessing knee confidence adequately?

The results of this study further support the idea that we are not assessing confidence adequately in people with knee OA, and that there appear to be some limitations with using this single item measure. Given that people can hold multiple conceptualisations of confidence, people can report being 'not at all' troubled in some domains of confidence and 'severely' troubled in others. Based on these observations, we suggest that a single item measure is unable to accurately capture the experience of 'knee confidence'. Our suggestion is supported by research which suggests that while

single item measures may be suitable for measuring simple constructs, they are not appropriate for measuring more complex, multifaceted constructs.[28] A further limitation with using this single item measure is that it has not been assessed for content validity by interview in a knee OA population, as is recommended by the COnsensus-based standards for the selection of health Status Measurement INstruments (COSMIN) initiative.[29]

The fact that we may not be appropriately assessing confidence in people with knee OA may explain the conflicting evidence around the association between reduced knee confidence and function in people with knee OA. It is plausible that a relationship between knee confidence and function exists in those individuals who conceptualise confidence in a particular way; for example, it would make sense that a relationship between confidence and function would exist for participants who conceptualise confidence as being related to knee instability (symptoms) or their ability to participate in their hobbies (functional ability). The results of this study suggest that the continued use of the single KOOS item as a measure of knee confidence in people with knee OA may not be appropriate in the context of large-scale quantitative research. Future enquiry building on the findings of the current study is needed to develop an optimal patient-reported instrument that captures all aspects of a person's appraisal of knee confidence. In addition, there may be some overlap between the confidence conceptualisations identified in this study and other psychological and cognitive factors, such as self-efficacy and pain-related fear. Future development of any PROM seeking to measure knee confidence would need to ensure sufficient divergent validity of all subscales.

Study Limitations and Design Considerations

This qualitative study comprised a convenience sample and recruitment was guided by the broader observational study, therefore we could not engage in maximal variation sampling and theoretical sampling, and cannot be sure that saturation was reached. However, the sample size is large for

qualitative enquiry, and robust methods like constant comparative analysis were used, enabling us to identify recurring patterns among the sample and to explore these concepts in subsequent interviews. The patterns we identified among the 51 participants enabled us to answer our research question. The inclusion of participant demographics in Table 1 can assist readers in judging how transferable these findings are to their own context. We acknowledge that the majority of our participants were recruited through private health practitioners (physiotherapists and orthopaedic surgeons) or through community newspapers in a higher socioeconomic area, so health literacy[30] and socioeconomics may have influenced our results. Participants in this study reported at least a moderate level of pain-related disability (which we defined as having moderate or greater, degree of difficulty with one or more items on the KOOS ADL subscale[13]), therefore it is not known whether people with lower levels of disability conceptualise confidence in the same way. Our study did not include people with a BMI > 30 (unless they met specific waist-to-hip ratio criteria) and we are therefore unable to determine how obesity, a significant contributor to knee OA,[31] overlaps with the construct of confidence. A recent longitudinal study has demonstrated that a higher BMI at baseline was a predictor of persistently poor knee confidence, and declining knee confidence over time.[4] Future research exploring what confidence means to obese individuals with knee OA is therefore warranted. Finally, we acknowledge that the design of this study, the data collection, analysis and interpretations were informed by our backgrounds as researchers with an interest in cognitive and behavioural approaches to the management of musculoskeletal pain and disability, and our clinical backgrounds as physiotherapists caring for people with knee OA. **Although we did not share our inferences with the study participants to gain additional insights from the participants' perspectives**, the use of reflexive thematic analysis, the inclusion of the think-aloud component, and triangulation strategies such as the cross-coding of data by other team members and a social-scientist and qualitative researcher with no clinical background, helped ensure that the meanings of knee confidence described in this paper remained grounded in the participants voices.

Implications for clinical practice

Clinicians should understand the four potential facets of 'knee confidence' during clinical encounters, so that they can better understand and address their patients' lack of confidence. Understanding how patients conceptualise confidence would allow targeted education and behavioural interventions. Table 5 provides quotes from four participants who held conceptualisations relevant to each of the different themes. Alongside the quotes are examples of both helpful and unhelpful responses that could be provided by the treating clinician. These responses were developed in conjunction with experienced clinicians and a consumer with a long history of knee OA. The helpful responses aim to address inaccurate beliefs held by people with knee OA and encourage patients to feel confident about loading their knee.

