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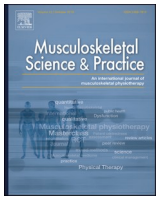

Original article

Clinicians' experience of the diagnosis and management of patellofemoral pain: A qualitative exploration

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ABSTRACT

Background: Patellofemoral pain (PFP) is common and has a poor long-term prognosis. There is a lack of clarity about the clinical reasoning of recognised inter-disciplinary experts in the published literature.
Objectives: To help identify best practice by exploring the clinical reasoning of a range of inter-disciplinary experts that regularly diagnose and treat PFP.
Design: Qualitative study with semi-structured interviews.
Method: Recruitment resulted in a convenience sample for semi-structured interview, which were recorded and transcribed verbatim. Data were analysed until theoretical saturation, as determined by multiple investigators.
Findings: Interviews with 19 clinical experts (15 men, 4 women; mean experience 18.6 years ± 8.6) from four broad professions yielded four themes. Firstly, the assessment and diagnosis process should include a thorough history and examination to rule in PFP. Secondly, information provision should aim to increase patients' understanding, aid in controlling symptoms, and facilitate behaviour change. Thirdly, active rehabilitation, which was a salient theme and included advocacy of combined hip and knee exercise that is adapted to the individual. Finally, treatment adjuncts, which can be used selectively to modify symptoms, may include running retraining, taping, or foot orthoses.
Conclusions: PFP should be diagnosed clinically, and tailored treatment programmes should be prescribed for people with PFP. Exercise was considered the most effective treatment and underlying psychological factors should be addressed to improve prognosis.

1. Introduction

Patellofemoral pain (PFP) is a common musculoskeletal complaint that has a reported annual prevalence of 22.7% in the United Kingdom (UK) general population (Smith et al., 2018a). Characterised by insidious onset, diffuse retro- and/or peripatellar pain, symptoms are aggravated by activities that load the knee in flexion, such as running, squatting, and prolonged sitting (Crossley et al., 2016). A broad range of treatment options exist, including education, rehabilitative exercise, patellar taping, and foot orthoses (Winters et al., 2021), as well as injection therapy and surgical procedures (McCarthy and Strickland, 2013). People with PFP are therefore likely to encounter numerous health care professionals, including physiotherapists, podiatrists, general practitioners, physicians, and surgeons. Despite a broad range of treatment modalities, more than half of people with PFP report persistent pain (>five years) after treatment (Lankhorst et al., 2016), highlighting the need for a greater understanding of optimal management strategies.

Research relating to PFP treatment modalities has been predominantly quantitative, using a randomised controlled trial (RCT) design

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(Barton et al., 2015). Both the most recent PFP consensus statement (Collins et al., 2018) and clinical practice guidelines (Willy et al., 2019) were developed using only quantitative data from trials of varying methodological quality. Although RCTs are designed to investigate treatment efficacy (Wright et al., 2016), qualitative data gives insight into the strategies required to translate this evidence into clinical practice and guide future research (Braun and Clarke, 2014). Mixed methods are therefore needed to help generate the multifaceted evidence required to address the research-practice gap and optimise evidence translation.

Barton et al. (2015) synthesised quantitative meta-analysis with expert clinical reasoning in 2015 for the management of PFP. Although a consensus generation approach was not used, there was broad agreement with respect to exercise therapy, taping/bracing, and foot orthoses. There was an absence of agreement for the effectiveness of acupuncture/dry needling (meta-analysis only), education (expert clinical reasoning only), and an absence of evidence on how best to deliver all interventions (Barton et al., 2015). The limitation of this study, which was acknowledged by the authors, was the inclusion of only physiotherapy experts and an absence of other health care professionals. The evidence synthesised in this guide is also now out of date and the study scores poorly on the Agree 2 guidelines (Brouwers et al., 2016). Whilst there are a number of clinical reasoning models used in practice and disagreement as to the optimal method for evaluating them (Edwards et al., 2004), there remains a need to address the absence of expert clinical reasoning in the published PFP literature.

The primary aim of this study was therefore to explore the clinical reasoning deployed by clinical experts from multiple specialities when diagnosing and managing PFP, to help identify best practice.

2. Methods

2.1. Design

A qualitative study using semi-structured interviews and following the Standards for Reporting Qualitative Guidelines (SRQR) (O'Brien et al., 2014) was conducted.

Ethical approval

The Queen Mary Ethics of Research Committee (QMERC/201848036) granted approval. All participants confirmed eligibility and provided written informed consent using Google Forms (Google Inc., California, USA) prior to being interviewed.

2.2. Recruitment

Participants were recruited as a sample of convenience by sharing recruitment materials with various professional networks and through social media channels. Participants were eligible for inclusion if they were qualified healthcare professionals with a minimum of five years clinical experience, had completed post-graduate education relevant to PFP, were involved in academia or research related to PFP, and spoke fluent English. Participants with mixed clinical and academic involvement were considered best able to provide information relating to current PFP management approaches. Potential participants were excluded if they did not meet these criteria. Sample size was revisited during data collection and theoretical sufficiency guided when adequate data to answer the research question had been collected (Vasileiou et al., 2018; Nelson, 2017). This was defined a priori as two subsequent participants providing no new information that would constitute an additional theme or subtheme (Maz, 2013).

