risk factors underwent semi-quantitative synthesis. The GRADE approach for prognostic factors guided assessment.

**Results** Across 66 included studies, 81 unique risk factors were identified. 64% and 49% of studies had high risk-of-bias from attrition and confounding. Semi-quantitative syntheses identified limited high-quality evidence that cruciate ligament, collateral ligament, meniscal, chondral, dislocation, fracture, and multi-structure injuries increase symptomatic osteoarthritis odds. Ten risk factors for structural osteoarthritis underwent meta-analysis (sex, rehabilitation for ACL tear, ACL reconstruction (ACLR), ACLR age, ACLR body mass-index, ACLR graft source, ACLR graft augmentation, ACLR+cartilage injury, ACLR+partial meniscectomy, ACLR+total medial meniscectomy). Very-low quality evidence suggests increased odds of structural osteoarthritis related to ACLR+cartilage injury (OR=2.31; 95%CI 1.35,3.94), ACLR+partial meniscectomy (OR=1.87; 1.45,2.42), and ACLR+total medial meniscectomy (OR=3.14; 2.20,4.48).

**Conclusion** Limited high-quality evidence suggests that various knee injury types (not just ACL tears) increase symptomatic osteoarthritis. Risk factor heterogeneity, low-quality evidence, and inconsistency in risk factor and osteoarthritis definition make identifying modifiable targets for preventing symptomatic post-traumatic knee osteoarthritis challenging.

**Management of Gluteal Tendinopathy: A Systematic Review with Meta-Analysis of All Interventions**

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**Introduction** Gluteal tendinopathy (GT) is a common source of hip pain with reported pain, function, quality of life being equivalent to end stage hip osteoarthritis. This systematic review aims to clarify the best management for people with GT.

**Materials and Methods** 9 electronic databases and the grey literature were searched from inception to March 2021. High-quality, randomised controlled trials of any intervention for GT were included. The PEDro scale was used for quality assessment, with risk of bias assessed using the Cochrane Risk of Bias tool 2.0.

**Results** Meta-analysis of four studies of exercise and education (EDX) for pain and function demonstrated that EDX has a large effect on pain outcomes in the short term (SMD 0.95, 95% CI 0.58, 1.33), medium effect in the medium term (SMD 0.60, 95% CI -0.21, 0.96) and a small effect on in the long term (SMD 0.46, 95% CI 0.10, 0.81). EDX has a large effect on functional outcomes in the short term (SMD 0.91, 95% CI 0.53, 1.28), medium effect in the medium term (SMD 0.79, 95% CI 0.42, 1.16) and a small effect in the long term (SMD 0.41, 95% CI 0.05, 0.76).

**Conclusion** Education and exercise has a positive impact on pain levels and function at every time point. Education and exercise interventions should form part of GT management.

**Pivoting in a Pandemic: Opportunities for Injury Surveillance Using Video Analysis in Sport**

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**Introduction** Prospective cohort studies represent the gold standard in injury surveillance. However, these methods require longitudinal monitoring and are highly resource intensive. We describe the use of video-analysis to inform injury prevention where no other surveillance data is available.

**Materials and Methods** Forty-eight female varsity rugby union matches were analysed through video-analysis. A three-stage approach to informing injury prevention included match event coding, suspected injury and concussion analysis, and tackle...
Conclusion Video-analysis is an underused tool for capturing suspected injury/concussion events. When undertaken using clearly operationalised definitions and in consultation with medical experts, vital information can be acquired to inform prevention strategies. The implications of this are wide-ranging and offer new opportunities for surveillance and prevention in under-reported and/or under-resourced sporting environments, particularly youth and female sport.

Introduction Plantar heel pain (PHP) used to be considered a self-limiting condition, where pain was thought to resolve among several patients. These results emphasise the large impact PHP may have on individuals and highlights the need for more effective treatments.