CONCLUSION

Individuals with knee OA conceptualise confidence with reference to one or more of four themes: (1) the presence or lack of symptoms; (2) functional ability; (3) the internal structure of the knee; and (4) knowledge about knee OA and its management. A single item is unlikely to assess all of the aspects of knee confidence in this population. This may explain the conflicting evidence around the association between reduced knee confidence and function in people with knee OA. It is important for clinicians and researchers to understand what knee confidence means to people with knee OA as it is likely to influence how these individuals engage with movement and activity. Understanding this relationship would enable more targeted education and functional rehabilitation for people with knee OA.

DECLARATIONS

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Contributors: TB, AS, POS, AC, LN and PK conceptualised and designed the study. TB facilitated participant recruitment and conducted the data collection. TB, AS, POS and SB analysed and interpreted the data and were involved in drafting and reviewing the manuscript. TB, AS, POS, SB, AC, LN and PK all made substantial contributions to the revision of the manuscript prior to submission, and all approved the final manuscript.

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Patient consent for publication: Not required

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Data Sharing: Data are available on reasonable request. Data are in the form of digital voice recordings of interviews, which were also transcribed verbatim into Word files. These data are stored in a password-protected research drive only accessible to the researchers of this study. Voice recordings contain identifiable data and will not be made available on request to maintain participant anonymity. Transcriptions with de-identified participant data may be made available on reasonable request.

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TABLES

TABLE 1. Eligibility Criteria

Inclusion criteria	• Clinical diagnosis of knee OA[32] o Aged ≥ 45 years o Knee pain for ≥ 3 months duration o Knee pain most days with average severity ≥ 4/10 on numeric rating scale o Morning stiffness < 30 minutes • Moderate pain-related disability o Moderate or greater, degree of difficulty with at least one item on the Function, Daily Living Scale of the KOOS[13] • Body mass index (BMI) o BMI < 30kg/m^2; or o Female with BMI 30-35 kg/m^2 and waist to hip ratio (WHR) of ≥ 0.85; or o Male with BMI 30-35 kg/m^2 and WHR of ≥ 0.95
Exclusion criteria	• Comorbidities resulting in a severe mobility impairment • Unable to complete physical assessment due to language or cognitive difficulties

TABLE 2. Demographic Characteristics of Participants

Characteristics	All participants (n = 51)	
	Mean (SD)	Min - Max values
Age (yr)	64.9 (7.5)	49 - 82
Female	22 (43%)	
BMI (kg/m^2)	26.8 (3.7)	17.9 - 33.4
KOOS pain score (0 - 100)	58 (13)	17 - 81
KOOS symptoms score (0 - 100)	58 (19)	18 - 89
KOOS ADL score (0 - 100)	66 (15)	9 - 94
KOOS sport/rec score (0 - 100)	32 (17)	0 - 75
KOOS QOL score (0 - 100)	39 (13)	0 - 63
Confidence (0 - 4)	2 (1.1)	0 - 4
‘Not at all’ troubled	5 (10%)	
‘Mildly’ troubled	10 (20%)	
‘Moderately’ troubled	19 (37%)	
‘Severely’ troubled	14 (27%)	
‘Extremely’ troubled	3 (6%)	

SD = standard deviation; BMI = body mass index; KOOS = Knee Injury and Osteoarthritis Outcome Score; KOOS scores range from 0-100 (0 = extreme knee problems, 100 = no knee problems); Confidence scores range from 0-4 (0 = ‘not at all’ troubled, 1 = ‘mildly’ troubled, 2 = ‘moderately’ troubled, 3 = ‘severely’ troubled, 4 = ‘extremely’ troubled)