2.3. Data collection

Eligible participants completed an online, one-to-one, semi-structured interview with open-ended questions with a single investigator (AJC) using Zoom video (San Jose, California, USA). Interviews followed a topic guide developed based on input from a patient and public involvement group at the design stage and a peer review process amongst the author group for dependability (Koch, 1994), but was not pilot tested.

The topic guide (see appendix 1), adapted from Barton et al. (2015), included open questions about the background of the participant, assessing and diagnosing PFP, patient education, managing PFP, and participants perceptions of the evidence base. Follow-on questions were used where the initial question did not elicit the required data, and the topic guide was further adjusted iteratively during data collection.

2.4. Data analysis

Interviews were audio recorded, anonymised, and uploaded onto a single-user password protected online transcription software Otter.Ai (Los Altos, California, USA). Once the computer-generated transcription was produced, the file was removed from Otter.Ai to ensure data protection. All audio files were transcribed verbatim and reviewed by a single investigator (AJC), with corrections made for any transcription errors. AJC is a podiatrist with four years' clinical experience, currently working in private musculoskeletal practice in the UK.

Data were analysed using thematic analysis, moving backwards and forwards through the six-phase model as described by Braun and Clarke (2006) (see Fig. 1). Transcriptions were read multiple times to achieve data familiarisation and facilitate the generation of preliminary ideas. Data coding was conducted by the lead author (AJC), which involved theme development, naming, and refinement. For rigour, a researcher triangulation procedure was used (Carter et al., 2014), whereby a second investigator (CB) independently reviewed all codes and themes against the transcripts to verify their development. CB is a medical doctor with two years clinical experience and an intercalated degree in sports and exercise medicine, currently working as a junior doctor in the national health service. Any disagreements between the investigators relating to the key themes were resolved verbally, with a third investigator (BSN) available, but not required, and no member check was performed. Contradictions to the findings (Morse et al., 2002) and verbatim quotes (Greenhalgh and Taylor, 1997) were included to enhance rigour.

3. Findings

3.1. Participants

27 participants volunteered, with six failing to meet the eligibility criteria (qualified for <five years = one, no post-graduate education specific to PFP = three, no research background = two). A further two participants failed to respond to repeat invitations to interview. 19 international participants were subsequently included from the UK (thirteen), India (one), Canada (one), America (two), Australia (one), and the Netherlands (one). There was one athletic trainer, one general practitioner, one sports physician, three orthopaedic surgeons, four podiatrists, and nine physiotherapists, with a mean average of 18.6 years (±8.6) clinical experience. During data collection, the imbalance between men and women was realised (see Table 1), with a particular attempt made to address this. Interviews were conducted between May 2020 and July 2021 and were a mean of 32.4 minutes (±10.7) in length. The final two interviewees reported no new information, and we judged that theoretical sufficiency was achieved. Four themes and twelve subthemes were identified and are detailed below (see Fig. 2).

Theme 1. Assessment and diagnosis of PFP

3.1.1. Specific populations

Participants described PFP occurring in specific groups, with patients

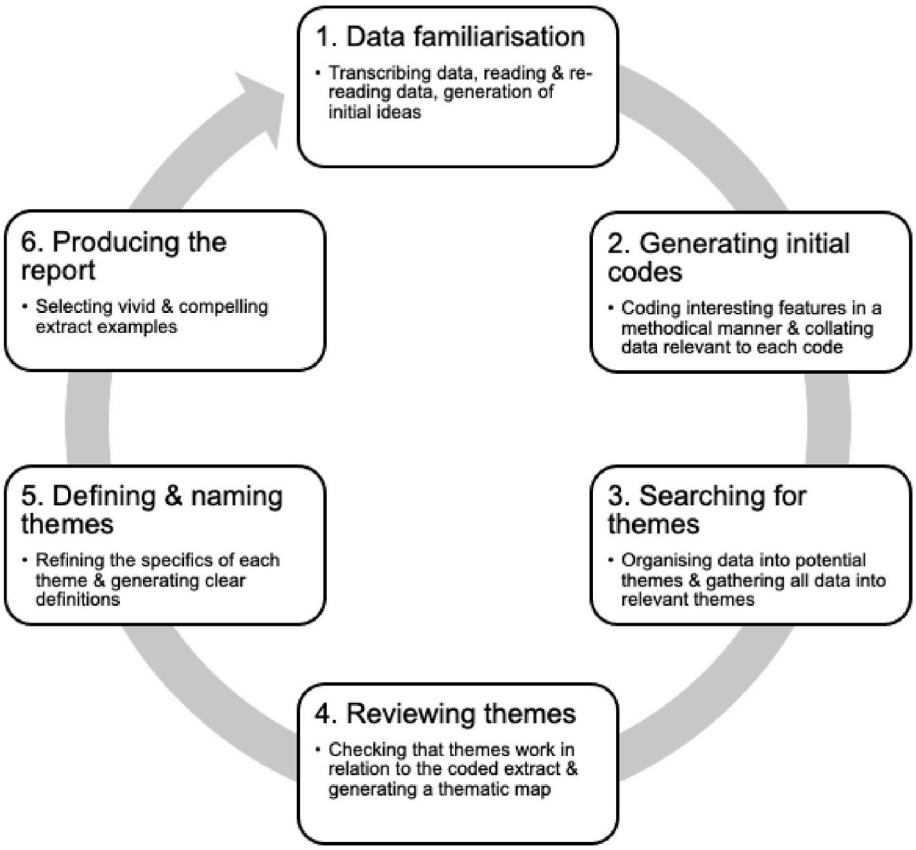

Fig. 1. Six-phase model described by Braun and Clarke.

