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The International Journal of Sports Physical Therapy is pleased to publish abstracts from the 4th World Congress of Sports Physical Therapy, which will take place in Nyborg, Denmark, August 26-27, 2022. The theme of the Congress is “Translating Science into Action.” The variety of presentations during this congress are examples of the contemporary sports physical therapy research activities taking place around the world. The abstracts presented in the following pages were selected by the Scientific Committee, which included members from and from the International Federation of Sports Physical Therapy. It should be noted that abstracts have not been reviewed by the Editorial Board, Associate Editors or Editor-in-Chief of the International Journal of Sports Physical Therapy.

After careful review by an international team of reviewers, research abstracts will be presented by authors at the World Congress.

Each abstract presents only a brief summary of a research project / presentation and does not permit full assessment of the scientific rigor with which the work was conducted.

While the abstracts offer only preliminary results that may require further refinement and future validation, they do serve an important role of sharing new research ideas from around the world. This sharing of ideas helps to encourage worldwide dialogue among researchers, clinicians, and educators that will ultimately contribute to the sports physical therapy body of knowledge.

Notice: The abstracts below are presented as prepared by the authors. The accuracy and content of each abstract remain the responsibility of the authors.

EXPLORING STUDENTS’ PARTICIPATION IN AND PERCEPTIONS OF RESISTANCE TRAINING IN THEIR HIGH SCHOOL WEIGHT ROOM**Ms. Joanne Parsons¹**, Ms. Gabby Masi¹University Of Manitoba, R106-771 McDermot Ave., Canada

Introduction: Greater muscular fitness is associated with increased function and a longer life. Building muscular fitness during the time of peak physical maturation is key, but there is limited research concerning adolescents and their participation in activities that develop that fitness.

Aim: To explore former students’ participation in and perceptions of their high school weight room.

Materials and Methods: We advertised an online survey via social media and university digital message boards that targeted 2012-2019 high school graduates. We asked if their high school had a weight room, their pattern of weight room use, and their perceptions of what encouraged or deterred use of the space.

Results: Of the 92 (71 female) respondents, 78 (85%) reported having a school weight room. Sixty-two of the 78 reported they used the space: 39% <1x/week, 32% 1-2x/week, 23% 3-5x/week, and 4% other frequency. All of the male respondents who had a school weight room used it, compared

to only 73% of the female respondents. Fifty-one percent of users rated the weight room ≤6 on a 10-point “welcoming” scale. The convenience of location and no cost, presence of friends, natural light, and sufficient space made the weight room appealing to students. Busy, unorganized spaces and a perceived intimidating/judgmental atmosphere discouraged use.

Conclusion: Less than 25% of respondents met participation guidelines (≥3x/week) for muscle building activities through their school weight room, and half did not consider the space overly welcoming. Respondents identified features that, with some minor changes, could encourage use of the space.

RESISTANCE TRAINING BEFORE TOTAL JOINT REPLACEMENT. DOES IT IMPROVE POSTOPERATIVE FUNCTIONAL PERFORMANCE AND KNEE-EXTENSOR STRENGTH? A SYSTEMATIC REVIEW AND META-ANALYSIS.:**Mr. Stian Langgård Jørgensen^{1,2,3}**, Ms. Signe Kierkegaard^{1,2,3}, Ms. Marie Bagger Bohn^{2,3}, Prof. Per Aagaard⁴, Prof. Inger Mechlenburg^{3,5}

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INTRODUCTION: Twenty percent of patients receiving total hip or knee replacement (TJR) report non-optimal postoperative outcome. Increasing preoperative lower-limb-strength prior to TJR may improve postoperative functional performance.

MATERIALS AND METHODS: Eligibility criteria: RCTs 1) comparing preoperative lower-limb-exercises before TJR with standard care 2) explicitly reporting the exercise intensity and 3) reporting functional performance were included.

Information sources: Cochrane Central, MEDLINE, EMBASE, and PEDro were searched in August 2021.

Risk of bias: Cochrane Risk of Bias tool was used to evaluate the risk of bias. Screening of eligible studies, data extraction and risk of bias assessment were conducted by two independent reviewers.

Synthesis of results: Primary outcome was functional performance assessed 2-4 months postoperatively. Secondary outcome measures included maximal knee-extensor strength 2-4 months postoperative and functional performance and knee-extensor strength 10-12 months postoperative. Random effects meta-analyses were performed to synthesize the results.

RESULTS: Seven RCTs including 234 participants were included.

A moderate effect favoring prehabilitation training on sit-to-stand performance was observed three months postoperatively (SMD(95%CI) (0.77; 0.43 to 1.12), along with moderate-to-large effects on Timed Up&Go (-1.33; -2.55 to -0.11), walking speed (-0.78; -1.16 to -0.41) and knee extensor-strength (0.55; 0.11 to 0.99).

Small-to-moderate effects favoring prehabilitation were observed twelve months postoperatively for sit-to-stand (0.49; 0.12-0.86), walking speed (-0.37; -0.74 to -0.00), stair climbing (-0.55; -1.03 to -0.06) and knee-extensor strength (0.49; 0.16 to 0.81).

CONCLUSION: Prehabilitation prior to TJR induce long-lasting improvements in functional performance and knee extensor muscle strength that are of moderate-to-large effect size.

SUBSTANTIAL DEFICITS IN HIP MUSCLE STRENGTH AND FUNCTIONAL PERFORMANCE IN PATIENTS WITH HIP ABDUCTOR TENDON RUPTURES COMPARED WITH HEALTHY CONTROLS

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Introduction: Patients with hip abductor tendon ruptures (HATR) experience pain and problems in daily living and sport. However, the degree of their impairments is unclear.

We aimed to investigate patient reported outcomes (Copenhagen Hip and Groin Scale (HAGOS)(0-100 scale) and Oxford Hip Score (OHS)(0-48 scale)), maximal hip muscle strength (abduction, extension and external rotation) and functional performance on the chair-stand-test (CTS) in patients with HATR compared with age and gender matched healthy controls. Furthermore, we investigated associations between hip abduction strength, pain and function.

Methods: 71 patients (100% females, mean age 56±13) with clinical and MRI verified HATR and 25 healthy controls (100% females, mean age 53±12) without hip pain were included in the study. All participants completed HAGOS and OHS, had their maximal hip strength measured using a hand-held dynamometer and completed the CTS.

Results: Patients reported substantial deficits in all HAGOS scores (median values 13-43 points) and OHS (median 23 points). Compared with controls, patients had significantly lower abduction (0.5±0.2Nm/kg vs. 1.0±0.3Nm/kg, p<0.001), extension (0.4±0.2Nm/kg vs. 0.8±0.3Nm/kg, p<0.001) and external rotation (0.3±0.1Nm/kg vs. 0.6±0.1Nm/kg, p<0.001) strength and completed significantly fewer CTSs (12±4 vs. 18±5, p<0.001). Patients' maximal hip abductor strength was associated with HAGOS ADL scores and with number of completed CTSs.

Conclusion: Patients with HATR demonstrated substantial muscular and functional deficits compared with healthy controls without hip pain, which was also reflected in their substantial impairments in patient reported outcomes.

THE RELATIONSHIP BETWEEN SYMPTOMS ASSOCIATED WITH MENSTRUATION AND SPORTS ACTIVITY RESTRICTION AMONG FEMALE ATHLETES IN SCHOOLS AND LOCAL SPORTS CLUBS

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Introduction: Many women have symptoms associated with menstruation that may affect their sports activities. However, there is a lack of research on what symptoms associated with menstruation can affect sports activities.

Aim: This study aimed to clarify the relationship between the severity of symptoms associated with menstruation and the restriction of sports activities.

Materials and Methods: A cross-sectional online survey was conducted on women athletes aged 16 to 30. The severity of symptoms while menstruation was assessed using the Menstrual Distress Questionnaire (MDQ). The degree of restriction of sports activities due to symptoms was asked to be answered as an 11-point scale ranging. Spearman's rank correlation coefficients were calculated for the

relationship between MDQ subscales and the sports activity restriction. A logistic regression analysis was conducted to examine the influence of the MDQ subscales on the sports activity restriction. The independent variables were the 6 MDQ subscales. The dependent variable was used by coding the degree of sports activity restriction <4 as “0: almost no limitation” and ≥4 as “1: limitation”.

Results: The final number for analysis was 157. All 6 MDQ subscales showed a significant correlation with the degree of sports activity restriction ($r > 0.4$, $p < 0.05$, respectively). The results of the logistic analysis showed that the subscale for pain was significantly related to the restriction of sports activities ($p < 0.05$).

Conclusion: This study indicated a relationship between various symptoms associated with menstruation and restriction of sports activities, especially the possibility that pain may affect the restriction of sports activities.