TABLE 3. Outcome of the Analytic Process

Codes	Sub-themes	Themes
Pain High pain levels Sudden onset of pain (twinges) Pain during specific tasks Pain that stops me from doing things Pain that makes my knee give way Instability Weakness Swelling that stops me from doing things Restricted movement Reduced balance / feeling unsteady Lack of control over symptoms Unpredictable symptoms	Present day symptoms	**Confidence related to presence or lack of symptoms**
Worried about an acute pain event Worried about symptoms becoming worse over time Worried about a symptom set-back	Concerns about future symptoms	
Current Ability Ability to perform daily activities Ability to participate in hobbies Ability to complete work duties Ability to perform specific tasks Vigilance Capability/reliability of the knee Understanding limitations and working within those limits Fear of falling	Present day function	**Confidence related to functional ability**
Future Ability General mobility Ability to perform daily activities Ability to participate in hobbies / quality of life Ability to complete work duties / job security	Concerns about future function	
My knee is 'bone on bone' My knee isn't normal My knee is not structurally sound/stable Pain is a sign that I'm damaging my knee I'm worried about damaging my knee	Present day structural integrity	**Confidence related to the internal structure of the knee**
Worsening of the internal structure ('bone on bone') over time I'm worried about damaging my knee over time Age-related 'wear and tear'	Concerns about future structural integrity	
What is wrong with my knee? What is the meaning of the pain? How do I best manage my knee in the present day?	Lack of knowledge in the present	**Confidence related to knowledge about osteoarthritis and its management**
Uncertainty about the future prognosis	Lack of knowledge about future	

TABLE 4. Supporting Quotes

Theme 1: Confidence related to presence or lack of symptoms	
Q1	*Oh well, I'm not very confident... Because, of the pain. It's quite a bit of pain.*
Q2	*I'd say [severely troubled]... Because I just don't, I feel like it's not stable enough I suppose… Yeah not stable enough, yeah. So it would be troubled with lack of stability in my knee.*
Q3	*I just don't trust the knee as much... It doesn't feel as strong as the right. It might let me down.*
Q4	*So when I help my brother, my brother is a ceiling fixer, so he used to get me to help him but I'd have to get up on trestles and planks and lift sheets and that sort of thing. But I've basically said to him that I can't do that anymore because I don't feel stable enough. And when you're two metres off the ground, lifting sheets and that, it's not good... Before that, I didn't worry about it you know? I just feel like my knee's not so great and, and, and I'm much more conscious of my balance. Because you're standing on a plank… I know I've got great balance at ground level, but under load when you got a three metre sheet and that, and you've got to use tools and that, and you've got to think about where your feet are and that all the time. I just don't feel that confident enough that I…*
Q5	*Well, my first thought when I read that [question] was thinking back to talking to other people who have knee problems in forums and that sort of thing. And also, in stuff that I've read, where some people have knees which will go out of joint, and they'll collapse like going downstairs or going upstairs. Well, I'm not worried about my knees doing that.*
Q6	*Now the other thing is, lack of confidence in the strength is probably not an issue. Because I always feel like my knee is strong enough to do things but just whether it will really hurt or not.*
Q7	*[Confidence] means every single time I perform an activity, my knee performs as I expect it to... It doesn't mean there is no pain. But it means that I know whenever I put my foot down in a certain way, it will be the same pain. Whatever pain I experience, it's going to be the same one each time. It's not going to change.*
Q8	*I can generally control what's bringing the pain on, so I suppose in that regard I think that I'm in control of it. I've probably got a certain degree of confidence.*
Q9	*I feel that I can keep the pain at bay by controlled movement. And I feel that running is less controlled. I might sort of, misstep and- That fall I had where I stumbled and twisted the ankle, I don't know if that was, I was walking down some steps at home and I was in a little bit of a hurry, and I don't know if I simply mis-stepped or if my knee gave way... So, I've got to be extremely careful now. So I do all of those things carefully.*
Q10	*"How much are you troubled with a lack of confidence in your knee?" Well, I don't know what's wrong with it. I'm nervous about doing something that makes it go really bad, causing an acute injury. There's occasions when I twist it and get really sharp pain. I don't want that to happen when I'm sailing solo at sea for instance. So yeah, I worry a bit about it. So, I guess, probably, moderately troubled.*