Table 1
Participant information.

Participant	Sex	Country	Profession	Years qualified	Highest qualification
1	M	UK	Physiotherapist	12	PhD
2	M	UK	Physiotherapist	15	PhD
3	M	UK	Physiotherapist	6	BSc
4	M	UK	Podiatrist	18	MSc
5	M	UK	Physiotherapist	10	MSc
6	M	Canada	Physiotherapist	18	PhD
7	M	USA	Athletic trainer	17	PhD
8	F	UK	Podiatrist	18	PhD
9	M	UK	Sports physician	19	FFSEM
10	M	India	Orthopaedic surgeon	29	MCh
11	M	Australia	Physiotherapist	5	BSc
12	F	Netherlands	General practitioner	10	PhD
13	M	UK	Physiotherapist	31	PhD
14	M	UK	Podiatric surgeon	38	FCPodS
15	M	Australia	Podiatrist	20	PhD
16	M	USA	Physiotherapist	22	PhD
17	M	UK	Orthopaedic surgeon	24	FRCS
18	F	UK	Orthopaedic surgeon	15	FRCS
19	F	UK	Physiotherapist	27	MSc

Key: M; male, F; female, UK; United Kingdom, USA; United States of America, PhD; Doctor of Philosophy, BSc; Bachelor of Science, MSc; Master of Science, FFSEM; Fellow of the Faculty of Sport and Exercise Medicine, MCh; Master of Surgery, FCPodS; Fellow of the College of Podiatrists in Podiatric Surgery, FCRS; Fellow of the Royal College of Surgeons.

described as physically active, adolescent to young adults, and more likely to be female. Running was deemed the most common sport subtype.

> *"I would say almost exclusively they would be considered sports people … that doesn't mean professional … normal humans but coming in a context of this being an injury either caused by sport or prohibiting sport." (P4)*

> *"90% of them are runners" (P6)*

Some participants contrastingly reported frequently seeing PFP in sedentary people who were overweight, with positional stresses on the knee exacerbating symptoms.

> *"Overweight patients who are sedentary, (with) sedentary jobs or occupations, they're just as vulnerable to it" (P9)*

> *"Pain with prolonged sitting seems to be a pretty nice indicator in someone that has patellofemoral pain" (P16).*

3.1.2. Ruling in PFP

A thorough subjective history was described as having primary importance when looking to rule in PFP, and to identify common aggravating factors that could subsequently be reproduced during a physical examination.

> *"The subjective history is critical" (P7)*

> *"So, the movements to load the extensor mechanism significantly … squatting … stair climbing, jumping … and running" (P9)*

Palpating the retropatellar facets and performing a patellar compression test was felt to be the best method of confirming PFP during physical examination. Participants advocated caution with Clarke's test given the high potential for provocation.

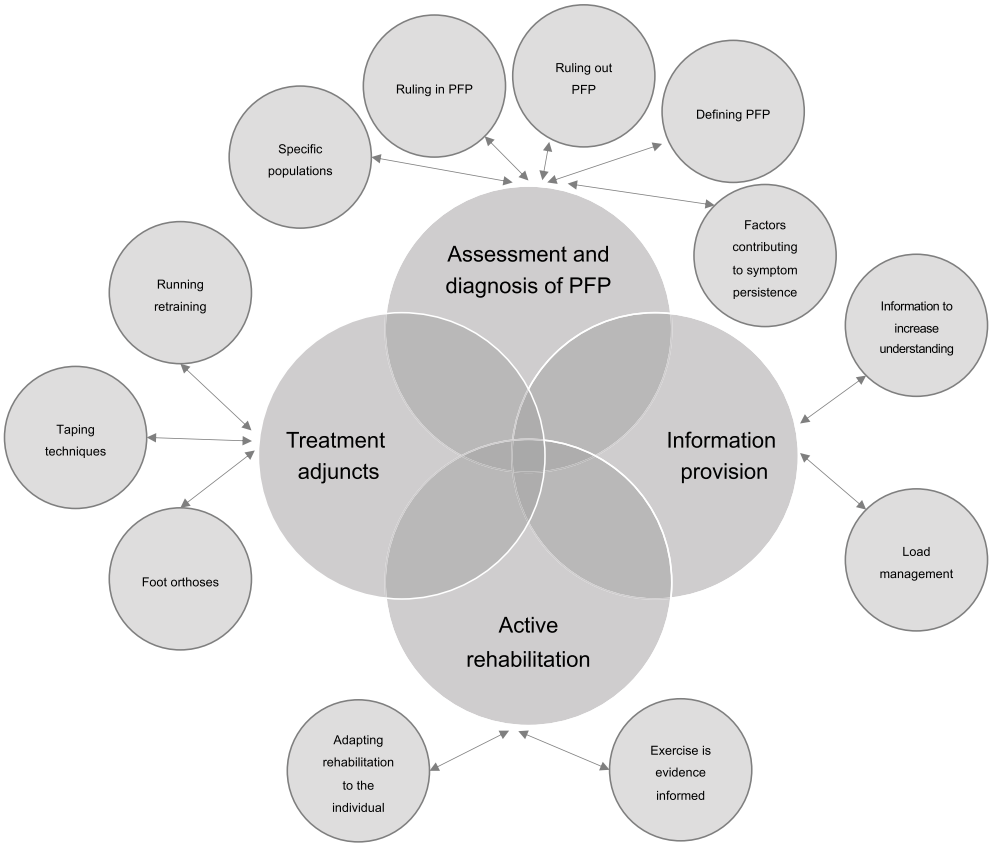

Fig. 2. Visual representation of the interacting themes and associated sub-themes.

