

SMA-2024-195**Hop to it! A systematic review and longitudinal meta-analysis of hop performance after ACL reconstruction**

M. Girdwood, K. Crossley, E. Rio, B. Patterson, M. Haberfield, J. Couch, B. Mentiplay, M. Hedger, A. Culvenor

La Trobe University, Australia

Introduction: The trajectory of hop performance after anterior cruciate ligament reconstruction (ACLR) has not been well summarised, despite its regular inclusion in clinical trials. We aimed to systematically review and meta-analyse how hop performance changes over time after ACLR. We planned to compare hop performance within-person (i.e., to the uninjured limb) and between-person (i.e. to uninjured healthy populations).

Methods:

MEDLINE, EMBASE, CINAHL, Scopus, Cochrane CENTRAL, and SPORTDiscus were searched to 28 February 2023. We included studies of primary ACLR ($n \geq 50$), with mean participant age 18-40 years, reporting a quantitative measure of hop performance (e.g. distance, height). Performance had to be reported for the ACLR limb and compared to: i) the contralateral limb (within-person); and/or ii) an uninjured control limb (between-person). Papers published 2010 or later, with any timepoint up to 10 years post-ACLR were included. Longitudinal meta-analyses were conducted for each hop test, utilising methods allowing for inclusion of data from multiple timepoints from the same cohort. To understand the correlation of performance between different hop tests, we conducted an exploratory bivariate analysis using data from studies which reported results for multiple hop tests.

Results:

We included 136 studies from 26 countries of 23,360 participants (36% women). Most studies ($n = 132$) compared hop performance within person ($n = 17$ between person). The most common hop tests were single-forward, triple-forward, triple-crossover, six-metre timed, side, and vertical hop. Performance on all tests showed initial sharp improvement, plateauing at 12-18 months post-ACLR. Estimated mean hop performance across all tests was 87.0 to 93.8% of the contralateral limb at 1-year post-ACLR, with greatest deficits seen for vertical hop performance. By 5 years post-ACLR, there were no meaningful deficits seen within-person, except for single-forward hop where ACLR performance was 94.2% (95%CI 93.1 to 95.3) of the contralateral limb. Between-person comparisons showed slightly larger deficits than within-person but were predominantly from studies in the first year post-surgery. All forward hop tests were highly correlated with each other, with a close to perfect relationship in performance deficits (e.g., single-forward and triple-forward hop: $\rho = 0.96$ 95%CI 0.90 to 0.99). The relationship between single-forward hop, and other tests (vertical, side hop) was discordant (e.g., side hop deficits 1.8-fold larger than single-forward hop).

Discussion:

Our review is the most comprehensive evaluation to date of hop performance following ACLR. Hop performance was largely stable after two years post-ACLR, with deficits of 5% or less seen across all tests. Measuring vertical and side hop performance may show greater deficits than forward hop tests, which could be useful for guiding return to sport decisions.

Impact/Application to the field:

There is limited improvement in hop performance beyond two years post-ACLR. Hop performance should be tested in multiple planes (e.g. forward, vertical, sideways), but multiple tests in the same plane may not provide extra information.

Declaration:

My co-authors and I acknowledge that we have no conflict of interest of relevance to the submission of this abstract.

<http://dx.doi.org/10.1016/j.jsams.2024.08.146>

SMA-2024-207**Patellar tendinopathy: a systematic review of diagnostic accuracy studies**

A. Nasser^a, R. Kinsella^b, C. Andrejic^a, D. Evans^a, H. Melchior^a

^a*University of Technology Sydney, Australia*

^b*University of Melbourne, Australia*

Introduction: Patellar tendinopathy is a common cause of anterior knee pain. The condition is prevalent in sports that involve jumping and rapid changes of direction such as basketball, volleyball and Australian rules. Differential diagnosis in people presenting with anterior knee pain is challenging as there may be various anatomical structures contributing to symptoms. Knowing which tests have the greatest diagnostic value is essential but currently not well understood. It is known that abnormalities on MRI are a poor predictor of symptomatic tendinopathy as these findings are present in a high percentage of people who do not report pain. This study aimed to determine the diagnostic accuracy of clinical tests used to diagnose patellar tendinopathy, evaluate the quality of studies, and describe which reference standards are commonly used.