Q11	*The biggest thing for me is that [the pain] is gonna get worse and worse.*
Q12	*So, yeah, I'm, yeah, severely troubled by the lack of confidence in my knee. And I know that if I do the wrong thing that I can feel it in my knee, that it's going to set it back to a painful position that takes a long time to heal and I don't want that.*
Theme 2: Confidence related to functional ability	
Q13	*Confidence for me is being able to do what I want to do when I want to do it.*
Q14	*It's just the knee feels a little bit tired afterwards, more than what it has been. Sometimes it aches. Sometimes it doesn't. But I have every confidence in my knee and it still does everything I want it to do.*
Q15	*I would have to say I'm troubled by the lack of confidence because of the limiting factors of what I can do with my knee, so I am severely troubled by it.*
Q16	*Confidence in my knee would be that I don't anticipate not being able to do most of the things that I would want to do on a daily basis.*
Q17	*Yeah, yeah. I hope I interpreted that correctly and the lack of confidence in being able to do the things I enjoy doing, which I thought was going to be part of my pleasure in retirement and a base for socializing and adding on to that activity.*
Q18	*Extremely [troubled]. I lack a lot of confidence because in my job, my knees are very important because I have to work with children with disabilities and have to bend down sometimes to help them put their shoes on. I have trouble getting up. So I reckon, extremely worried about it.*
Q19	*I think I would have to say [moderately troubled] again because mostly I assume that it will do everyday things. And where my concern comes in is when I want to do something that is more vigorous or requires more rapid and therefore more reliable movement... But mostly I guess it's to do with the skiing or getting in and out of kayaks.*
Q20	*I suppose, I want to keep up exercising, and my concern is that I won't be able to exercise as it gets much worse, that I won't be able to ride the bike or go for walks, or... and then I won't be able to enjoy holidays and trips, which is one of the reasons I retired.*
Q21	*So yeah, my job depends on my knees. And my knee, I'm worried about the money, that's what took me so long to get my shoulder done... You got to take more time off. Then they're going to, then I have to see the education doctor again. And he's going to say "well you can't do this, this and this. So, you can't stay in that job".*
Q22	*[If I was confident in my knee] I wouldn't have to think. I'd run up and down the stairs, I wouldn't have to use a rail ever. I could run up and down through the garden and not worry about falling over. I could do my deep water running again and it wouldn't matter, it wouldn't hurt. I wouldn't get in trouble with it... I'd be able to do all those other things that I wouldn't have to think, I wouldn't have to consider that as an aspect whereas... Now you have to plan and make choices and you don't like doing that if you've never had to do it because it's another job.*
Q23	*[Confidence means] knowing your knee is going to stand up to whatever you put to it, whatever you do with it, yeah so that's what it means to me. I'm confident at this point in time, most things, you know 90% of things I've always done, probably apart from running on hard surfaces, I can probably do.*
Q24	*When the question is presented to me, it's a lack of confidence. I'm interpreting it at the confidence for the knee to stand up in the activity and the things I enjoy doing. And at the moment it is failing in holding its position when I'm move into proper tennis strokes or allowing me to move quickly off the mark to retrieve a ball, it doesn't happen.*
Q25	*I don't want to fall. So I am concerned that I will or could fall... it is not especially my knee. Because I wasn't balanced before my knee was giving me trouble... It's more that if anything, at my age you're worried about, it is lack of independence and hurting yourself and causing more damage... [My knee] is just emphasising my instability as such.*
Q26	*The other thing I would say, for me, looking at that question, I know I have limitations with my knee. I'm confident in what it can do, and what it can't do. So I would say I'm not troubled by a lack of confidence, because even though I might not be able to do what I used to be able to do, I'm confident about what it can do, and where my limitations are. So I manage that really easily, because I go, "Well, I know that playing golf means this, so I'll prepare by doing X, Y, Z". So I can still play golf, but I'm not getting to the point where at the end of the day, it's really hurting and I have to take drugs, and whatever to cope with what I've just done.*