"Yeah, I suppose like you know, palpation of the patella facets as a clinical test" (P11).

"Like a patellar compression test, which is part of my diagnostic criteria" (P6)

"A positive Clarke's test for me is they either punch you in the face, or they jump off the bed so aggressively" (P2)

There was consensus that diagnostic imaging has a limited role when ruling in PFP, with the potential for negative consequences if used inappropriately.

"Imaging is not helpful for diagnosing patellofemoral pain" (P12)

"I think, from the qualitative work I've done and from my own experience of treating patients that had scans, the risk of having a negative effect is so high" (P1)

3.1.3. Ruling out PFP

The subjective history remained critical for ruling out PFP and excluding possible sinister pathology. Symptoms such as night pain and signs such as an effusion were described as uncommon features of PFP that more than likely indicated the presence of systemic pathology.

"An impression about what the background in history has been around their knee pain, and then kind of excluding red flag pathologies and kind of sinister pathology" (P5)

"I'm not expecting to hear about night pain if they've got patellofemoral pain" (P19)

Diagnostic imaging was described as a useful tool to rule out PFP, by ruling in concomitant pathology. Magnetic resonance imaging and ultrasound scan were advocated for investigating articular (such as an osteochondral defect) and soft tissue (such as tendinopathy) pathologies respectively.

"I'm looking to image not to clarify my diagnosis, but to clarify if it's actually something else" (P19)

"Use point of care ultrasound to look at those pre-mentioned structures … particularly tendons" (P9)

3.1.4. Defining PFP

PFP was described as a generic term for a collection of symptoms located at the anterior knee which exist in the absence of defined tissue pathology (e.g., tendinopathy).

"PFP for me is a blanket term that needs honing down" (P2)

"For me patellofemoral pain is just a collection of symptoms. So, it's not really a diagnosis" (P17)

The heterogeneity of PFP makes it a difficult diagnosis to explain to patients, with experts using simple language (e.g., kneecap pain) and emphasising the non-sinister nature of the condition.

"So, pain around the kneecap that is not …" (P1)

"I inform them that it's not dangerous" (P11)

3.1.5. Factors contributing to symptom persistence

Participants highlighted the importance of recognising, and dealing with, fear avoidant behaviours that may have developed because of the symptom persistence evident in people with PFP.

"I think a lot of PFP (patients) have this fear avoidance behaviour. And they … use the pain to dictate how much activity they do" (P1)

"We've got to kind of get away from the fear and their kinesiophobia around the knee" (P5)

Participants described the importance of identifying pre-conceptions and self-efficacy as a contributor to a patient's overall prognosis.

"If the patient thinks they're going to get better, they will" (P1)

Participants described using their physical examination to screen for physical characteristics like muscle biomotor properties or lower limb kinematics as a contributor to symptom persistence.

"I'm thinking intrinsic …, like muscle length, muscle strength, foot position, movement" (P19)

Theme 2. Information provision

3.1.6. Information to increase understanding

Pain information emerged as a facilitator of self-management via improved understanding and behaviour change.

"If the patient knows more about what they need, how the pain comes on through loading, then they can unload it, they're in more control of it" (P2)

Excessive medical terminology was thought to contribute to pain catastrophisation by creating fear and negative messages about the state of their condition.

"I try to reassure them nothing is damaged. It is important when it comes to the knee in my experience, the knee is something people catastrophise" (P4)

"The trendy word would be catastrophising, so just reassure them that this is a condition that's eminently treatable" (P14)

Participants described using online resources (free at the point of access) and how these resources can facilitate self-management.

"If they're looking for self-treatments and to learn exercises, I'll refer them to the TREK website" (P7)

Not all clinicians provided patients with information resources, as they felt that nothing has been created that is worth giving, with some questioning the need for information altogether.

"I have never found anything I've liked enough to hand out" (P1)

"I don't think it's ambiguous enough for them to need further information" (P8)

3.1.7. Load management

Participants felt that unplanned or excessive changes in physical activity levels often resulted in symptom provocation, with patients needing to understand appropriate levels of progression.

"It's either too much load, or too frequent a load" (P2)

"I teach them about load management … and how they should follow a 10% load increase weekly" (P10)

Theme 3. Active rehabilitation

3.1.8. Exercise is evidence informed

Participants described exercise as the treatment with the strongest efficacy, although outcomes remain sub-optimal.

"I don't think there's a strong evidence base for anything we do. The strongest evidence we have is for exercise. But even then, the quality of that evidence is quite low" (P1)

"I think we now have enough evidence that exercise is better than nothing" (P12)

Participants felt that giving a combination of quadricep (knee) and gluteal (hip) exercises was superior to isolating the knee or hip.

"I think there's good evidence now that we know hip and knee strengthening improves patellofemoral pain outcomes" (P6)

"Progressive loading, progressive patellofemoral joint loading, yeah, absolutely. Like, quadricep strength training alone versus quadricep plus hip, and we know that quad plus hip is going to be more effective in the short, medium and long term" (P16)

3.1.9. Adapting rehabilitation to the individual

The importance of self-efficacy was evident. Participants highlighted the need to encourage patients to be motivated and in control of their care.