Materials and Methods Five databases were searched for case-control studies. Muscle electromyography, flexibility, performance and cross-sectional area data were extracted from reports of functional or isolated tasks and synthesised. An evidence gap map was constructed.

Results Sixty-seven studies were retained. In functional tasks, electromyographic investigations showed moderate evidence of small effect for vastus medialis onset-delays relative to vastus lateralis (0.44 [0.03, 0.83]) during stepping/stair negotiation tasks, and higher biceps femoris mean excitation amplitudes (0.55 [0.06, 1.04]) in single-leg triple-hop test. In isolated tasks, we found moderate evidence of medium effect for lower Hoffman-reflex amplitude of vastus medialis (-1.12 [-1.56, -0.67]). Muscle performance investigations showed: strong evidence with medium and small effects for lower extensors concentric (-0.61 [-0.81, -0.40]) and eccentric (-0.56 [-0.79, -0.33]) strength; and moderate evidence of medium effect of lower isometric (-0.64 [-0.87, -0.41]) strength; moderate evidence with small effect for rate of force development to 30% (0.55[0.09, -0.21]), 60% (-0.57[-0.90, -0.25]) and medium effect to 90% (-0.76[-1.43, -0.10]) of maximum voluntary contraction; and small effect for lower flexors concentric strength (-0.46 [-0.74, -0.19]) and extensors total work (-0.48 [-0.90, -0.70]). Flexibility investigations showed tighter hamstrings (-0.57 [-0.99, -0.14]).

Conclusion Quadriceps and hamstring motor-control, flexibility and weakness are robustly associated with patellofemoral pain, so these parameters should be used to guide investigations of treatment effect mechanisms.

Abstracts

LOCAL NEUROMUSCULAR CHARACTERISTICS ASSOCIATED WITH PATELLOFEMORAL PAIN: A SYSTEMATIC REVIEW AND META-ANALYSIS

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INTRODUCTION Local neuromuscular deficits have been reported in people with patellofemoral pain. To help identify interventional targets, we synthesized the neuromuscular characteristics associated with patellofemoral pain persistence.

MATERIALS AND METHODS Five databases were searched for case-control studies. Muscle electromyography, flexibility, performance and cross-sectional area data were extracted from reports of functional or isolated tasks and synthesised. An evidence gap map was constructed.

RESULTS Sixty-seven studies were retained. In functional tasks, electromyographic investigations showed moderate evidence of small effect for vastus medialis onset-delays relative to vastus lateralis (0.44 [0.03, 0.83]) during stepping/stair negotiation tasks, and higher biceps femoris mean excitation amplitudes (0.55 [0.06, 1.04]) in single-leg triple-hop test. In isolated tasks, we found moderate evidence of medium effect for lower Hoffman-reflex amplitude of vastus medialis (-1.12 [-1.56, -0.67]). Muscle performance investigations showed: strong evidence with medium and small effects for lower extensors concentric (-0.61 [-0.81, -0.40]) and eccentric (-0.56 [-0.79, -0.33]) strength; and moderate evidence of medium effect of lower isometric (-0.64 [-0.87, -0.41]) strength; moderate evidence with small effect for rate of force development to 30% (0.55[0.09, -0.21]), 60% (-0.57[-0.90, -0.25]) and medium effect to 90% (-0.76[-1.43, -0.10]) of maximum voluntary contraction; and small effect for lower flexors concentric strength (-0.46 [-0.74, -0.19]) and extensors total work (-0.48 [-0.90, -0.70]). Flexibility investigations showed tighter hamstrings (-0.57 [-0.99, -0.14]).

CONCLUSION Quadriceps and hamstring motor-control, flexibility and weakness are robustly associated with patellofemoral pain, so these parameters should be used to guide investigations of treatment effect mechanisms.

Usability of Paper and Electronic Pain Drawings in Assessing Musculoskeletal Pain: A Scoping Review

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INTRODUCTION COVID-19 has accelerated the implementation of online consultations thus creating the need to assess usability of electronic-pain-annotation tools. We aimed to learn from