DIAGNOSTIC LABELS AND ADVICE FOR ROTATOR CUFF-RELATED SHOULDER PAIN INFLUENCE PERCEIVED NEED FOR SHOULDER SURGERY: AN ONLINE-RANDOMISED EXPERIMENT

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Introduction: There is no research on how diagnostic labels for rotator cuff-related shoulder pain interact with advice from health professionals nor the direct effect of advice for rotator cuff-related shoulder pain.

Aim: To examine the effects of diagnostic labels and advice, and interactions between labels and advice, on perceived need for shoulder surgery for rotator cuff-related shoulder pain.

Material and methods: We conducted a 2×2 factorial randomised experiment in people with shoulder pain. Participants read a scenario describing a patient with rotator cuff-related shoulder pain and were randomised to one of four combinations of labels and advice given by a health professional: bursitis plus guideline-based advice, bursitis plus standard advice, rotator cuff tear plus guideline-based advice, and rotator cuff tear plus standard advice. Guideline-based advice included encouragement to stay active and positive prognostic information. Standard advice stressed treatment is needed for recovery. Perceived need for surgery was the primary outcome.

Results: 2,024 responses (99.8% of 2,028 randomised) were analysed. Both labelling as bursitis (vs. rotator cuff tear) (mean effect: -0.5 on a 0-10 scale, 98.3% CI -0.7 to -0.2) and guideline-based advice (vs. standard advice) (mean effect: -1.0, 98.3% CI -1.3 to -0.7) decrease perceived need for surgery and secondary outcomes of perceived need for imaging and to see a specialist, and perceived seriousness of the condition. There was little-to-no evidence of an interaction between labels and advice for any outcome.

Conclusion: Labels and advice influence management preferences for rotator cuff-related shoulder pain, although the effect of advice is stronger.

THE EFFECTS OF MATURATION ON LANDING MECHANICS IN MALE YOUTH SOCCER PLAYERS: A SYSTEMATIC REVIEW

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Introduction: Maturation is the process whereby the body develops towards a biologically advanced state, and is classified into three stages (“Pre”, “Circa” and “Post”). During peak height velocity (PHV) there is an increased risk of injury, and high training loads and tissue vulnerability are both thought to be responsible for this. Compromised neuromuscular control during PHV, commonly referred to as “adolescent awkwardness”, has also been suggested as a risk factor for this increased risk.

Aim: To undertake a systematic review to establish whether landing biomechanics and neuromuscular control alter throughout maturation.

Materials and methods: Databases including: Cochrane; Google Scholar; Medline; PubMed; Scopus; and Sport Discus were searched from the study inception date until March 2020. Studies investigating biomechanics or neuromuscular control in male adolescent footballers in different maturation status were systematically reviewed and evaluated by 2 authors, with 7 studies included in the final review.

Conclusion: A range of methodological approaches have been used to determine maturation status and showed alterations in landing mechanics from maturation. Knee valgus decreased during maturation, however limb asymmetries showed increased valgus on the right leg compared to left (especially in Circa-PHV groups). Pre and Circa-PHV showed increased landing forces relative to body weight. Increased peak ground reaction force in the left leg Circa-PHV, but right leg Post-PHV. Limb asymmetries were most evident in Circa-PHV. Future research should further explore the limb asymmetries highlighted in this systematic review, which in turn could benefit injury prevention for the developing athlete.

THE ASSOCIATION BETWEEN SENSE OF COHERENCE, PHYSICAL FITNESS AND ACTIVITY LEVEL IN SWEDISH ADOLESCENTS: AN ANALYSIS OF GENDER DIFFERENCES

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Introduction: Mental health problems is a big part of burden of disease and affect adolescent worldwide. A salutogenic perspective of health is personal experience, helping individuals coping stressors. Previous research indicates physical activity as one behavior positively affect adolescents' health. Aim: The study aimed to investigate sense of coherence (SOC) association with physical fitness and activity level in adolescents.

Materials and Methods: A total of 3,315 male and female adolescent between age 14-18 years old, were included. The participants performed physical tests measuring cardiovascular ability and muscular strength. Questionnaires was used to measure activity levels and SOC value. Multiple linear regression analyses were performed to determine whether there was any association between SOC and independent variables.

Results: Boys reported higher SOC value in every age group comparing to girls. The only variable in regression analysis with significant results for both sexes were sedentary (boys $p = .002$; girls $p = .013$). Vo_{2max} was significant negative associated with SOC for boys ($\beta = -.109$, $p = 0.26$). The regression analysis had a small variability (3,3% for girls and 4,3 % for boys). Conclusion: Low sedentary levels was positively significantly associated with SOC for both genders indicating overall movement as the most important factor in the analysis. However, emotional support in vulnerable environments may have bigger impact on SOC value for adolescents.

THE RELATIONSHIP BETWEEN THE INTRINSIC FOOT MUSCLES AND PLANTAR FASCIA IN REPETITIVE REBOUND JUMP AND JUMP LANDINGS IN ADOLESCENT ATHLETES

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Introduction: Jumping and jump landing ability have been reported to be associated with the intrinsic foot muscle (IFM) and plantar fascia morphology in adults, however this is unknown in adolescent athletes.

Aim: This study aimed to investigate the relationship between the IFM and plantar fascia morphology, measured by ultrasound imaging, and the repetitive rebound jumping and jump landing ability in adolescent athletes.

Materials and methods: Thirty-four boy adolescent athletes participated in this study. B-mode ultrasonography

was used to obtain images of the IFM and plantar fascia morphology (thickness and cross-sectional area (CSA) of the abductor hallucis (AbH), flexor hallucis brevis (FHB), flexor digitorum brevis (FDB), and thickness of the plantar fascia). The repetitive rebound jump performance was evaluated using the Optojump™ system. Participants were instructed to jump five times continuously with one leg and to jump as high as possible with minimal ground contact time. The jump landing was assessed by measuring the dynamic postural stability index (DPSI) using forward one-legged jump landings.

Results and Conclusion: The thickness and CSA of the AbH and FDB were positively correlated with the jump height and reactive jump index. In the multiple regression analysis, the AbH and FDB thickness was associated with jump height and the FDB thickness was associated with rebound jump index ($p < 0.05$), indicating that AbH and FDB thickness might facilitates adolescent athletes to jump higher with minimal contact time in repetitive rebounding movements. The IFM (especially AbH and FDB) should be focused on examining the sports performance in adolescent athletes.

CHARACTERISTICS OF FALLS AMONG MEN'S WHEELCHAIR RUGBY PLAYERS IN THE RIO 2016 AND TOKYO 2020 SUMMER PARALYMPIC GAMES

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Introduction: Wheelchair rugby is a contact sport with many falls that can lead to injuries, yet the characteristics of the falls are still under-reported.

Aim: We aimed to investigate the fall characteristics of men's wheelchair rugby players by functional classification, using all 36 official match videos from the Rio 2016 and Tokyo 2020 summer Paralympic Games.

Materials and methods: The match videos from the national wheelchair rugby teams that entered in the Rio 2016 and Tokyo 2020 summer Paralympic Games were analyzed to evaluate the number of falls, direction of the fall, and the body part first in contact with the floor. All 182 men's wheelchair rugby players (Rio 2016, 94; Tokyo 2020, 88) were classified as low-point players or high-point players depending on their functional classification.

Results and Conclusion: A total of 200 falls were detected, 27 (13.5%) for low-point players and 173 (86.5%) for high-point players. Significant differences were noted between low-point players and high-point players in the direction of the fall and body part first in contact with the floor. High-point players had more falls in the forward and left-right directions, whereas low-point players were char-

acterized by a higher percentage of falls in the left-right and backward directions. Additionally, high-point players landed on the floor with their hands with high frequency, whereas low-point players landed with their elbows and shoulders more often. Our findings suggest the significance of devising measures to prevent falls during men's wheelchair rugby games according to their physical functional classification.

EXPLANATION, BUT NOT THE SPECIFIC DIAGNOSTIC LABEL, IS IMPORTANT FOR PATIENTS WITH SHOULDER PAIN

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Introduction: The diagnostic labels clinicians use, seem to impact patients' expectations of treatment, prognosis and understanding of their pain. "Subacromial impingement" is a diagnostic label currently under scrutiny, due to biomechanical inaccuracy and the barriers to non-surgical treatments it might cause. "Rotator cuff syndrome" has been suggested as a more appropriate label. However, it's unknown how this label is perceived by patients.

Aim: To explore the impact it has on patients to receive the diagnosis "rotator cuff syndrome".

Materials and Methods: Semi-structured interviews were conducted with 7 patients recruited from a specialized shoulder unit in secondary care in Denmark. All patients had received the diagnosis "rotator cuff syndrome" and an individualized explanation thereof, based on uniform concepts. Data was analysed using the General Inductive Approach.