Theme 3: Confidence related to the internal structure of the knee	
Q27	*Because I do lack confidence in my knee. Seriously, I just cannot rely, at times, on ... It's probably different to some of the other knee osteoarthritis people you might get. I just feel I've got nothing. To me it feels like I've got nothing left in my knee. You know, it's 'bone on bone'. And that may or may not be right, but that's how I feel, I just feel that I can't rely on it.*
Q28	*Because I experience pain in it on a daily basis, I'm alert to the fact that it's not intact, and if something's somewhat broken it can become somewhat more broken. So I'm alert to the fact that it's a compromised area, and that makes me only moderately confident, as opposed to fully confident. Because I'm a realist.*
Q29	*The knee, all the bits of the joints, they are all connected. The arthritis has eaten away at some bits of it. It's not sitting in there are solidly as it could be. And the fact that I occasionally get this little bit of movement sideways or whatever is um… although it's not major, it's just occasionally it will slip, and that might happen anyway I don't know, but it always seems to be that knee.*
Q30	*When I do dance, my knee starts to play up, so I'm sort of worried about damaging more. I'm very worried about that.*
Q31	*Why do I lack confidence in my knee? Because it gives me pain when I do things. That's the only signal. At the moment it appears to work fine. It does click, so mechanically there's something odd there. But the pain is giving me the signal that says, "Hey, there's something not right here."*
Q32	*I just feel like its wearing. The 'bone on bone' is naturally wearing it away. So therefore, it's going to get worse. It's not going to improve because it has to be... two bones of the same material and density rubbing will wear it away.*
Q33	*Probably just that I'm going to damage it or something. Yeah that's more the issue... mainly the longer [term], I don't want to do something that's going to make it really, worse than what it is.*
Theme 4: Confidence related to knowledge about osteoarthritis and its management	
Q34	*Because I just don't understand what's wrong with it, and whether it's something that if I go easy on it for six weeks it'll suddenly get better, or if it's something that I've got to live with for life. Both of which are fine. Or if it's actually something acute that's gone wrong, and if I'm not careful I'm going to make it a lot worse.*
Q35	*Does that pain mean stop, you're going to harm it? Or does that pain mean just slow down? Or does this pain mean ... what else can it mean? Yeah. There's another aspect to it. Pain means you're damaging, pain's a warning not do that, or the pain is something that isn't so bad and just go through it?*
Q36	*I suppose the word confidence, I quite like that word because I feel uninformed. Okay? So I am uninformed... when I'm playing golf regularly, which I really enjoy doing. Am I doing any more harm to my knee or not? Is it a good thing to walk around a golf course, or should I be in a cart? So that worries me.*
Q37	*Lack of knowledge... Not Knowing... If you don't know, you think, well is it going to get worse? How fast does it get worse?*
Q38	*If I had exactly the same pain I have now or discomfort that I have now and I knew that I was medicated correctly, that I needed to do this to prevent muscle wastage and what the likely prognosis was in x years, in five years, should I book overseas travel where I'm going to be walking around the place...? I wouldn't be troubled. I'd be interested. I'd be interested in being informed, but I wouldn't be troubled.*
Q39	*If you told me that, "Yes your knee's stuffed. You're old, you've just had too much fun on it. The pain is the same as this pain, put up with it. There's surgery we can do. We can do a knee replacement, whatever, but if you're happy to put up with the pain, just go for it." Then I'll walk out with a big smile on my face...Yeah, yeah. My confidence returned. I can manage the pain, that's no drama.*
Confidence related to a combination of themes	
Q40	*Lack of confidence to me means, am I worried my knee is going to give way, and I'm going to fall over or collapse? So, I am not very worried about my knee collapsing on me, but I'm a little worried that the condition of my knee will continue to deteriorate to the degree that I won't be able to move around as I'd like to. So, lack of confidence? I'd probably say, moderately.*