"They need to own their treatment if they're going to actually do well" (P13)

Participants provided insight into the specifics of which exercises they may include in PFP rehabilitation. Hamstring and calf exercises were considered important, alongside ankle stability drills and foot exercises.

"I'm looking at how controllable is their hip, how strong their abductors, their glutes, how strong are those? Then I'll come down to the musculature around the knee. We've spoken about that before - isometric testing, getting the hamstring, quadricep going, calf endurance" (P2)

"I would say a combination of stabilising movement exercises that are linkage exercises. So, weight bearing works best. I pinch a lot from chronic ankle instability" (P8)

Exercise should be individually prescribed, with varied intensity according to the level of pain. Progressive overload and strength training was used to eventually reflect the loads going through the patellofemoral joint during running and jumping based activities.

"For the very painful one, very shallow modified wall squats is one I might use in the early stages" (P19)

"I try to get patients doing some heavy strength training early on … 70% of their one repetition max or higher for the other strengthening exercise, and that'd be for both hip and quadriceps strengthening" (P16)

Participants described what evidence gaps exist in relation to exercise prescription and how addressing these may help with clinical outcomes.

"We don't do a very good job publishing sets and reps and I think that's a reason why we might get differences in how effective certain treatments are" (P7)

"And I think we need more evidence on what type of exercise and how long and how intensive (this) exercise (should be)" (P12)

Exercise prescription has evolved over time, with the vastus medius oblique (VMO) muscle no longer the main priority with PFP treatment.

"When I initially qualified and thinking about firing VMO … I've gone a lot more (towards) exercise (for) patient goals and less around thinking about firing specific muscles" (P5)

Participants described the biopsychosocial elements of PFP to be comparable to those observed in lower back pain, which can be used to

guide treatment.

"In a similar way that best practice guidelines might suggest that you, for example, treat low back pain. So, avoiding a structural diagnosis, addressing prognostic factors from a mental health (and) psychological point of view, and trying to improve the general health of the person with physical activity" (P3)

Theme 4. Treatment adjuncts

3.1.10. Running retraining

Participants discussed running retraining as an emerging and beneficial treatment that can be used alongside strength training, but should not supersede rehabilitation.

"When they're doing their strengthening exercises, we couple that with some movement retraining. But everybody who comes in who's a runner, they get a gait evaluation" (P16)

Increasing cadence and/or step width, and moving towards forefoot striking, were gait training parameters that participants use, and there is a need for a better understanding as to which variables to target.

"But the interventions in particular that I use would be just either increasing cadence or increasing step width and I think there is some evidence behind both" (P6)

"*We'll go back to gait retraining. I think that's still grey. And, and I think particularly what specifically what parameters you might want to retrain." (P6)*

3.1.11. Taping techniques

Participants felt there was a role for taping to provide short-term pain relief, although the importance of teaching patients why tape is being used was stressed.

"Kinesio tape I use, the evidence is really good for pain but not for anything else". (P2)

"If we put a daft bit of tape on their knee, we need them to understand what that tape is doing and what the positives and negatives are. Regardless of the intervention, there needs to be an understanding for the patient to get compliance" (P13)

McConnell taping was the most frequently reported technique used by clinicians, but with individual adaptations for their specific patient.

"My taping technique is McConnell of Australia. But I have taken her principles and modified as per my requirement" (P10)

"When I'm in clinic sometimes I don't tape anyone and I have other clinics, like I'm taping everyone" (P19)

3.1.12. Foot orthoses

Foot orthoses were reported as effective in the short-term, with treatment direction tests used to determine who may benefit.

"We'll have them do a single leg squat with and without a foot orthosis and if the orthosis reduces their pain, we'll have them issue an over-the-counter orthosis for six to twelve weeks, and then we'll start weaning them off" (P16)

"The evidence for foot orthoses is that they are most beneficial in the short term … you don't necessarily need them in the long term, but they can help change function and you can do a test to get someone to squat with them/without them and see if it makes a difference" (P14)

4. Discussion

This study explored the clinical reasoning of experts from multiple clinical backgrounds in relation to the diagnosis and management of PFP, with four key themes emerging: assessment and diagnosis of PFP, information provision, active rehabilitation, and treatment adjuncts.

4.1. Assessment and diagnosis of PFP

Experts were clear that PFP can be diagnosed clinically using diagnostic reasoning (Edwards et al., 2004) after a thorough subjective and objective examination. This clinical diagnosis requires ruling out concomitant pathology, ruling in PFP, and identifying physical characteristics that inform management planning. Diagnostic imaging was framed as an important tool to rule out concomitant pathology, rather than to rule in PFP. Concerns over inducing catastrophising or fear avoidant behaviours, resulting in increased disability and chronicity (Maclachlan et al., 2017), were highlighted as a possible negative consequence of inappropriate imaging. A diagnosis of PFP should be clearly communicated and with minimal use of medical terminology despite an incomplete understanding as to whether this has a direct negative impact on patients (Wride and Bannigan, 2019).

4.2. Information provision

Providing appropriate information for people with PFP was advocated, aligning with the existing literature (de Oliveira Silva et al., 2020). Experts described using narrative reasoning (Edwards et al., 2004) to identify concerns and provide reassurance to patients about the likely absence of structural damage and PFP's positive prognosis, targeting relevant biopsychosocial elements of their presentation (Vicenzino et al., 2019). Advice was given to manipulate physical activity levels/training loads to gain control of symptom provocation, and address catastrophising behaviours.