Results: The analysis identified 3 main and 8 sub-themes. Most patients did not remember receiving a diagnosis and expressed no need for one, as they had received a meaningful and thorough explanation of their pain. The explanation was perceived as indicating that symptoms had muscular origin, facilitating physiotherapy and exercise as chosen management strategies.

Conclusion: Our analysis revealed that "rotator cuff syndrome" was associated with an understanding of physiotherapy and exercise as relevant management strategies. Patients did not express the need for a specific diagnosis, as they felt they had received an adequate and comprehensive explanation. The explanation seemed to be essential for the patients to understand and manage their condition.

ARE PROGRESSIVE SHOULDER EXERCISES FEASIBLE IN PATIENTS WITH GLENOHUMERAL OSTEOARTHRITIS OR ROTATOR CUFF ARTHROPATHY TEAR ELIGIBLE FOR SHOULDER ARTHROPLASTY?

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Introduction: Little is known about the feasibility of applying progressive shoulder exercises (PSE) to patients with glenohumeral osteoarthritis (GOA) or rotator cuff arthropathy tear (RCAT).

Aim: To investigate whether 12 weeks of PSE is feasible in patients with GOA or RCAT eligible for shoulder arthroplasty. Moreover, to report changes in shoulder function and range of motion (ROM) following the exercise program.

Materials and Methods: 20 patients were included. 18 patients (11 women, 14 with GOA) aged 70 (57-80) years performed 12 weeks of PSE with 1 weekly physiotherapist-led and 2 weekly home-based sessions. Feasibility was measured by drop-out rate, adverse events, pain exacerbation (VAS) and adherence to PSE. At baseline and end of treatment, patients completed the Western Ontario Osteoarthritis of the Shoulder (WOOS) score, and Disabilities of the Arm, Shoulder and Hand (DASH).

Results: Two patients dropped out. No adverse events were observed. Sixteen of the eighteen patients (89%) had a high adherence to PSE and acceptable pain levels were reported during the intervention. WOOS improved with a mean of 23 points (95% CI 13; 33), and DASH improved 13 points (95% CI 6; 19).

Conclusion: Adherence to PSE was high and drop-out rates were low. PSE is feasible, safe and may relieve shoulder pain, improve function and ROM in patients with glenohumeral OA or CTA. The patient-experienced gains after PSE seems clinically relevant and should be compared to arthroplasty surgery in a RCT setting.

ACUTE ANTERIOR CRUCIATE LIGAMENT RUPTURE: NEUROMUSCULAR CONTROL DURING STAIR DESCENT AND ANTERIOR TIBIA TRANSLATION

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Introduction: Anterior cruciate ligament rupture has direct impact on knee stability and specifically stretch reflex excitability. However, literature on neuromuscular deficits in patients with acute anterior cruciate ligament deficit (ACL-D) is sparse.

Aim: To investigate neuromuscular activity in patients with an acute ACL-D compared to matched controls with an intact ACL (ACL-I) during stair descent and anterior tibia translation.

Materials and Methods: Surface electromyography (EMG) of vastus medialis (VM) and lateralis (VL), biceps femoris (BF) and semitendinosus (ST) of 15 acute ACL-D (1-3 weeks post-injury) and 15 ACL-I matched controls was recorded during stair descent and anterior tibia translation. The movements of stair descent were divided into preactivation (PRE), weight-acceptance (WA) and push-off (PO) phases; reflex activity into preactivation, short, medium, and late latency responses. Kruskal-Wallis tests and post-hoc analyses (Dunn-Bonferroni corrected) were used to compare normalized root mean squares for each muscle, limb, movement, and reflex phase between groups ($\alpha = 0.05$).

Results: During PRE, hamstrings of the involved leg of ACL-D showed approximately 30 – 50% less activity compared to either leg of ACL-I (all significant). During WA and PO, VL of ACL-D (involved leg) revealed approximately 40% less activity compared to ACL-I ($p < 0.05$). Short latency response of BF and ST of ACL-D (involved leg) was 2 to 5 times significantly increased compared to ACL-I (matched, non-involved leg).

Conclusion: After acute ACL rupture, neuromuscular alterations are found in both legs during stair descent and reflex activity, emphasizing the need for early focus on neuromuscular control and bilateral treatment.

PERSISTENT CONCUSSION SYMPTOMS AND THE EFFECT ON QUALITY OF LIFE IN FEMALE ATHLETES – A QUALITATIVE STUDY.

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Introduction: Persistent concussion symptoms (PCS) can last for months or years and affect a significant number of people suffering from commotio cerebri.

Aim: This project highlights the influence PCS has on quality of life (QoL) in female athletes, including the importance of QoL in returning to sports.

Materials and methods: This project is a qualitative study. Empirical data is generated by semi-structured interviews, where the phenomenological and hermeneutic approach is used to gain insight into their life-world. The analysis is developed on the basis of the systematic text condensation of Malterud, in which the theory from Kajandi on QoL and coping strategies are being used to interpret the statements from the participants.

Results: The informants reported lower QoL due to the occurrence of PCS. Emerged themes in the interviews were Symptoms, QoL, Behavior change, Handling, and Sports life. Impact on social life and feelings of neglect in the handling from the health care system and in sports life. Self-awareness and energy management were highlighted as important in PCS management.

Conclusion: PCS is found to have a negative impact on the participants' QoL, especially on their identity, self-perception, social life, and physical activity in connection with sports. However, social support, acceptance of the condition, and self-awareness showed to help raise the QoL. As health professionals, we are responsible for informing early in the process about what options the patient has for interdisciplinary treatment.

CHARACTERISTICS OF FALLS AMONG WHEELCHAIR RUGBY AND WHEELCHAIR BASKETBALL PLAYERS IN THE RIO AND TOKYO PARALYMPIC GAMES: A VIDEO ANALYSIS

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Introduction: Falls during wheelchair sports are very serious, however, few research have been reported on wheelchair sports and falls.

Aim: To identify the fall characteristics of athletes in wheelchair rugby and wheelchair basketball during the Tokyo 2020 Paralympic Games and compare these with those of the Rio 2016 Paralympic Games.

Materials and Methods: We obtained video footage from the International Paralympic Committee of the Tokyo 2020 Paralympic Games that included 8 teams from each of the 18 wheelchair rugby and 10 wheelchair basketball games (men and women). The data were analyzed to evaluate the number of falls, class difference (low or high pointer), time of play during the fall, phase of play, contact with other athletes, fall direction, fall location, and the body part that first contacted the floor during the fall. These data from the Rio 2016 and Tokyo 2020 games were compared.

Results and Conclusion: Overall, 430 falls (rugby, 104; men's basketball, 230; and women's basketball, 96) occurred (average per game: 5.8, 23.0, and 9.6, respectively),

and the number of falls increased from Rio 2016. There were significant differences between the three sports in terms of type of fall, direction, site of fall, and body part contacted, but no difference in trend from Rio 2016. The Tokyo 2020 Games were characterized by a significant increase in the number of falls in low pointers in men's wheelchair basketball. Continuing to collect data on falls in wheelchair sports will allow for analysis of the mechanisms of falls and injuries.

AGE-RELATED HIP JOINT FLEXIBILITY AND HAMSTRING EXTENSIBILITY IN ADULT NONPROFESSIONAL TABLE TENNIS PLAYERS: AN EXPLORATORY CROSS-SECTIONAL STUDY

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Introduction: Flexibility of the lower extremity contributes to the movement pattern of table tennis strokes. Rotation of the hip joints is an important component for generating high force and acceleration during topspin forehand and backhand. Restricted extensibility of hamstring muscles has been demonstrated to predispose an individual to various musculoskeletal overuse injuries and influence an individual's functional level. Age-related differences of joint and hamstring flexibility have been established in various sports, however, information on table tennis is lacking.

Aim: To explore age-related hip range of motion (hip-ROM) and hamstring extensibility in adult table tennis players.

Materials and Methods: Twenty-two right-handed table tennis players (10 females, 12 males) volunteered to participate. They were divided into 2 groups (G1: ages 18-28 years; G2: ages 32-45 years). Hip-ROM was measured using a goniometer and hamstring extensibility was quantified using the sit-and-reach test. Test results were normalized to participant height and weight to express flexibility without units. Independent samples t-tests were used to analyze significance of differences between groups ($p \leq 0.05$).

Results: Significant differences between groups were found for passive (G1: 9.7 ± 2.1 versus G2: 7.7 ± 1.7 ; $p=0.03$) and active (G1: 9.4 ± 2.2 versus G2: 7.5 ± 1.6 ; $p=0.04$) external hip-ROM of the left leg.

Conclusion: Right-handed table tennis players aged 32-45 years seem to demonstrate decreased external hip-ROM of the left leg compared to players aged 18-28 years. Whether this decrease is an age-related, sport-specific functional adaptation and may influence stroke kinematics and kinetics needs to be further investigated.