TABLE 5. Helpful and unhelpful responses when discussing lack of confidence with people with knee OA

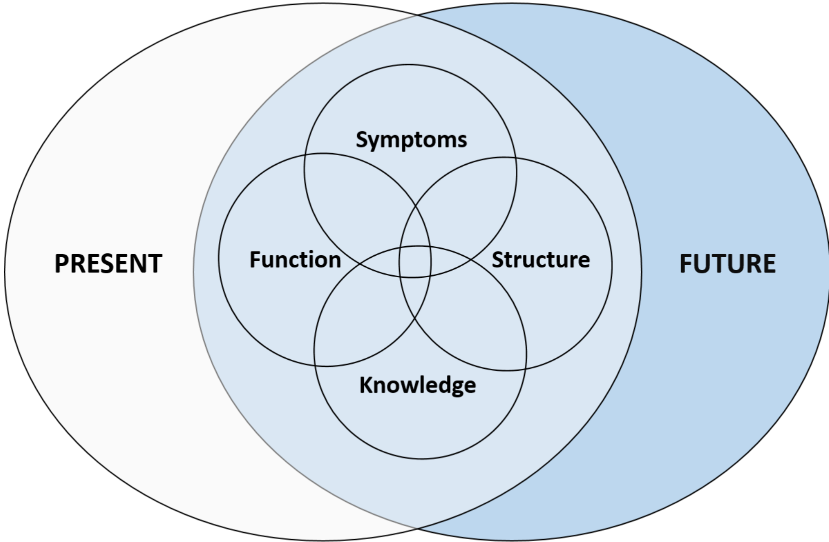
Theme 1: Confidence related to presence or lack of symptoms	
Quote (P14):	*[I feel] very unconfident in it. I don't trust it at all. It's failed on me a few times. I was once trying to step down and put a boat in the water or whatever, I know that I can't do that. It's just gonna... Yeah, it'll just go. Well, it's painful. I can't do it. So, yeah. It'll either collapse or I'll give up.*
Unhelpful response:	*The instability you're feeling is likely a result of the laxity of the supporting structures within your knee joint. Unfortunately there is nothing you can do to fix this. The only way to resolve your instability is by having a knee replacement.*
Helpful response:	*The feeling of giving way is really scary. This is usually linked to a combination of muscle weakness and sensitivity of your knee structures when they are loaded.[33,34] Would you like to explore ways that we can gradually build up your knee strength and control to get you confident to load it?*
Theme 2: Confidence related to functional ability	
Quote (P28):	*Extremely [troubled with a lack of confidence]. I lack a lot of confidence because in my job, my knees are very important because I have to work with children with disabilities and have to bend down sometimes to help them put their shoes on. I have trouble getting up. So I reckon, extremely worried about it.*
Unhelpful response:	*Unfortunately there is no cure for osteoarthritis. Your knee will continue to deteriorate over time making it difficult for you to perform the tasks required in your job. At that point, you'll either have to have a knee replacement, or find another job.*
Helpful response:	*Having difficulty performing your day-to-day work duties can certainly affect your confidence in your knee. The good news is that exercise has been shown to improve function in people with knee OA.[35] So let's practice the activities that you find difficult and work on improving the strength of the muscles around your knee, and get you back to performing your work duties with confidence.*
Theme 3: Confidence related to the internal structure of the knee	
Quote (P38):	*Well I suppose when my knees originally were giving me trouble but it was more of an ache rather than a pain, I didn't have any concerns about going on trips or going on long walks, or that sort of thing. I had confidence in my knees, but they did ache a bit, maybe at night or after I'd [used them]. Yeah, but it wasn't like now, because I've got like 'bone on bone'. Every time I walk, I can feel that impact, like the 'bang, bang, bang'. So you can sort of think, how much longer can I [keep going like that]?*
Unhelpful response:	*You should avoid weight-bearing physical activity because you don't want to accelerate the degenerative change in your joint. Rather, you should focus on non-weight bearing exercise such as swimming and cycling as these are less likely to wear away your joint.*
Helpful response:	*The term 'bone on bone' does sound scary, and I can understand why that would reduce your confidence in loading your knee. However, the research actually demonstrates that loading the joint is safe for people with knee OA and is actually beneficial to joint health.[36] In addition, weight-bearing physical activity can actually reduce pain levels and improve your function.[35] The key is to start slowly and progress gradually to give your knee an opportunity to adapt to the load. Let's put a plan in place to improve your confidence in loading that knee.*
Theme 4: Confidence related to knowledge about osteoarthritis and its management	
Quote (P32):	*Probably because lack of knowledge and lack of confidence go together, so if I know that I'm not going to do any harm, if I understand what's going on, I wouldn't be as troubled, I think… Does that pain mean stop, you're going to harm it? Or does that pain mean just slow down? Or does this pain mean ... what else can it mean? Yeah. There's another aspect to it. Pain means you're damaging, pain's a warning not do that, or the pain is something that isn't so bad and just go through it?*
Unhelpful response:	*Pain is a warning. It's the body's way of keeping you safe and making sure you don't do any further harm. You should be avoiding activities that cause you pain because you want to avoid further damaging your knee.*
Helpful response:	*Not understanding the meaning of your pain can certainly affect your confidence in your knee. You should feel reassured to know that pain does not mean you're damaging your joint. Pain is related to the sensitivity of the knee structures which is influenced by lots of different things like your strength, activity levels, body weight, sleep and even your mood.[37-39] We can discuss which of these factors may be relevant to you and make a plan to address these.*

FIGURE LEGENDS

FIGURE 1. Conceptual representation of the meaning of confidence in people with knee OA

FIGURES

FIGURE 1. Conceptual representation of the meaning of confidence in people with knee OA