Methods:

PubMed, Medline, CINAHL, DITA, EMBASE and SCOPUS were searched from inception to July 2023 using keywords mapped to diagnostic test accuracy and patellar tendinopathy. Studies with diagnostic accuracy data on tests used to diagnose patellar tendinopathy were included. The risk of bias in included studies was assessed using the QUADAS-2 tool, and the certainty of the evidence was evaluated according to the Grading of Recommendations Assessment, Development and Evaluation guidelines.

Results:

Five studies ($n = 507$) met inclusion criteria involving 10 different index tests. All studies were rated as high risk of bias, with 4 of 5 studies having a case-control design. Given the various combinations of index tests and reference standards used, a meta-analysis was not conducted. The sensitivity of index tests ranged from 0.50-0.98 and specificity from 0.09-0.98. Palpation of the patellar tendon reported the highest sensitivity (0.98). The Royal London Hospital Test reported the highest specificity (0.94). Although several tests reported promising diagnostic utility, results should be interpreted with caution, as the certainty of evidence was very low.

Discussion:

There was significant variability in reference standards used across studies. This is unsurprising as there is no gold standard for diagnosing patellar tendinopathy. The only index test that was assessed in multiple studies was palpation. Whilst most clinical tests, such as palpation, reported high diagnostic utility, most studies utilised case-control designs which exaggerate the effectiveness of index tests.

Impact/Application to the field:

Cross-sectional studies recruiting patients with mixed causes of anterior knee pain of insidious onset are required. This will provide a more accurate reflection of the diagnostic utility of clinical tests. Future research comparing clinical tests to a complete clinical workup (including imaging) is warranted, although this has its limitations.

Declaration:

My co-authors and I acknowledge that we have no conflict of interest of relevance to the submission of this abstract.

<http://dx.doi.org/10.1016/j.jsams.2024.08.147>

SMA-2024-218**Validity and Reliability of the ISOTIB for Ankle Strength Assessment**

S. Drew, S. Horan, M. Worsey, S. Duhig

Griffith University, Australia

Introduction:

The one repetition maximum (1RM) strength test is the gold standard for determining the maximum an individual can lift for a specific exercise. While the effectiveness of 1RM tests for major muscle groups is well-documented, research on ankle-specific 1RM strength tests using heavy resistance equipment is scarce. ISOTIB, designed to specifically target ankle dorsiflexion, inversion and eversion, offers a novel approach to assessment of ankle strength. This study aims to determine the ISOTIB's validity and reliability to support its potential to be used routinely as a strength assessment tool.

Methods:

Fifteen healthy male and female participants were recruited (male = 10, female = 5, aged 29.7 ± 4.4 years). A repeated measures design was used to determine test-retest reliability of the ISOTIB's 1RM strength test. Reliability was assessed using intraclass correlation coefficients (ICC) with 95% confidence intervals (CI) and the use of Bland-Altman plots. Concurrent validity was evaluated by comparing the 1RM results of the ISOTIB and isokinetic dynamometer, using Pearson's correlation coefficient (r). Surface electromyography (sEMG) was also employed to compare three different ankle muscles during the ISOTIB and dynamometer tests.

Results:

The ISOTIB exhibited excellent reliability in the assessment of dorsiflexion (ICC = 0.99, 95% CI, 0.97-0.99), inversion (ICC = 0.99, 95% CI, 0.97 - 0.99) and eversion (ICC = 0.97, 95% CI, 0.92 - 0.99) strength. Very high positive correlations were shown for dorsiflexion ($r = 0.9$, $p < 0.001$), eversion ($r = 0.87$, $p < 0.001$) and a high positive correlation for inversion ($r = 0.67$, $p < 0.007$). sEMG results demonstrated favourable and comparable muscle activity between the ISOTIB and dynamometer.