IMMEDIATE EFFECTS OF HIP FOAM ROLLER AND STRETCH ON GOLFERS' DRIVING PERFORMANCE

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[Introduction]: It is evident that golfers are less likely to stretch as a warm-up (12.2%). In recent years, research papers have been scattered about the combination of foam roller and stretching (FR+ST) aimed at improving flexibility and performance. However, the effects of FR+ST on the performance of golfers has not been clarified.

[Aim]: The purpose of this study was carried out to examine the immediate effects of FR+ST to the leading hip on driving performance in golfers.

[Materials and Methods]: The subjects were 22 males. The study design was crossover design, and the subjects predetermined the exercises in both the FR+ST group and Swing (SW) group. The washout period was set at least one week. The evaluation items were ball speed, club speed, flight distance (carry), launch angle, and spin rate. Within group comparisons before and after exercise in each group and intergroup comparisons between the FR+ST and SW group were performed by paired t-test or Wilcoxon rank test. Significant differences were set at the level of .05.

[Results]: Flight distance and the spin rate were significantly greater after the exercise than before the exercise only in the FR+ST group ($p < 0.05$). A significantly higher value was observed only in the flight distance in the FR+ST group compared to that in the SW group.

[Conclusion]: It was suggested that FR+ST might be useful for increasing the flight distance. Between-group comparisons showed no significant differences other than in flight distance, suggesting that factors affecting flight distance need to be clarified.

EARLY OPEN KINETIC CHAIN ALLOWS BETTER MUSCLE STRENGTH RECOVERY AT TIME TO RETURN TO RUNNING AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

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Introduction: After anterior cruciate ligament reconstruction (ACLR), muscle strengthening is a key element in return to running (RTR) for athletes attempting to return to their sport.

Aims: To determine whether the early associated use of open kinetic chain (OKC) and closed kinetic chain (CKC) improved quadriceps and hamstring strength in athletes after ACLR. Secondary objective was to assess whether the early

use of OKC had an influence on graft laxity at 3 and 6 post-operative months.

Methods: This study (IRBN:PCE-06.18-038) included two groups (OKC+CKC group vs CKC group) of 15 athletes (26,5±5 years old, Marx score = 16, Tegner score ≥ 9) who had an ACLR with hamstring graft. OKC protocol were introduced at 4 weeks after ACLR (29.7± 8.4 days).

At 3 months (99.9±14.5 days), an evaluation of quadriceps and hamstring strength was performed by isokinetic device (60°.s-1). Peak torque (PT), limb symmetry index (LSI) and the relative peak torque (PT/WB) were calculated for the quadriceps and hamstring during isokinetic assessment. Comparative measurement of laxity, by GNRB, was performed at 3 and 6 postoperative months.

Results: Quadriceps and hamstring strength in the OKC+CKC group was higher than in CKC group for LSI (respectively p = 0,02 and p = 0,003) and for PT/WB (respectively p < 0,001; p < 0,001). At 3 and 6 months the laxity, there was no statistically significant difference.

Conclusion: Early combination of OKC and CKC may allow better correction of quadriceps and hamstring strength deficits for RTR without increasing graft laxity.

KINEMATIC DIFFERENCES IN THE SHOULDER GIRDLE DURING THE TENNIS SERVING MOTION BETWEEN THE STANDING AND SITTING POSITIONS

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[Introduction]: The serving motion of wheelchair tennis players be causing more shoulder injuries than that of tennis ones. This is thought to be partly due to changes in shoulder girdle motion caused by restricted movement of the lower limbs and trunk, but the differences in specifics are unclear. If this difference in movement can be clarified, it might help prevent injuries in the serving motion of wheelchair tennis players.

[Aim]: To compare the kinematics of the scapula and shoulder during the tennis serving motion between standing and sitting positions.

[Materials and Methods]: The shoulder girdle motion during tennis serve was measured in 22 able-bodied tennis players in standing and sitting positions with an electromagnetic tracking device (Liberty, Polhemus Inc.). The scapular motion relative to thorax, humerus motion relative to thorax, and humerus motion relative to scapular during cocking phase (from the arm elevation to the maximum external rotation) were calculated.

[Results]: In the sitting position, the scapular internal rotation displacement during the cocking phase was 7.2° greater (Standing: -3.6 ± 9.3°, Sitting: 3.6 ± 10.6°, p<0.01) and the scapular posterior tilt displacement was 2.6° less (Standing: 11.1 ± 7.7°, Sitting: 8.5 ± 5.4°, p<0.05) than in the standing position.

[Conclusions]: The scapular motion during the serving motion in the sitting position showed an increase in internal rotation and a decrease in posterior tilt compared to the standing position. The repetition of these movements may increase the incidence of shoulder joint injuries in wheelchair tennis players.

THE FIFA INJURY PREVENTION PROGRAMS REDUCE THE INCIDENCE OF GROIN INJURY: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

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Introduction: Groin injuries are among the most common and time-consuming injuries in sports. Consequently, implementing sports injury prevention programs (IPPs) such as the Fédération Internationale de Football Association (FIFA) 11, 11+ and modified 11+ has grown in interest lately.

Aim: To evaluate the effectiveness of IPPs such as 11, 11+ and modified 11+ in reducing the incidence of groin injuries among athletes.

Materials and Methods: This meta-analysis was based on the PRISMA protocol. Two investigators independently searched for relevant studies published from 1985 to 2022 using the following databases: Cochrane Library, PubMed, Web of Science, and PEDro. The keywords used in the search strategy were 'neuromuscular training', 'injury prevention programs', 'FIFA', 'groin injury', 'athlete', and combinations of these search terms. Included studies had to be randomized controlled trials using the 11, 11+ and modified 11+ IPPs. Studies not reporting specific groin injuries were excluded. The random-effects model by the RevMan Meta-Analysis software (version 5) was used in analyzing the extracted data.

Results: The pooled results of 9322 athletes showed 35% groin injuries reduction per 1000 hours of exposure compared to the control group with an injury risk ratio [IRR] of 0.65 (95% confidence interval [CI], 0.49–0.85).

Conclusion: This meta-analysis demonstrates that the 11, 11+, and modified 11+ IPPs decreased the risk of groin injuries among athletes.

INJURY PREVENTION PROGRAMS REDUCE THE INCIDENCE OF SPORT-RELATED HEAD INJURY: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

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Introduction: Sport-related head injuries, including concussion, are becoming a rising public health and sports medicine issue around the world. To avoid these injuries, it is necessary to investigate the effectiveness of injury prevention programs (IPPs) in reducing sport-related head injury.

Aim: To evaluate the effectiveness of IPPs in reducing the incidence of sport-related head injury among athletes.

Materials and Methods: Two investigators independently searched for relevant studies published from 1985-2022 using the following databases: Cochrane Library, MEDLINE, AMED, PubMed, Web of Science, and PEDro. The keywords used in the search strategy were 'neuromuscular training', 'injury prevention programs', 'FIFA', 'head injury', 'athlete', and variations of these search terms. Included studies had to be randomized controlled trials using IPPs for athletes with the primary outcome being head injury rate. There were no restrictions of age or playing level. The random-effects model was used in analyzing the extracted data by the RevMan Meta-Analysis software version 5.

Results: The pooled results of 10524 athletes showed 34% sport-related head injury reduction per 1000 hours of exposure compared to the control group with an injury risk ratio [IRR] of 0.66 (95% confidence interval [CI] 0.47–0.92).

Conclusion: This meta-analysis demonstrates that IPPs decreased the risk of sport-related head injury among athletes and therefore reducing healthcare costs and athletes' absenteeism.

INJURY PREVENTION PROGRAMS THAT INCLUDE BALANCE TRAINING EXERCISES REDUCE ANKLE INJURY RATES AMONG SOCCER PLAYERS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: The ankle is one of the most common sites of injuries among soccer players. There is evidence that the incidence of ankle injuries can be reduced by improving proprioception and ankle stability via balance training exercises.

Aim: This review aimed to investigate how ankle injury rates among soccer players are influenced by injury prevention programs (IPPs) that include balance training.

Materials and Methods: Two investigators independently searched for relevant studies using different elec-

tronic databases. The keywords used in the search strategy were "balance", "injury prevention programs", "ankle", "soccer". The main inclusion criteria were randomized controlled trials used IPPs that include balance training on soccer players without any restrictions of age or playing level, while the primary outcome was ankle injury rate. The random-effects model was used in analyzing the extracted data by the Comprehensive Meta-Analysis software version 3.

Results: Nine articles met the inclusion criteria. The pooled results of IPPs that include balance training exercises among 4,959 soccer players showed 36% ankle injury reduction per 1000 h of exposure compared to the control group with an injury risk ratio [IRR] of 0.64 (95% CI 0.54 to 0.77). Moreover, the pooled results of the Fédération Internationale de Football Association (FIFA) IPPs showed 37% ankle injury reduction [IRR 0.63; 95% CI 0.48 to 0.84], and balance-training exercises alone showed 42% ankle injury reduction [IRR 0.58; 95% CI 0.41 to 0.84].