Education requires an assessment of learning (Gervais, 2016). Experts were conflicted on the best ways to educate people with PFP, with some advocating online materials and some feeling that no adequate resource(s) currently exist. The efficacy of any form of education is yet to be established in people with PFP, precluding evidence-based delivery of this intervention. The existing literature, and the experts interviewed in this study, discuss only the provision of information and at no point refer to methods through which learning has been evaluated. Future work should develop evidence-based information resources and education interventions and evaluate their comparative efficacy to identify the superior intervention.

4.3. Active rehabilitation

Experts considered exercise the most effective conservative intervention, with a combination of hip and knee exercise particularly advocated to optimise outcomes. This is consistent with the existing evidence syntheses of Lack et al. (2015), and van der Heijden et al. (2015), with positive effects reported for both pain and function. Although hip strength deficits play a questionable role in the development of PFP (Neal et al., 2019; Rathleff et al., 2014), hip muscle weakness is consistently observed in people with PFP, representing a valid treatment target. People with PFP have also been reported to describe fear avoidance, which is associated with symptom persistence (Smith et al., 2018b). Experts described using collaborative reasoning (Edwards et al., 2004) to prescribe exercise to address broad elements of the biopsychosocial model, specifically targeting biomotor deficits, reducing fear avoidant behaviours, and enhancing self-efficacy. The specifics of exercise prescription and mechanisms through which exercise derives its positive effects remain unclear and were presented as a possible explanation for suboptimal outcomes. The results of this study align with both the existing quantitative and qualitative literature,

reflecting effective evidence translation into clinical practice, but a continued need to explore the possible mechanisms of effect for exercise interventions in people with PFP (Smith et al., 2017, 2018b; Matthews et al., 2017).

4.4. Treatment adjuncts

Gait retraining was advocated as a modern and evolving adjunct to PFP management despite limited supporting evidence (Barton et al., 2016). Some experts felt that more clarity is required about effective retraining cues. As the majority of gait retraining research is conducted in biomechanics laboratories, its direct clinical applicability is often limited (Noehren et al., 2011). Experts consistently advocated cues designed to increase cadence or step width, or facilitate a forefoot strike pattern, which is supported by current observational evidence (Davis et al., 2020).

Experts were conflicted on the value of patellar taping, but those who used taping recommended it for short-term pain relief. The inconsistency in taping outcomes is also reflected by the published literature, with both no benefit (Callaghan and Selfe, 2007), and positive short-term benefits reported (Barton et al., 2014). Experts reported handling this inconsistency of evidence through appropriate patient education and using taping specifically to modify pain in the short-term, without tailoring the intervention to achieve other possible treatment effects.

Experts were inconsistent in their use of foot orthoses, despite the previous best practice guide (Barton et al., 2015), and the most recent PFP consensus statement (Collins et al., 2018), advocating their use in the short-term (<six weeks). Experts with experience of prescribing foot orthoses (i.e., podiatrists) reported using them clinically, whereas experts who were less confident with foot orthoses interventions (i.e., non-podiatrists) were less likely to prescribe them. Consistent with current evidence, experts discussed the challenge of identifying in whom foot orthoses may be effective (Matthews et al., 2020; Mills et al., 2012; Barton et al., 2011), with immediate changes in pain during functional tasks (e.g., a squat) advocated. Further evidence designed to identify which patient characteristics are best managed with treatment adjuncts will help guide clinical decision making, with subsequent clinical education required to translate this new knowledge into practice.

4.5. Clinical implications

Consistent with the most recent diagnostic consensus document (Crossley et al., 2016), PFP should be ruled in using a comprehensive clinical examination involving a thorough history and physical assessment. Clinicians should be aware that imaging has a limited role in diagnosing PFP once differential diagnoses have been excluded. Fear avoidant movement patterns are common in patients with PFP, and clinicians should be aware that early identification of psychological features can have a positive impact on long-term outcomes and facilitate self-management.

Exercise should be considered the most effective conservative treatment, with both hip and knee exercises combined to achieve positive outcomes. Clinicians should be aware that the effects of exercise are not isolated to biomotor properties and can instead be used to affect change on the other biopsychosocial elements of an individuals' presentation. Adjuncts, including gait retraining, taping, and foot orthoses, should be considered for appropriate people with PFP as part of a multimodal treatment plan. These treatment approaches align well with the existing clinical practice guidelines (Barton et al., 2015; Collins et al., 2018; Willy et al., 2019), but further emphasis the importance of incorporating reasoning that considers all elements of the biopsychosocial model in people with PFP.

4.6. Limitations

Interviews were not able to be conducted in person due to the SARS-CoV-2 pandemic, which was mitigated with the use of Zoom video. It is possible that body language cues were missed, but through face-to-face interview participants and the interviewer were able to develop appropriate rapport and modify questioning when necessary. Participants were recruited using convenience sampling and defined eligibility criteria to achieve richness within the data set. We recognise that a more purposive sampling approach may have led to some additional nuances in the results, albeit data sufficiency was reached, and sampling was broad. Clinical academics were sought to ensure that viewpoints were evidence-informed, but the limitation of this eligibility criteria is that the insight from experienced clinicians may have been under-represented. A lower than anticipated number of female clinicians volunteered to participate (4/19), with physiotherapists (10/19) the most represented profession, potentially influencing the transferability of the findings.

