

0.031) and KOOS activity of Daily Living Function (4.71, 95% CI 1.20 to 8.22;  $p = 0.010$ ) than CON.

**Conclusion** In ACLR participants with persistent hamstrings muscle deficiency, 12 weeks of supervised progressive strength training was superior compared to low-intensity home based exercises (usual care) for improving knee flexor muscle strength and some patient reported outcomes.

### 7 IS ABSOLUTE OR RELATIVE KNEE FLEXOR STRENGTH RELATED TO PATIENT-REPORTED OUTCOMES IN PATIENTS WITH ACL RECONSTRUCTION WITH HAMSTRING TENDON AUTOGRAFT?

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**Background** There is a need for better understanding of how knee flexor strength influence patient-reported outcomes (PROs) after anterior cruciate ligament (ACL) reconstruction. Therefore, the aim was to investigate the relationship between the eccentric NordBord test and the seated concentric Biodex test, with PROs, during the first year of rehabilitation after ACL reconstruction with a hamstring tendon (HT) autograft.

**Methods** Data of patients with an index ACL reconstruction with an HT-autograft participating in a rehabilitation registry were screened for inclusion. Outcomes of interest were the correlation between absolute (N/kg or Nm/kg) and relative (limb symmetry index) knee flexor strength measured in the NordBord and Biodex with the results of PROs. The significance level was set at  $p < 0.05$  and Pearson's correlation coefficient was used.

**Results** 137 patients were included (47% women) with a mean age of  $24.8 \pm 8.4$  years. There were non-significant and weak correlations between relative strength for all PROs. Significant and weak correlations between absolute strength in the Biodex with the K-SES18present at 4 and 8 months, and for the ACL-RSI at 12 months was observed, accounting for 8.4–15.7% of the variance. Significant and weak correlations between absolute strength in the Nordbord with the KOOS-Sports at 4 months, the K-SES18present and the ACL-RSI at 8 months were observed, accounting for 9.4–14.4% of the variance.

**Conclusion** Absolute knee flexor strength relative to body-weight for both the Biodex and NordBord test appeared to have a stronger relationship with perceived knee function than relative knee flexor strength, although the observed correlations were weak.

### 9 THE NONCONTACT ANKLE SPRAIN IS NOT ALWAYS THE RESULT OF A "BAD LANDING": A SYSTEMATIC VIDEO-ANALYSIS OF 145 NON-CONSECUTIVE CASES

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**Introduction** The noncontact lateral ankle sprain is the most common injury in indoor and court sports. Here, it is predominantly described as occurring via a mechanism that typically incites from an initial "bad landing" – with the foot in inverted position. Descriptions of the actual foot landing posture prior to injury has, however, only been documented in few quantitative cases, or simply retrospectively reported by the incurring athletes during prospective trials. Therefore, we aimed to determine the initial foot landing posture using video-recorded injuries.

**Materials and Methods** In this explorative, observational, non-consecutive, case-series study, two independent, blinded, analysts systematically retrieved and analysed 585 video-recorded lateral ankle sprain injuries.

**Results** 445 injuries remained after 79 duplicates, and 61 videos with no clear view or non-lateral joint excursion, had been excluded. Of these, 113 (25%) were noncontact and 32 (7%) were indirect-contact injuries. Among the 113 noncontact injuries, 18 (16%) were characterised by initial contact on the lateral side, while 95 (84%) had a medial- or flat landing posture prior to injury. Among the 32 indirect-contact injuries, 9 (28%) injuries had initial contact on the lateral side, while 23 (72%) had a medial- or flat landing posture.

**Conclusion** Contrary to our expectations, most noncontact injuries were not caused by an initial "bad landing" with the foot in an initially inverted position. It is important to concede that the noncontact lateral ankle sprain can indeed occur and progress irrespective of initial foot landing posture. Joint stiffness might be more important than joint position.

### 10 INTERRATER AND INTRARATER RELIABILITY OF FOUR DIFFERENT CLASSIFICATION METHODS FOR EVALUATING ACROMIAL MORPHOLOGY ON STANDARDIZED RADIOGRAPHS

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**Introduction** Acromial morphology is an important pathophysiological factor for the development of subacromial impingement syndrome. There are three radiological methods to evaluate acromial morphology: Bigliani, Modified Epstein, and Acromial angle. However, their reliability have not been compared in a single study, nor using standardized radiographs. Consequently, the evaluation of acromial morphology is currently not validated though its widespread use across the world. The objective of this study was to investigate reliability of the three known classifications and the novel Acromial curve classification.

**Materials and Methods** Three experienced clinicians rated 102 standardized supraspinatus outlet view radiographs with the four classification methods in two separate sessions a month apart. All measurements were blinded. With an expected kappa and ICC  $> 0.7$  ( $\pm 0.15$ ), the target sample size was 87 radiographs.

**Results** The Bigliani classification had interrater and intrarater reliability ranging from fair to good (Kappa 0.32–0.41 and 0.26–0.62). The modified Epstein classification had fair to

good interrater and intrarater reliability (Kappa 0.24–0.69 and 0.57–0.63). The Acromial angle classification had moderate to good interrater and intrarater reliability (Kappa 0.53–0.60 and 0.59–0.72). The novel Acromial curve classification showed moderate to good interrater and intrarater reliability (ICC 0.66–0.71 and 0.75–0.78, respectively).