Conclusions: This meta-analysis demonstrates that balance exercises alone or combined with an IPP decrease the risk of ankle injuries. PROSPERO CRD42017054450.

ACUTE PERIPHERAL FATIGUE INDUCES BRAIN ACTIVITY CHANGES DURING PREDEFINED AND REACTIVE BALANCE TASKS.

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Introduction: Decreased balance ability may increase injury risk. Also, acute physical fatigue (APF) affects balance performance. Recently, reactive balance tasks were developed to assess balance in a more sport related context. Furthermore, it is unknown if APF induces changes in brain activity during different balance tasks.

Aims: To study whether (1) APF fatigue alters brain activity during one predefined and one reactive balance task, and (2) performance on these balance tasks.

Materials and methods: Twenty healthy participants volunteered for this cross-over study. APF was induced through a 30-second modified Wingate-protocol. Brain activity was measured through electroencephalography during both balance tasks and computed by means of spectral power analysis. The predefined balance task was the Y-balance test (YBT), while the neurocognitive balance test encompassed the reactive balance test (RBT).

Results: Decreased RBT accuracy was observed after APF ($p < 0.05$), yet YBT performance and RBT visuomotor reaction time remained unaffected. APF induced α - and β -spectral power increments in the prefrontal, motor and posterior parietal cortex during YBT performance ($p < 0.05$). For the RBT, an α -spectral power increment in the posterior parietal cortex and a β -spectral power increment in the prefrontal cortex were observed due to APF ($p < 0.05$).

Conclusions: APF induces different changes in brain activity during both balance tasks. It is likely that different central mechanisms are affected depending on the type of balance task. Further research is needed in an applied set-

ting to gain insight in the possible interaction between APF and injury occurrence.

RELATIONSHIP BETWEEN THE MORPHOLOGY OF THE INTRINSIC FOOT MUSCLES AND PLANTAR FASCIA AND THE BALANCE INDEX DURING SINGLE-LEG DROP LANDING

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[Introduction]: In recent years, it has been found that muscle cross sectional area (mCSA) of intrinsic foot muscles and plantar fascia (PF) thickness are related to static posture maintenance ability. However, it is unclear whether the intrinsic muscles and plantar fascia is related to the ability to shock absorb during landing.

[Aim]: The aim of this study is to investigate the relationship between the morphology of the intrinsic foot muscles and PF and the ability to shock absorb during single-leg drop landing.

[Materials and Methods]: For the 21 subjects, mCSA [mm²] of the abductor hallucis, flexor hallucis brevis (FHB), and flexor digitorum brevis and PF thickness at the heel [mm] were measured with an ultrasound imaging system. The subject performed a single-leg drop landing on a force plate from a height of 20 cm, and the peak vertical ground reaction force (peak-vGRF) [%BW], peak onset time [ms], rate of force development [%BW/s], and the center of pressure (COP) length [%foot length] were calculated. Pearson's or Spearman's rank correlation coefficient was used for statistical analysis. The significance level was set at 5%.

[Results]: A significant negative correlation was found between mCSA of the FHB and peak-vGRF ($r = -0.47$, $p = 0.03$), and between PF thickness and the COP length ($r = -0.51$, $p = 0.02$).

[Conclusions]: The mCSA of the FHB and the PF thickness might be related to the shock-absorbing effect and postural control after landing, respectively.

DEVELOPMENT OF A PREDICTION MODEL FOR RE-INJURY AFTER BEING CLEARED TO RETURN TO WORK FROM INJURY

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Introduction: Musculoskeletal injuries cause 10 million medical visits every year and the primary cause of attrition

and medical separation in the US military. Properly returning soldiers to full duty after injury is important for reducing long-term sequelae and re-injury risk.

Aim: The purpose of this study was to develop a prediction model for re-injury after being cleared for full duty after an injury.

Materials and methods: A cohort study to develop an injury prediction model. Soldiers cleared for unrestricted full military duty from 3 large military hospitals after sustaining a musculoskeletal injury were enrolled. Medical history, demographics, physical performance (Y-Balance TestTM, Functional Movement ScreenTM, triple hop, closed chain ankle dorsiflexion, 2-mile run, 75% bodyweight carry time), and past injury history were assessed. Monthly text messages to soldiers and medical records were used for injury surveillance.

Results: 469 soldiers (65 females), ages 18-45 participated. 15 variables were included in the model. The Area Under the Curve was 0.74(95CI: 0.69-0.80), indicating good performance. The calibration score of the model was 1.02(95CI: 0.95-1.09) indicating very good performance. With an injury incidence in our cohort of 38.0%, the treat all net benefit was 0.000, and the net benefit of our predictive model was 0.251. This means 25 additional soldiers were correctly identified as high risk for injury compared to not using a prediction model at all.

Conclusion: This multivariable model accurately predicted injury risk, providing guidance for decision-making about when soldiers are ready to return to full duty with lowest risk of subsequent injury.

SOCCER-RELATED INJURIES PRE- AND POST-COVID-19 LOCKDOWN: A PROSPECTIVE EPIDEMIOLOGICAL STUDY

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Introduction: The Coronavirus disease (COVID-19) caused a global lockdown, followed by the Ministry of Sports announcing suspension of all sports activities, which has forced soccer players to train indoor or stop training.

Aim: The purpose of this study was to evaluate the consequences of COVID-19 lockdown on the injury rate among soccer players.

Materials and Methods: A total of 45 soccer teams (630 players) competing in the amateur leagues, were followed for two seasons (pre- and post-COVID-19 lockdown). The medical staff of participating teams were requested to report all injuries during matches and/or training. Exposure during all matches and training were calculated.

Results: The incidence of soccer-related injuries significantly increased post COVID-19 lockdown by 47.25% among amateur soccer players.

Conclusion: This study indicates that COVID-19 lockdown has an impact on the overall injuries among soccer players.

ADAPTABILITY AND NEUROCOGNITIVE FUNCTIONAL PERFORMANCE: PHYSICAL FATIGUE NEGATIVELY AFFECTS ACCURACY IN THE REACTIVE BALANCE TEST.

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Introduction: Adaptability and neurocognitive performance tests have recently been put forward as relevant concepts within the functional performance spectrum. Physical fatigue is known to decrease an athlete's functional test performance, but to date it is not known if acute physical fatigue affects adaptability and neurocognitive performance tests.

Aim: To assess the impact of acute physical fatigue on traditional and neurocognitive functional performance tests (FPT) in healthy recreational athletes.

Materials and Methods: We included twenty recreational athletes (age = 24 ± 3 years) in a randomized counterbalanced cross-over study. We evaluated fatigue impairments following a 30 second all-out effort in three traditional and one neurocognitive FPT. The traditional FPT encompassed the single leg hop for distance (SLH), counter-movement jump (CMJ) and Y-balance test (YBT). The neurocognitive FPT encompassed the reactive balance test (RBT). A 30 second modified Wingate was used to induce acute physical fatigue.

Results: Acute physical fatigue was successfully induced as indicated by a significant increase in heart rate, systolic blood pressure, blood lactate levels and rating of perceived exertion ($p < 0.001$). Acute physical fatigue induced significant decreases in RBT accuracy ($p = 0.004$) and SLH performance ($p < 0.001$). YBT, CMJ and RBT visuomotor reaction time remained unaffected by acute physical fatigue.

Conclusions: Acute physical fatigue decreases accuracy in the RBT and impairs SLH performance. YBT and CMJ performance remained unaffected by acute physical fatigue. Clinicians should be aware of this divergent neurocognitive functional impairments caused by one all-out effort to allow well-informed selection of functional performance tests.

2D KINEMATIC ANALYSIS SOFTWARE: RELIABILITY AND APPLICATION IN RUNNING

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Introduction: Runners perform gait analyses for preventing injury and/or improving performance. This mainly consists of kinematics assessments which need to be reproducible for consistent data interpretation.

Aim: To assess the reproducibility of the relevant parameters measurement in the frontal/sagittal planes using the Simi-Aktisys®-2D software, at 3 stages of the running cycle: Initial contact (IC), Midstance (MS) and Toe-off (TO).

Materials and Methods: 18 active subjects were equipped with 5 active markers in the frontal and sagittal planes and then alternatively evaluated 4 times (twice/day, two days) by two random investigators. Each run lasted 90s at their comfort speed on a treadmill whilst twelve running kinematics variables were recorded. Intra- and inter-rater reliabilities of measured parameters were calculated using absolute differences and intraclass correlation coefficients (ICC). ICC were interpreted as poor (< 0.5), moderate (0.5–0.75), good (0.75–0.9) or excellent (> 0.9). The standard error of measurement (SEM) and smallest detectable difference (SDD) were calculated.