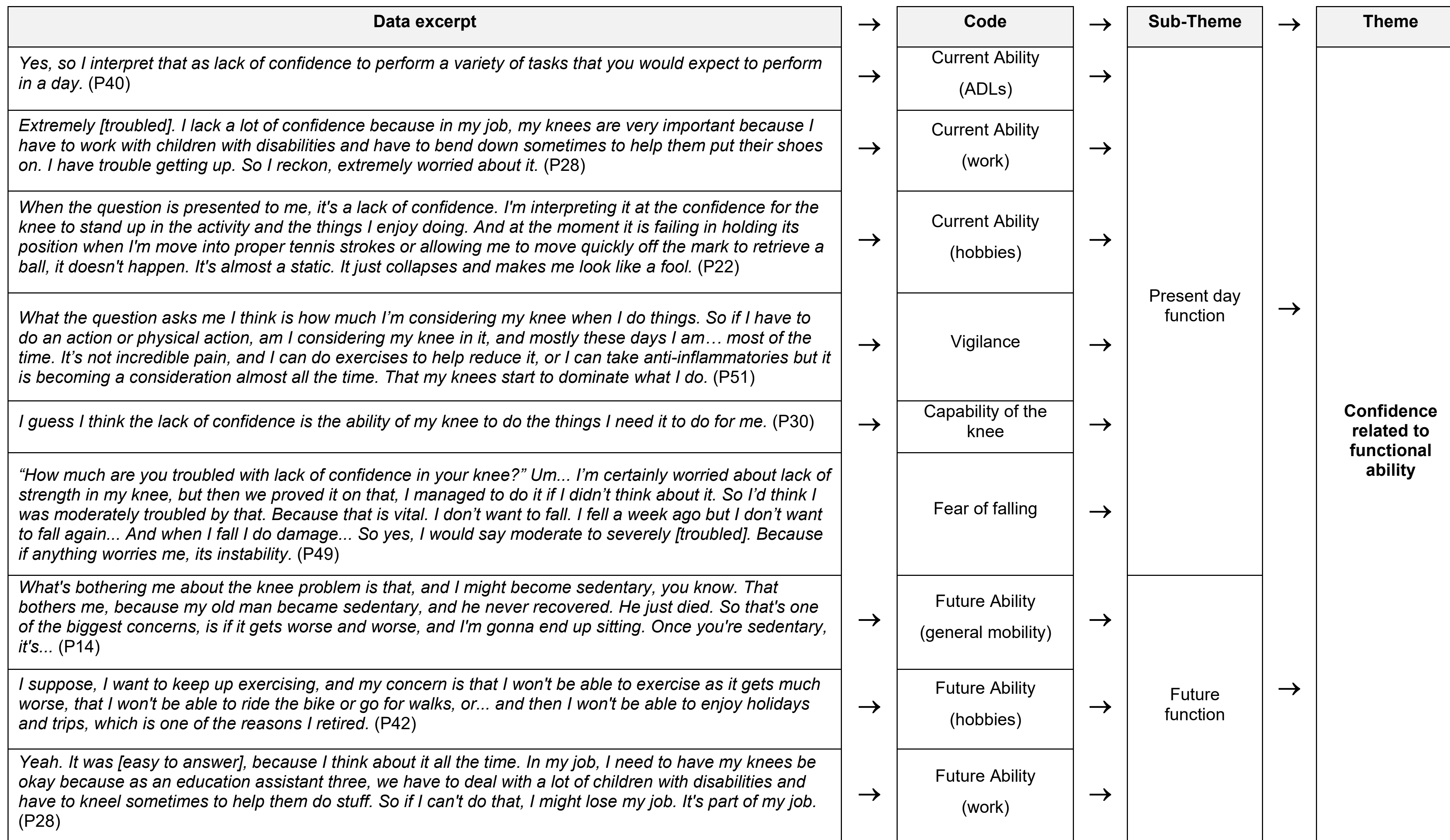


APPENDIX 1. Interview Schedule

Practice question (unrelated to knee)	"I'd like you to read the question aloud, and verbalise all of the thoughts that come into your mind as you come to a response"
Question on knee confidence	"I'd like you to read the question aloud, and verbalise all of the thoughts that come into your mind as you come to a response"
General Probes	"How did you arrive at that answer? "I noticed you hesitated. Tell me what you were thinking? "Was that easy or hard to answer?
Comprehension/interpretation probe	"What does this question mean to you?"
Paraphrasing probe	"Can you repeat the question in your own words?
Defining knee confidence	"What does knee confidence mean to you?" "Are you confident in your knee? Why?" "Do you trust your knee? Why?" "What does being confident in your knee look like?" "Why do you lack confidence in you knee?" / "Why do you have confidence in your knee?
Activity Limitations	"What tasks do you feel confident with and why?" "What tasks do you lack confidence doing and why? - Example: "How confident do you feel going up stairs/down stairs?" "Why?" - "What is it about this/these tasks that makes you lack confidence?" "Do you avoid certain tasks/activities because you lack confidence in your knee?" 'Do you ever change or modify the way you do a particular task because you lack confidence in your knee?" "Do you use your affected leg the same way you use the unaffected leg?"