Discussion:

This ISOTIB demonstrated excellent validity and reliability, providing support for the device being a viable maximal strength assessment for the ankle. This study provides several new avenues for ankle strengthening; the ability to use a free weight device that is practical in terms of accessibility and mobility compared to an expensive, immovable dynamometer. Additionally, the ISOTIB can serve as a new method for direct ankle strength exercise training to compliment established lower limb training methods and potentially improve performance and prevent ankle injuries.

Impact/Application to the field:

The ISOTIB represents an exciting advancement in ankle strength assessment, serving both as a practical strength evaluation tool and training device. It has potential to strengthen ankles for athletes in sports involving jumping, sprinting, balance and agility manoeuvres. Further, by integrating the ISOTIB into strength training regimens, athletes and the general population can enhance ankle resilience, potentially reducing the incidence of common injuries.

Declaration:

My co-authors and I acknowledge that we have no conflict of interest of relevance to the submission of this abstract.

<http://dx.doi.org/10.1016/j.jsams.2024.08.148>

SMA-2024-211**The acute effect of transitioning between strength and hypertrophy resistance training sessions in youth rugby league athletes**

K. Doma, L. Bartlett, W. Sinclair, J. Connor, A. Leicht

James Cook University, Australia

Introduction: Youth rugby league athletes are increasingly engaging in rigorous resistance training to meet the demands of their sport. As part of periodisation, resistance training workload volume is typically altered in a wave-like progression (i.e. mesocycles). While exposure to an unfamiliar stimulus is desirable during periodisation, youth athletes may initially encounter elevated levels of exercise-induced muscle damage (EIMD), including delayed onset muscle soreness (DOMS), creatine kinase (CK), and loss of muscle function. Developing a greater comprehension of the acute responses to variations in resistance training workload volume could aid practitioners in managing symptoms of EIMD, ensuring training quality, and minimizing injury risks. Therefore, this study aimed to investigate the impact of transitioning between different mesocycles on indirect markers of muscle damage and muscle performance metrics in resistance-trained youth rugby league athletes.

Methods: Resistance-trained youth male rugby league athletes ($n=18$) volunteered for this six-week study. Participants underwent a four-week mesocycle aimed at maximal strength development, followed by one maximal strength exercise session in Week 5 and one hypertrophy exercise session in Week 6. Outcome measures included CK, DOMS, lower limb explosive strength (drop box jump) and upper body explosive strength (plyometric push-up). All measures were evaluated before, at 24 hours (T24), and at 48 hours (T48) after the maximal strength training session in Week 5. Additionally, muscle damage and performance measures were assessed before, at T24, and at T48 following the hypertrophy session (i.e., same strength exercises conducted in Week 5 but with reduced intensity and increased volume) in Week 6. Comparisons of variables between strength and hypertrophy sessions over time were examined via 2-way ANOVA and post-hoc pairwise comparisons with Bonferroni correction.

Results: Measures of DOMS and CK was significantly increased, while drop jump performance was significantly lower 24-hours and 48-hours after the hypertrophy modality in Week 6, although these trends were not identified after the strength modality in Week 5. Furthermore, the changes in DOMS, CK and drop jump performance were significantly more pronounced after the hypertrophy modality in Week 6 than the strength modality in Week 5. However, there were no differences in plyometric push-up performance after strength and hypertrophy modalities, nor between the strength and hypertrophy modalities.

Discussion: Raising workload volume during a mesocycle transition led to heightened muscle damage and hindered lower body explosive strength measures for up to 48-hours following several weeks of maximal strength training. Coaches should closely monitor acute strength responses amid workload volume fluctuations and implement strategies to enhance training quality and performance in athletes.