Results: Intra-rater intra-day reliability was excellent for all variables at each stage, except for trunk angle at TO (ICC=0.78) and crossover at MS (ICC=0.73) for which it was respectively good and moderate. Inter-rater intra-day reliability was moderate to good for all variables at IC and MS stages, but moderate to poor at TO. Intra-rater inter-day reliability was moderate to good, but poor at TO for femoral adduction (ICC=0.48) and pelvis angle (ICC=0.42).

Conclusion: The Simi-Aktisys®-2D software can be reliably used for running gait analyses at IC and MS stages, but not at TO.

MIND THE GAP: PROPERTIES OF THE BONE-PATELLAR TENDON-BONE (BPTB) GRAFT HARVEST SITE FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION (ACLR)

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Introduction: Using BPTB autografts for ACLR comes with a cost. Patients who receive BPTB grafts experience prolonged quadriceps weakness and anterior knee pain impacting rehabilitation. Altered tendon structure may explain this morbidity.

Aim: To investigate the morphological and viscoelastic properties of the central (graft site) and adjacent regions of the patellar tendon 1.3±0.3months after ACLR.

Materials and methods: Four men and six women (22±8years-old, BMI:25.3±4.5kg/m², Quadriceps Strength

Index:40±18%) were included. Morphology (thickness) and viscoelastic properties (shear modulus and viscosity) were collected bilaterally from the graft site (central), and adjacent tendon (medial, lateral) using ultrasound and continuous shear wave elastography. Limb(2) by region(3) repeated measures ANOVA were performed for thickness, shear modulus, and viscosity.

Results: A 2-way interaction effect ($p < 0.001$) was observed for thickness characterized by thicker tendon in the involved versus uninvolved limb. The central region displayed the largest difference between limbs (mean difference=0.37cm), followed by the medial (mean difference=0.19cm) and lateral (mean difference=0.10cm) regions. Main effect of region on shear modulus ($p=0.049$) was observed. No specific direction of the effect, however, was identified likely due to the large spread in data. No significant findings were observed for viscosity.

Conclusion: The patellar tendon after BPTB graft harvest was thicker, possibly due to collagen fiber proliferation, and the asymmetry in thickness was as expected, not uniform across the tendon. For viscoelastic properties, a less clear pattern emerged. Viscoelastic properties seem to not be uniform across the patellar tendon regardless of side, the details of which will be investigated in the future.

PREDICTIVE MODELS FOR MUSCULOSKELETAL INJURY RISK: WHY STATISTICAL APPROACH MAKES ALL THE DIFFERENCE

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Introduction: Prediction models are derived to better understand injury risk, but poor methodology is common.

Aim: To compare performance between injury prediction model that did and did not categorize predictors, and to compare selection of predictors for a final model when using univariable significance versus assessing non-linear relationships.

Materials and methods: This was a validation and replication of a previous prospective prediction model. A cohort of 1466 healthy military service members followed for one year after physical performance, medical history, and sociodemographic variables were collected. The first model was the original model which dichotomized 8 predictors. The second model (M2) included the 8 original predictors and the third model (M3) included 15 predictors. For M2 and M3, continuous predictors were kept continuous and were assessed for non-linearity. Model performance was assessed with R², calibration slope, and discrimination. Decision curve analysis was performed with risk thresholds from 0.25 to 0.50.

Results: 478 personnel sustained an injury. The original model demonstrated poorer R² (Original:0.07; M2: 0.64; M3: 0.65), calibration slope (Original:0.86 (0.62,1.10); M2: 0.93 (0.77,1.09); M3:0.90 (0.75,1.05)), and discrimination

(Original:0.62 (0.58,0.66); M2: 0.90 (0.89,0.92); M3:0.90 (0.89,0.92)). At 0.25 injury risk, M2 and M3 demonstrated a 0.47 net benefit improvement, at 0.50 injury risk, M2 and M3 demonstrated a 0.36 net benefit improvement compared to the original model.

Conclusion: Model performance was substantially worse in the original model, resulting in very poor performance compared to the other two models. This highlights the importance of following established recommendations when developing prediction models.

DOES THE USE OF I-FACTOR BONE GRAFT AFFECT BONE HEALING IN THOSE UNDERGOING PERIACETABULAR OSTEOTOMY (PAO) FOR HIP DYSPLASIA?

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Introduction: Periacetabular osteotomy (PAO) is a common treatment for hip dysplasia. Bone union post-operatively is important for success.

Aim: To compare, in patients with and without the use of i-FACTOR bone graft during PAO surgery for hip dysplasia,

1. bone healing at six-weeks post-operatively
2. rate of complications.

Methods: Design: Retrospective review of case records.

Participants: Patients aged 15-50 years undergoing PAO surgery for hip dysplasia. Group 1: patients with i-FACTOR, Group 2: No i-FACTOR.

Primary outcome: Rate of bone healing on radiographs at 6-weeks.

Data Analysis: Likelihood of bone healing was compared using logistic regression with Generalised Estimating Equations and expressed as odds ratios (OR) (95% confidence intervals (CI) and p values). The occurrence of complications was extracted from surgical records.

Results: The i-FACTOR group had 3-times greater odds of partial/full union than those without ((adjusted OR 3.3 (95%CI: 1.032-10.330, $p=0.044$)). The i-FACTOR group had 89% partial/full union at 6-weeks, compared to 69% of the non-i-FACTOR group. Half of patients had leaking of bone graft in the i-FACTOR group versus 10% in the non-i-FACTOR group. Nearly a third (26%) of the i-FACTOR group and 12% of the non-i-FACTOR group had neuropraxia of the lateral femoral cutaneous nerve (LFCN).

Conclusion: Patients undergoing PAO surgery for hip dysplasia with i-FACTOR had 3-fold greater odds of partial/full bony union six-weeks post-operatively compared to those without i-FACTOR. The prevalence of complication

rates was low; however, the rate of LFCN neuropraxia and bone graft leakage was higher in the i-FACTOR group.

PHYSICAL IMPAIRMENTS IN ADULTS WITH DEVELOPMENTAL DYSPLASIA OF THE HIP (DDH) UNDERGOING PERIACETABULAR OSTEOTOMY (PAO): A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: The most common surgical treatment for DDH is PAO. It is unclear if physical impairments exist in patient's undergoing PAO.

Objective: To investigate if physical impairments change in adults with DDH pre- to post-PAO, and to compare with asymptomatic participants.

Methods:

- Systematic review with meta-analysis.
- A literature search was performed in five databases
- Studies were considered if patients were above 15 years, treated with PAO for DDH and if they reported physical impairment outcomes.
- Two independent reviewers performed data extraction and assessed methodological quality.

Results: Of 5,017 studies, 24 were included with 2190 patients. The methodological quality scores ranged from 39% to 88%. With low level of evidence, meta-analysis showed 58% (95%CI: 39-76%) of patients had a positive anterior impingement test, pre-PAO and 1-3 years later. Five years after PAO, the proportion fell to 17% (95%CI: 11-24%). Prior to PAO, patients with DDH walked with a lower peak hip extension angle, compared to asymptomatic participants (SMD 0.65 (95%CI 0.21-1.10)).

Best evidence synthesis of non-pooled data showed limited evidence of increased walking velocity, stride length and improved hip flexion and extension moment 18-months post-PAO compared to pre-op. Cadence, hip abduction and hip flexion strength did not change pre- to post-PAO.

Conclusion: Prior to PAO, most patients with DDH have a positive anterior impingement test. Compared to asymptomatic participants, patients with DDH demonstrate physical impairments during walking which appear to improve after surgery.

REHABILITATION STRATEGIES FOR LATERAL ANKLE SPRAIN DO NOT REFLECT ESTABLISHED MECHANISMS AND RISK FACTORS FOR RE-INJURY: A SCOPING REVIEW

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Introduction: Many athletes suffer recurrent lateral ankle sprain (LAS) on return to sport. Common inciting events for re-injury include changing direction and jumping/landing; this is often mediated by excessive supination at initial contact and/or delay in Peroneus muscle activation. To optimally reduce the risk of recurrent LAS, rehabilitation interventions must reflect the aetiology and mechanisms of these injuries.

Aim: Determine if rehabilitation programs in the current literature address common impairments and mechanisms underpinning recurrent LAS

Materials and methods: We searched six electronic databases. Inclusion criteria were RCT's including patients with acute LAS, managed through exercise-based rehabilitation. Each exercise was categorised by the primary impairment(s) addressed (muscle strength, mobility, neuromuscular training, joint positional sense), and by its: direction of movement (uni- vs multiplanar); base of support (single vs double limb); open vs closed chain; and use of a flight phase.