5. Conclusion

This study offers deep insight into the experience of experts that regularly diagnose, treat, and research PFP. Following a thorough clinical examination to reach a diagnosis, with imaging used only to exclude concomitant pathology, a treatment plan should look to include active rehabilitation and adjuncts if indicated. Treatment should consider all elements of the biopsychosocial model and enhance self-efficacy through appropriate information and treatment provision reflective of a person's needs.

Ethical statement

This study was approved by the Queen Mary Ethics of Research Committee (QMERC/2018/48036).

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Declaration of competing interest

The authors have no financial disclosures or conflicts of interest to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.msksp.2022.102530.

References

Barton, C.J., Menz, H.B., Crossley, K.M., 2011. The immediate effects of foot orthoses on functional performance in individuals with patellofemoral pain syndrome. Br. J. Sports Med. 45 (3), 193–197.

Barton, C., Balachandar, V., Lack, S., Morrissey, D., 2014. Patellar taping for patellofemoral pain: a systematic review and meta-Analysis to evaluate clinical outcomes and biomechanical mechanisms. Br. J. Sports Med. 48 (6), 417–424.

Barton, C.J., Lack, S., Hemmings, S., Tufail, S., Morrissey, D., 2015. The "best practice guide to conservative management of patellofemoral pain": incorporating level 1 evidence with expert clinical reasoning. Br. J. Sports Med. 49 (14), 923–934.

Barton, C.J., Bonanno, D.R., Carr, J., Neal, B.S., Malliaras, P., Franklyn-Miller, A., et al., 2016. Running retraining to treat lower limb injuries: a mixed-methods study of current evidence synthesised with expert opinion. Br. J. Sports Med. 50 (9), 513–526.

Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. Qual Res Psychol 3 (2), 77–101. Available from: http://www.ncbi.nlm.nih.gov/pubmed/11752478.

Braun, V., Clarke, V., 2014. What can "thematic analysis" offer health and wellbeing researchers? Int. J. Qual. Stud. Health Well-Being 9, 9–10.