Symptoms	"You mentioned pain. Tell me about the pain." - "What's your understanding of the pain?" - "What's causing the pain?" - "What does the pain mean?" - "How does the pain make you feel?" / "Does the pain worry/frustrate/upset/scare you?" "You mentioned weakness. Tell me about the weakness." - "What's causing the weakness? Why is it weaker?" - "Does your knee feel strong?" "You mentioned instability/giving way. Tell me about this." - "What's causing the instability?" - "Does your knee feel stable?" "Are you symptoms predictable?"
Beliefs	"What is your understanding of knee osteoarthritis?" "Has a health professional ever spoken to you about your knee?" "Have you got a picture of your knee? What does it look like? Does it look the same as your unaffected side?" "Is there anyway of treating knee osteoarthritis?"
Emotions	"Are you frustrated by your knee?" "Are you worried about your knee? "Are you fearful of your knee? Does the pain scare you?" "How fearful are you that you are doing further damage/causing harm to your knee?" "How much control do you feel you have over your knee?
Future/Quality of life	"What do you see in your future?" "Are you concerned about how your knee will function in the future?" "Do you worry about your knee affecting your quality of life?" "Has anyone in your family undergone a TKR? If so, what was their outcome?"

APPENDIX 2. Example of analytic process



Data excerpt	Code	Sub-Theme	Theme
Yes, so I interpret that as lack of confidence to perform a variety of tasks that you would expect to perform in a day. (P40)	Current Ability (ADLs)	Present day function	**Confidence related to functional ability**
Extremely [troubled]. I lack a lot of confidence because in my job, my knees are very important because I have to work with children with disabilities and have to bend down sometimes to help them put their shoes on. I have trouble getting up. So I reckon, extremely worried about it. (P28)	Current Ability (work)		
When the question is presented to me, it's a lack of confidence. I'm interpreting it at the confidence for the knee to stand up in the activity and the things I enjoy doing. And at the moment it is failing in holding its position when I'm move into proper tennis strokes or allowing me to move quickly off the mark to retrieve a ball, it doesn't happen. It's almost a static. It just collapses and makes me look like a fool. (P22)	Current Ability (hobbies)		
What the question asks me I think is how much I'm considering my knee when I do things. So if I have to do an action or physical action, am I considering my knee in it, and mostly these days I am… most of the time. It's not incredible pain, and I can do exercises to help reduce it, or I can take anti-inflammatories but it is becoming a consideration almost all the time. That my knees start to dominate what I do. (P51)	Vigilance		
I guess I think the lack of confidence is the ability of my knee to do the things I need it to do for me. (P30)	Capability of the knee		
"How much are you troubled with lack of confidence in your knee?" Um... I'm certainly worried about lack of strength in my knee, but then we proved it on that, I managed to do it if I didn't think about it. So I'd think I was moderately troubled by that. Because that is vital. I don't want to fall. I fell a week ago but I don't want to fall again... And when I fall I do damage... So yes, I would say moderate to severely [troubled]. Because if anything worries me, its instability. (P49)	Fear of falling		
What's bothering me about the knee problem is that, and I might become sedentary, you know. That bothers me, because my old man became sedentary, and he never recovered. He just died. So that's one of the biggest concerns, is if it gets worse and worse, and I'm gonna end up sitting. Once you're sedentary, it's... (P14)	Future Ability (general mobility)	Future function	
I suppose, I want to keep up exercising, and my concern is that I won't be able to exercise as it gets much worse, that I won't be able to ride the bike or go for walks, or... and then I won't be able to enjoy holidays and trips, which is one of the reasons I retired. (P42)	Future Ability (hobbies)		
Yeah. It was [easy to answer], because I think about it all the time. In my job, I need to have my knees be okay because as an education assistant three, we have to deal with a lot of children with disabilities and have to kneel sometimes to help them do stuff. So if I can't do that, I might lose my job. It's part of my job. (P28)	Future Ability (work)		