Results: The most addressed impairment was sensorimotor function (48%), followed by plantar flexion muscle strength (29%), and sagittal plane mobility (14%). Most exercises were limited to the sagittal plane (48%), with only 30% incorporating multiplanar movements. Two thirds of exercises (118/177) involved closed kinetic chain training, of which, half were undertaken on single leg (59/120). Just 18% of all exercises (33/177) incorporated a flight phase.

Conclusion: Rehabilitation strategies for LAS largely comprise simple exercises that do not reflect established mechanisms and risk factors associated with re-injury. Future interventions can be enhanced by incorporating more open chain joint position sense training, multiplanar single limb challenges, and jumping and landing exercises.

THE FOREFOOT TRANSVERSE ARCH AND DYNAMIC POSTURE STABILITY CLASSIFIED BY MATURITY OFFSET IN JAPANESE ADOLESCENT ATHLETES

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Introduction: The peak height velocity (PHV) at the adolescent is known as individuals and effect the musculoskeletal development and physical performance, yet the relationship between foot morphological characteristics and physical performance in accordance with maturity level is not discussed.

Aim: We aimed to investigate the differences the foot morphology and balance ability regarding the PHV.

Materials and methods: 43 male adolescent athletes were participated in the study. They were divided three groups; pre-PHV(Chronological age: 12.0±1.3 years), circa-PHV(13.3±0.7 years), post-PHV(15.0±1.3 years) regarding on the maturity offset (Sluis et al., 2014). Navicular height and forefoot transversal arch height/width were measured as a foot morphological assessment. Dynamic postural stability index (DPSI) was measured as a dynamic balance assessment. The higher value of DPSI indicates instability.

Results and Conclusion: Variation of the navicular height was not significantly differences between groups ($p=0.98$). Regarding the foot transverse arch, changing of medial sesamoid height was significantly increased in post-PHV compared than pre-PHV($p<0.05$). In addition, changing of width between lateral-sesamoid and second metatarsal head was significantly increased in post-PHV compared with circa-PHV($p<0.05$). DPSI was significantly increased in post-PHV compared with circa-PHV($p<0.05$). The value of maturity offset was significantly positive correlated with DPSI($p<0.05$). Our findings suggest that there were difference foot morphological characteristics and dynamic posture stability classified based on maturity offset. Further, the foot morphology change caused by weight bearing might be more common in the forefoot. We would conduct the prospective study to clarify the causal relationship between these factors.

ONLINE INFORMATION ABOUT THE MANAGEMENT OF ANTERIOR CRUCIATE LIGAMENT RUPTURES IN AUSTRALIA: A CONTENT ANALYSIS

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Introduction: Most people who suffer an anterior cruciate ligament (ACL) injury search for information online.

Aim: Summarise the proportion of webpages on ACL rupture management that present evidence-based information.

Materials and Methods: We examined webpage information on ACL ruptures identified through (1) Google searches using terms synonymous with 'anterior cruciate ligament rupture' and searching 'knee surgeon' linked to

each Australian capital city, and (2) websites of professional associations. The primary outcome was the proportion of webpages that suggest people can return to at least some form of sport with non-surgical management. Secondary outcomes included webpage information on return to sport with ACL reconstruction (ACLR) and non-surgical management, benefits, harms, and risk of osteoarthritis related to these options, and activity modification.

Results: Out of 115 webpages analysed, 48% suggested people can return to at least some form of sport with non-surgical management. Almost half of webpages suggested most people will return to some form of sport following ACLR (41%) and mentioned benefits of ACLR (43%). Fewer webpages mentioned benefits of non-surgical management (14%), approximately two in three people return to pre-injury level of sport following ACLR (4%), risk of re-injury following ACLR (23%), most people return to sport within 9 months of ACLR (27%), activity modification as a management approach (20%), and ACLR will reduce the risk of osteoarthritis (23%).

Conclusion: Most online information on ACL rupture management isn't aligned with the best available evidence. Inaccurate information could mislead patients' treatment choices and create unrealistic expectations for return to sport.

PAIN PROVOCATION TESTS AND CLINICAL ENTITIES IN MALE FOOTBALLERS WITH LONGSTANDING GROIN PAIN: RELATIONSHIPS TO PAIN INTENSITY AND DISABILITY

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Introduction: Pain provocation tests are used to examine and classify longstanding groin pain into clinical entities (adductor-, iliopsoas-, inguinal- or pubic-related). It is unknown how pain provocation tests and clinical entities relates to self-reported pain intensity and disability.

Aim: To investigate how the number of positive pain provocation tests and clinical entities correlate with pain intensity and disability measured by the Copenhagen five-second squeeze test (5SST) and the Hip And Groin Outcome Score (HAGOS), respectively.

Materials and methods: Both groins of forty male footballers (mean 24 [SD: 3.2] years; 182 [5.7] cm; 78 [6,6] kg) with longstanding groin pain for median 8.5 (IQR: 4-36) months were examined and classified into number of clinical entities (0-7) based on findings from 33 pain provocation tests.

Results: 21/40 footballers had ≥ 10 positive pain provocation tests. 118 clinical entities were classified in 35/40 footballers. The number of positive tests (range 2-23) cor-

related with pain intensity (5SST $r = 0.70$ [95% CI: 0.50, 0.83]) and disability (HAGOS subscales Pain $r = -0.38$ [95% CI: -0.69,-0.06], Symptoms -0.52 [-0.73, -0.24], ADL -0.48 [-0.71, -0.18], Sport -0.62 [-0.81;-0.36]). The number of classified clinical entities (range: 1-7) showed similar but weaker correlations to pain intensity and disability.

Conclusion: In footballers with longstanding groin pain, the number of positive pain provocation tests and clinical entities correlate weak to strongly with pain intensity and disability. Consequently, when pain and disability is severe, patients are more sensitive to pain provocation tests and have more clinical entities.

FEASIBILITY AND ACCEPTABILITY OF EXERCISE THERAPY FOR TENDINOPATHY: A CONVERGENT SEGREGATED MIXED METHODS SYSTEMATIC REVIEW

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Introduction: Tendinopathy is frequently managed using exercise therapy. For exercise to be effective, it needs to be feasible to deliver, and acceptable to those undertaking it. No synthesis of the research evidence on feasibility and acceptability of exercise for tendinopathy management has been conducted to date.

Aim: To synthesise the qualitative and quantitative evidence on feasibility and acceptability of exercise for tendinopathy management.

Materials and Methods: Convergent segregated mixed-method systematic review using JBI methodology and following an a priori registered protocol. Eligibility criteria included: i) Participants aged ≥ 18 with any location or severity of tendinopathy; ii) studies exploring any aspect of feasibility of delivering and/or acceptability of undertaking exercise for tendinopathy from patients' or providers' perspectives; iii) studies conducted in any country ranked very high in the human development index and published from 1998 to 2021.

Results: Ninety-six reports (85 quantitative; 11 qualitative) from 94 studies representing 4,211 participants and 20 countries were included in the review. Quantitative findings demonstrated that self-reported adherence and attendance to supervised exercise was good (70-80% and 90% respectively), that fidelity was seldom reported, and that exercise therapy for tendinopathy was considered acceptable, when reported. Qualitative findings highlighted the need for an individualised person-centred approach facilitated by a strong therapeutic alliance and the provision of appropriate patient education.

Conclusion: Physiotherapists should be aware of the potential barriers and facilitators to engaging with exercise for

tendinopathy, the impact of patients' and physiotherapists' prior beliefs, and the importance of education, self-management and the patient-physiotherapist relationship.

QUANTIFYING GENDER DIFFERENCES AFTER AN ANTERIOR CRUCIATE LIGAMENT INJURY: A SYSTEMATIC REVIEW AND META-ANALYSES OF 122,839 ADOLESCENTS AND YOUNG ADULTS

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Introduction: Evidence suggests gender differences exist after anterior cruciate ligament (ACL) injury despite surgical management and rehabilitation.

Aim: To investigate gender differences in self-reported activity and knee-related quality-of-life after ACL injury.

Methods: We searched eight electronic databases to December 2021. Observational or interventional studies of ≥ 10 women and 10 men were included if they reported gender-stratified data and/or gender analysis on a valid self-report measure of activity or knee-related quality-of-life after ACL injury. We performed meta-analysis with GRADE level of evidence.

Results: We included 246 studies ($n=122,839$, 43% women, mean age 26 years). 107 studies reported sufficient data to contribute to one of 36 meta-analyses. After ACL injury, low-certainty evidence shows that women had 23-25% reduced odds of returning to pre-injury sport within 1-year post ACL injury and/or reconstruction (44 studies, OR 0.75 95%CI 0.62, 0.91), 1-5 years (OR 0.76 95%CI 0.70, 0.83) and 5-10 years (OR 0.77 95%CI 0.57, 1.04) compared to men. This corresponded with a clinically meaningful inferior 10-point difference on the KOOS-Sport/Rec subscale within the first post-injury year (low-certainty evidence pooled SMD -0.30 95% CI -0.35, -0.26). Low-certainty evidence suggests women experienced inferior knee-related quality of life on most (21/28; 75%) knee-related quality of life meta-analyses, although most were not clinically significant (i.e., failed to reach minimal clinically important difference).