Brouwers, M.C., Kerkvliet, K., Spithof, K., 2016. The AGREE reporting checklist: a tool to improve reporting of clinical practice guidelines. BMJ 352.
Callaghan, M.J., Selfe, J., 2007. Patellar taping for patellofemoral pain syndrome in adults. Cochrane Database Syst. Rev. 3.
Carter, N., Bryant-Lukosius, D., Dicenso, A., Blythe, J., Neville, A.J., 2014. The use of triangulation in qualitative research. Oncol. Nurs. Forum 41 (5), 545–547.
Collins, N.J., Barton, C.J., Van Middelkoop, M., Callaghan, M.J., Rathleff, M.S., Vicenzino, B.T., et al., 2018. 2018 Consensus statement on exercise therapy and physical interventions (orthoses, taping and manual therapy) to treat patellofemoral pain: recommendations from the 5th International Patellofemoral Pain Research Retreat, Gold Coast, Australia, 2017. Br. J. Sports Med. 52 (18), 1170–1178.
Crossley, K.M., Stefanik, J.J., Selfe, J., Collins, N.J., Davis, I.S., Powers, C.M., et al., 2016. 2016 Patellofemoral pain consensus statement from the 4th International Patellofemoral Pain Research Retreat, Manchester. Part 1: terminology, definitions, clinical examination, natural history, patellofemoral osteoarthritis and patient-reported outcome m. Br. J. Sports Med. 50 (14), 839–843.
Davis, I.S., Tenforde, A.S., Neal, B.S., Roper, J.L., Willy, R.W., 2020. Gait retraining as an intervention for patellofemoral pain. Curr Rev Musculoskelet Med 13 (1), 103–114.
de Oliveira Silva, D., Pazzinatto, M.F., Rathleff, M.S., Holden, S., Bell, E., Azevedo, F., et al., 2020. Patient education for patellofemoral pain: a systematic review. J. Orthop. Sports Phys. Ther. 50 (7), 388–396.
Edwards, I., Jones, M., Carr, J., Braunack-Mayer, A., Jensen, G.M., 2004. Clinical reasoning strategies in physical therapy. Phys. Ther. 84 (4), 312–330.
Gervais, J., 2016. The operational definition of competency-based education. J Competency-Based Educ. 1 (2), 98–106.
Greenhalgh, T., Taylor, R., 1997. How to read a paper: papers that go beyond numbers (qualitative research). BMJ 315, 740.
Koch, T., 1994. Establishing rigour in qualitative research: the decision trail. J. Adv. Nurs. 19 (5), 976–986.
Lack, S., Barton, C., Sohan, O., Crossley, K., Morrissey, D., 2015. Proximal muscle rehabilitation is effective for patellofemoral pain: a systematic review with metaanalysis. Br. J. Sports Med. 49 (21), 1365–1376.
Lankhorst, N.E., Van Middelkoop, M.M., Crossley, K.M., Bierma-Zeinstra, S.M.A., Oei, E. H.G., Vicenzino, B., et al., 2016. Factors that predict a poor outcome 5-8 years after the diagnosis of patellofemoral pain: a multicentre observational analysis. Br. J. Sports Med. 50 (14), 881–886.
Maclachlan, L.R., Collins, N.J., Matthews, M.L.G., Hodges, P.W., Vicenzino, B., 2017. The psychological features of patellofemoral pain: a systematic review. Br. J. Sports Med. 51 (9), 732–742.
Matthews, M., Rathleff, M.S., Claus, A., Mcpoil, T., Nee, R., Crossley, K., et al., 2017. Can we predict the outcome for people with patellofemoral pain? A systematic review on prognostic factors and treatment effect modifiers. Br. J. Sports Med. 51 (23), 1650–1660.
Matthews, M., Rathleff, M.S., Claus, A., McPoil, T., Nee, R., Crossley, K.M., et al., 2020. Does foot mobility affect the outcome in the management of patellofemoral pain with foot orthoses versus hip exercises? A randomised clinical trial. Br. J. Sports Med. 54, 1416–1422.
Maz, J., 2013. Employing a grounded theory approach: core characteristics. Br. J. Card. Nurs. 8 (9), 453–458.
McCarthy, M.M., Strickland, S.M., 2013. Patellofemoral pain: an update on diagnostic and treatment options. Curr Rev Musculoskelet Med 6 (2), 188–194.
Mills, K., Blanch, P., Dev, P., Martin, M., Vicenzino, B., 2012. A randomised control trial of short term efficacy of in-shoe foot orthoses compared with a wait and see policy for anterior knee pain and the role of foot mobility. Br. J. Sports Med. 46 (4), 247–252.
Morse, J.M., Barrett, M., Mayan, M., Olson, K., Spiers, J., 2002. Verification strategies for establishing reliability and validity in qualitative research. Int. J. Qual. Methods 1 (2), 13–22.
Neal, B.S., Lack, S.D., Lankhorst, N.E., Raye, A., Morrissey, D., Van Middelkoop, M., 2019. Risk factors for patellofemoral pain: a systematic review and meta-analysis. Br. J. Sports Med. 53 (5), 270–281.
Nelson, J., 2017. Using conceptual depth criteria: addressing the challenge of reaching saturation in qualitative research. Qual. Res. 17 (5), 554–570.
Noehren, B., Scholz, J., Davis, I., 2011. The effect of real-time gait retraining on hip kinematics, pain and function in subjects with patellofemoral pain syndrome. Br. J. Sports Med. 45 (9), 691–696.
O'Brien, B.C., Harris, I.B., Beckman, T.J., Reed, D.A., Cook, D.A., 2014. Standards for reporting qualitative research: a synthesis of recommendations. Acad. Med. 89 (9), 1245–1251.
Rathleff, M.S., Rathleff, C.R., Crossley, K.M., Barton, C.J., 2014. Is hip strength a risk factor for patellofemoral pain? A systematic review and meta-analysis. Br. J. Sports Med. 48 (14), 1088.
Smith, B.E., Hendrick, P., Bateman, M., Moffatt, F., Rathleff, M.S., Selfe, J., et al., 2017. Current management strategies for patellofemoral pain: an online survey of 99 practising UK physiotherapists. BMC Muscoskel. Disord. 18, 181–192.
Smith, B.E., Selfe, J., Thacker, D., Hendrick, P., Bateman, M., Moffatt, F., et al., 2018a. Incidence and prevalence of patellofemoral pain: a systematic review and meta-analysis. PLoS One 13 (1), 1–18. https://doi.org/10.1371/journal.pone.0190892. Available from:
Smith, B.E., Moffatt, F., Hendrick, P., Bateman, M., Rathleff, M.S., Selfe, J., et al., 2018b. The experience of living with patellofemoral pain - loss, confusion and fear-avoidance: a UK qualitative study. BMJ Open 8 (1), 1–9.
van der Heijden, R.A., Lankhorst, N.E., van Linschoten, R., Bierma-Zeinstra, S.M., van Middelkoop, M., 2015. Exercise for treating patellofemoral pain syndrome. Cochrane Database Syst. Rev. 2017 (6).
Vasileiou, Konstantina, Barnett, Julie, Thorpe, Susan, Young, Terry, 2018. Characterising and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. BMC Med. Res. Methodol. 18 (1), 1–18.
Vicenzino, B., Maclachlan, L., Rathleff, M.S., 2019. Taking the pain out of the patellofemoral joint: articulating a bone of contention. Br. J. Sports Med. 53 (5), 268–269.
Willy, R.W., Hoglund, L.T., Barton, C.J., Bolgla, L.A., Scalzitti, D.A., Logerstedt, D.S., et al., 2019. Patellofemoral pain clinical practice guidelines linked to the international classification of functioning, disability and health from the academy of orthopaedic physical therapy of the American physical therapy association. J. Orthop. Sports Phys. Ther. 49 (9). CPG1–95.
Winters, M., Holden, S., Lura, C.B., Welton, N.J., Caldwell, D.M., Vicenzino, B.T., et al., 2021. Comparative effectiveness of treatments for patellofemoral pain: a living systematic review with network meta-analysis. Br. J. Sports Med. 55, 369–377.
Wride, J., Bannigan, K., 2019. Investigating the prevalence of anxiety and depression in people living with patellofemoral pain in the UK: the Dep-Pf Study. Scand J Pain 19 (2), 375–382.
Wright, S., O'Brien, B.C., Nimmon, L., Law, M., Mylopoulos, M., 2016. Research design considerations. J Grad Med Educ 8 (1), 97–98.