**Conclusion** The Acromial curve classification was the only classification method with an ICC value > 0.7. The popular Bigliani method had the worst reliability. The Acromial curve classification produces numerical data, as opposed to the other three classification methods. This could potentially be utilized in future research to establishing cut-off values for treatment stratification.

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### QUADRICEPS OR HIP EXERCISES FOR PATELLOFEMORAL PAIN? A RANDOMIZED CONTROLLED EQUIVALENCE TRIAL

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**Introduction** Exercise therapy comprising exercises for the hip and the knee is recommended for improving pain and function in patients with patellofemoral pain (PFP). However, there is uncertainty about which type of exercises that are most effective. We aimed to assess effectiveness equivalence between two commonly prescribed exercise programs targeting either the quadriceps or the hip muscles in patients with PFP.

**Materials and Methods** This randomised controlled equivalence trial included 200 participants with a clinical diagnosis of PFP. Participants were randomly assigned to either a 12-week quadriceps-focused (QE) or a hip-focused (HE) exercise program. The primary outcome was the change in Anterior Knee Pain Scale (AKPS) (0–100) from baseline to 12-week follow-up. Prespecified equivalence margins of  $\pm 8$  points on the AKPS were chosen to demonstrate comparable efficacy. Key secondary outcomes were the Knee Injury and Osteoarthritis Outcome Score questionnaire (KOOS) pain, physical function, and knee-related quality of life subscales.

**Results** The least squares mean changes in AKPS (primary outcome) were 7.5 for QE and 7.2 for HE (difference 0.3 points, 95% CI –1.9 to 2.4; test for equivalence  $p < 0.0001$ ). None of the group differences in key secondary outcomes exceeded predefined equivalence margins.

**Conclusion** 12-week focused quadriceps and hip focused exercise protocols were equivalent in changes in symptoms and function for patients with PFP.

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### IS MY ACLR STRONG ENOUGH? GRAFT TYPE, ACTIVITY LEVEL INFLUENCE KNEE STRENGTH IN 392 ATHLETES ACROSS FIVE TIME POINTS

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**Introduction** An essential priority in rehabilitation after anterior cruciate ligament reconstruction (ACLR) is the restoration of knee muscle strength. We aimed to describe quadriceps and hamstrings strength after ACLR of an uncomplicated rehabilitation course, categorized into level of activity and graft type (patellar-tendon – BPTBG, hamstring – HSG).

**Methods** Isokinetic concentric strength (body weight – BW-adjusted) was measured in 392 athletes ( $26.2 \pm 6.7$ y) at five time-points (3, 4.5, 6, 7.5, and 9m) following ACLR. Data was analyzed using mixed-effects models and participant specific random effects. Fixed effects included graft type, athlete categorization, and assessment time. We applied Tukey adjustment for multiple comparisons.

**Results** Professional athletes (HSG) displayed greater quadriceps strength than recreational (BPTBG) at all time-points (except 7.5m). No other significant differences were noted.

Professional and recreational athletes' quadriceps strength significantly increased through time (irrespective of graft type). Professionals (HSG) reached >2.5 BW quadriceps strength at 6-months, and recreational >2.3 BW at 7.5-months.

Professional athletes showed significantly greater hamstring strength through time (irrespective of graft type). Both athletic categories reached maximum hamstring strength at 6-months post operatively (>1.7 BPTB and >1.5 HS, BW).

Recreational athletes (BPTBG) displayed a significant increase in hamstring strength (1.4 BW, 4.5m), while for recreational athletes (HSG) strength was consistently improving up to 7.5m.

**Conclusions** Knee strength increases during rehabilitation but at the initial phase of ACLR rehabilitation is influenced by the graft type, while at the end of rehabilitation it is affected by the activity level. The maximum achieved strength is affected mostly by activity level.

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### SEX-DEPENDENT DIFFERENCES ON KNEE FRONTAL MOMENT IN PRE-ADOLESCENT AND ADOLESCENT AGES DURING A CUTTING MANEUVER TASK

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**Introduction** Although the rate of anterior cruciate ligament (ACL) injury is low among children, it increases during adolescence, especially in girls. The injury typically occurs immediately after foot-ground contact during sports activities such as a cutting maneuver (CM). The knee frontal plane moment (KFM) has been implicated as a biomechanical risk factor, but it has not been extensively studied within the injury timeframe. The present study aimed to prospectively investigate sex-dependent changes in the KFM from pre-adolescence to adolescence during the first 70 ms of a CM task.

**Methods** A total of 293 handball and soccer players, aged 9–12 years, were recruited to perform a CM, where kinematic and kinetic data were obtained using marker-based motion capture and force plates. Those who continued sports participation (n=105) returned five years later to repeat the test procedure. A mixed-model analysis of variance (ANOVA) for repeated measures was used for statistical analysis of the KFM during the first 70 ms after foot-ground contact.