



BASES EXPERT STATEMENT

TARGETED TREATMENT OF PATELLOFEMORAL PAIN

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Patellofemoral pain (PFP) characterised by diffuse retro/peripatellar symptoms, is the most common orthopaedic condition in sports medicine, with prevalence as high as 22.7% (Smith *et al.*, 2018). It is concerning to sport and exercise science practitioners that 21.5% of athletes cease participation in physical activity/ sports due to PFP (Rathleff *et al.*, 2012) and many subsequently develop associated psychological disorders (Maclachlan *et al.*, 2017; Sinclair & Butters, 2021). This statement provides an update on the assessment and management of PFP that should be of interest to sport and exercise science practitioners, those treating PFP and those who are seeking guidance into treatment options.

BACKGROUND AND EVIDENCE

Despite widespread utilization in clinics, current multimodal management approaches do not lead to successful

outcomes in the majority of patients. Patients exhibit unfavourable recovery rates in both the short (Stathopulu & Baildam, 2003; Collins *et al.*, 2013) and long-term (Price *et al.*, 2000; Lankhorst *et al.*, 2016), following diagnosis. This indicates that the majority of PFP patients do not respond to treatment and continue their lives with chronic knee pain. The consensus statement from the International Patellofemoral Pain Research Retreat in 2013 speculated that PFP may be a precursor to the development of patellofemoral osteoarthritis (Witvrouw *et al.*, 2014). Individuals undergoing arthroplasty for patellofemoral osteoarthritis were more than twice as likely to report having had PFP as an adolescent than patients undergoing an arthroplasty for isolated tibiofemoral osteoarthritis (Thomas *et al.*, 2010) and 64% of people with knee pain aged over 50 years had clear radiographic patellofemoral

osteoarthritis, indicating that there may be specific degenerative processes occurring within the patellofemoral joint (Teng *et al.*, 2015). This makes the development and implementation of effective management strategies particularly pertinent to long term musculoskeletal health.

Based on the above information, identification of the mechanisms responsible for the inadequate success rates of current multimodal management approaches are a priority (Selfe *et al.*, 2013). The most significant factor affecting the efficacy of conventional management approaches is that patients exhibit a variety of musculoskeletal and biomechanical differences, meaning that current multimodal approaches, do not treat the heterogeneous PFP population with the same level of effectiveness (Selfe *et al.*, 2016).

TARGETED TREATMENT OF PATELLOFEMORAL PAIN

Our work has led to the development of a new sport and exercise science-based approach for the management of PFP, based around targeted interventions, to mediate improved outcomes (Selfe *et al.*, 2013). Initial research showed using six specific assessments that can be undertaken by qualified sport & exercise scientists i.e. quadriceps strength, hip abduction strength, patellar mobility, foot posture index, quadriceps flexibility and gastrocnemius flexibility, that there are 3 subgroups in PFP populations. Allowing users to subgroup patients based on the results of the aforementioned assessments and also guide patients themselves to the most appropriate rehabilitation programme. These subgroups were characterised as “strong”, “weak and tight” and “weak and pronated foot” (Selfe *et al.*, 2016), where recreational and competitive athletes (most pertinent to sport and exercise science practitioners) are more likely to fit the “strong” group profile.

A new targeted treatment approach for PFP was introduced based on these groupings. For the strong subgroup a suggested targeted treatment program was designed according to the deficits identified by the subgrouping assessments and centred specifically around improving neuromuscular control and coordination ability rather than strength, as it was identified that no deficit in strength was present in this subgroup. This primarily involved using proprioceptive exercises/ devices such as progressive balance training and knee braces which offer improvements in movement control in patients with PFP (Selfe *et al.*, 2011) and reductions in patellofemoral joint reaction forces (Sinclair *et al.*, 2016). Of particular interest to sport and exercise science practitioners is our follow up research, showing that the “strong” subgroup responded the least favourably to traditional multimodal approaches (Table 1). In a prospective crossover intervention, we showed that the “strong” subgroup demonstrated a very poor response to initial multimodal treatment but had a significant improvement in pain intensity during activity after targeted intervention (Yosmaoglu *et al.*, 2019).

CONCLUSIONS AND RECOMMENDATIONS

Implementation of targeted interventions for PFP following six simple sport and exercise science-based tests represents



▲ **Figure 1:** Quadriceps strength and hip abduction strength assessments.

▼ **Table 1:** Multimodal treatment approach.

MODALITY	APPLICATION TYPE
Thermotherapy	Cold packs, 20 min
Transcutaneous electrical neural stimulation	Conventional mode, 20 min 50-100 Hz, 20-60 pulse/s
Therapeutic ultrasound	1 W/cm ² , 5 min around knee joint
Hamstring/tensor fascia latae/iliotibial band stretching	30 s / 5 rep
Isometric quadriceps strengthening	10 rep × 3 set
Isometric hip adductor strengthening	10 rep × 3 set
Open kinetic chain knee extension exercise	3 sets of patients' 8-10 RM, in painless range of motion
Open kinetic chain hip adductor exercise	Side-lying/3 sets of patients' 8-10 RM

▼ **Table 2:** Targeted treatment program in the strong group.

MODALITY	APPLICATION TYPE
STRONG SUBGROUP	
Progressive balance/proprioception exercises	Standing on 1 leg on wobble board 3 sets of 1 min exercise each leg 1-3 sets per session depending on pain Progression: Eyes closed, bouncing ball against wall, bouncing ball against wall on an unstable surface
Patellar bracing	Patient was asked to put on knee brace during activities of daily living
Activity modification	Activity reduction to fit within envelope of function locally determined and negotiated with individual patient



an easily implemented approach. This innovative strategy, particularly when tailored to the distinctive characteristics of the “strong” subgroup, signifies an important step forward in achieving more favourable treatment outcomes compared to current multimodal programs. By doing so, recreational athletes may be able to sustain their physical activities important to the maintenance of long-term physical and psychological health, and competitive/ elite athletes can maintain their current levels of competition, underscoring the profound impact and potential of this approach on the broader landscape of sports and exercise science. We advocate the adoption of targeted treatments, in particular within the “strong” subgroup pertinent to sport and exercise sciences, as a measure to manage this prevalent condition. ■



▲ **Figure 2:** Patellar mobility assessment.

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