Conclusions: Low-certainty evidence suggests inferior outcomes for women compared to men after ACL injury. Women benefit from gender-specific rehabilitation (e.g., access, social support, strength training) to enhance post-injury outcomes. Future studies should report/and analyse outcomes by gender.

LONG-TERM PROGNOSIS OF INDIVIDUALS WITH PLANTAR HEEL PAIN

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Introduction: Plantar heel pain (PHP) used to be considered a self-limiting condition, where pain was thought to resolve within a year after onset. However, several studies with varying quality of outcomes and small sample-sizes have questioned the benign nature of PHP.

Aim: To explore the long-term prognosis of individuals treated for PHP.

Materials and Methods: Patients treated for PHP at Aalborg University Hospital between 2011-2018 were asked to complete online questionnaires. Data were collected from participants in 2021-2022. Questionnaires included demographic and participant characteristics, heel pain during the past 4 weeks, mean pain intensity during the past week (0-10 numerical rating scale), work situation, comorbidities, and the EQ5D.

Results: So far, 300 individuals completed the questionnaires (45% response rate). Mean age was 54 years (± 12) and median period of PHP was 18 months (IQR 6-50). At follow-up, 53% (95%CI 47-59%) still reported PHP during the past week with a median pain intensity of 5 (IQR 3-7). 76-86% of these reported concomitant musculoskeletal pain. Among those still experiencing PHP, 10% changed their work assignments, and 19% took sick leave due to PHP (median days off work 21 (IQR 7-70)), and 19% reported depressive symptoms on the EQ5D.

Conclusion: Despite specialised care, more than half the participants still reported PHP up to 10 years after treatment. The condition was associated with changed work assignments and sick leave among participants still experiencing PHP. These results emphasise the substantial impact and burden PHP has on individuals and highlights the need for more effective treatments.

INFLUENCE OF HIP ABDUCTOR STRENGTH ON PELVIS AND KNEE POSITION DURING A SINGLE-LEG LANDING TEST

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Introduction: Knee-straining sports increase the risk of anterior cruciate ligament (ACL) injuries. Therefore, current research focuses on identifying and minimizing possi-

ble modifiable risk factors and improving injury prevention programs, like the influence of gluteus muscles on the leg axis during landing tasks.

Aim: The aim of this study was to investigate whether the hip abductor strength has an influence on the biomechanics of the pelvis and knee position in the frontal plane during a single-leg landing task.

Materials and methods: 28 healthy participants performed a single leg landing test (LT). The the sway maximal amplitude medial-lateral (SMA m-l) during LT were recorded using a force plate. During LT additionally, knee and pelvic-thigh angles were estimated using a 2D video analysis. The participants were manually tested for hip abductor strength (microFET®2).

Results: The Pearson correlation between the pelvic-thigh angle at LT and the hip abductor strength was ($r=0.18$, $p=0.21$). The pelvic-thigh angle and knee angle showed no correlation to the SMA m-l ($r=-0.01-0.09$). The correlation between pelvic-thigh and knee angle was $r=0.76$ ($p<0.01$).

Conclusion: Neither knee position during landing or pelvic-thigh angle are predictive values for the subjects' stability and control during landing. The pelvic-thigh angle at landing test cannot be explained by a strength status of the hip abductors. The implementation of motor learning and the use of a feedforward strategy, aiming to decrease valgus moments in landing might be of further interest for the determination of gluteus muscles role during landing tasks.

BREAKING DOWN BREAKDANCE

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Introduction: Breakdance becomes an Olympic sport in 2024, however there is minimal literature on injury epidemiology and no literature on training history or normative data.

Aim: The purpose of this study was to describe injury and training profiles, along with the results of a short performance test battery in a group of professional breakdancers (breakers).

Materials and Methods: Fourteen professional breakers attended a training summit that included a performance test battery. Injury and training history were obtained through interview. Injuries were classified by body part and injury type. Isometric hip abduction/adduction (at 30° hip flexion) and shoulder external/internal rotation (at 90° shoulder abduction) strength were tested using fixed dynamometers. Counter movement jumps were tested using force plates (2000 Hz). Descriptive statistics were used.

Results: Breakers were 24.1 ± 5.4 years old, with 12.6 ± 4.1 years experience breaking. On average the breakers trained 27.2 ± 10.4 hours per week, 7.0 ± 7.1 hours were dedicated to non-breaking training modalities. There were an average of 3.2 injuries per breaker. The most commonly injured body

part was the knee. Categorized by injury type, joint injuries were most common at the knee, and muscle injuries most common at the thigh. Strength and counter movement jump data are presented on the infographic.

Conclusions: The results of this study highlight the importance of developing injury prevention strategies for breakers. Although a small sample, this study provides the first functional data on breakers. These findings can inform future rehabilitation, screening batteries, and preventive efforts.

A PILOT OBSERVATIONAL STUDY TO IDENTIFY THE NUMBER AND TYPE OF TRAINING AND COMPETITION INJURIES IN MIXED MARTIAL ARTS (MMA)

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Introduction: Mixed-martial arts (MMA) has become one of the most popular sports globally over the last 30 years, however there is a limited understanding as to the number and type of injuries that occur in the sport.

Aim: To identify the number and type of injuries that are sustained in MMA across training and competition and see how this compares to other combat sports. The intention to better understand the number and type of injuries in the sport aims to assist practitioners to enhance safety measures within the sport.

Materials & Methods: A pilot cross-sectional retrospective observational cohort design collected and reported on the clinical injury history (42 weeks) of 32 professional MMA athletes. Medical record data included: age, weight, diagnosis, mechanism, exposure type and training information related to session, training phase and technical theme.

Results: 93 injuries were reported, 78.5% from training and 15.1% from competition. 92.31% of competition injuries resulted from striking: fractures (38.46%), concussion (15.38%) and ligamentous (15.38%) injuries were the main type. Training injuries were primarily caused by grappling (61.54%): discogenic (20%), ligamentous (18.46%) and articular (15.38%) were most prevalent. The head and face (69.23%) were most injured in competition and upper limb (23.08%) in training.

Conclusion: MMA demonstrates differences in training and competition injuries by type and location, reflective of characteristics of injuries observed in MMA and other combat sport styles. There are several limitations of this study which limits its extrapolation of results. Further research should be conducted more longitudinally and on larger populations.

DOES LAND-BASED EXERCISE-THERAPY IMPROVE PHYSICAL ACTIVITY IN PEOPLE WITH KNEE OSTEOARTHRITIS? A SYSTEMATIC REVIEW WITH META-ANALYSES.

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Aim: We aimed to investigate the effects of exercise-therapy on physical activity in people with knee osteoarthritis (KOA).

Methods: Systematic review and meta-analysis of randomised controlled trials investigating land-based exercise-therapy on physical activity, fitness and general health in people with KOA. We updated a Cochrane review (2013) search on exercise-therapy for KOA in April 2021 and applied the Cochrane Risk-of-Bias Tool to included articles. Standardised mean differences (SMDs) and 95% confidence intervals (CI) were calculated. GRADE was used to assess certainty of the evidence.

Results: Twenty-three trials (2789 participants) evaluating the effects of resistance-training (n=10), walking (n=6) and mixed-exercise programs (n=7) were identified.

Low to moderate certainty evidence indicated small increases in physical activity for exercise-therapy compared to non-exercise interventions in the short-term (SMD, 95% CI = 0.29, 0.09 to 0.50), but not the medium- (0.03, -0.11 to 0.18) or long-term (-0.06, -0.34 to 0.22). Low certainty evidence indicated large increases in physical activity for walking programs (0.53, 0.11 to 0.95) and mixed-exercise programs (0.67, 0.37 to 0.97) compared to non-exercise in the short-term. Low and very low certainty evidence indicated moderate and small increases in physical activity for exercise-therapy combined with non-exercise compared to non-exercise alone at medium- (0.45, 0.19 to 0.71) and long-term (0.29, 0.01 to 0.69).

Conclusion: Walking and mixed-exercise, but not resistance-training, may improve physical activity in people with KOA in the short-term. Combining exercise-therapy with education or behaviour change techniques may increase physical activity in the long-term, although the evidence is very uncertain.

FORCE AND MOMENT ARM DISTRIBUTION BETWEEN THE VASTUS MEDIALIS AND LATERALIS IN ADOLESCENTS WITH PATELLOFEMORAL PAIN

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Introduction: Alteration in the force distribution among quadriceps heads is one possible underlying mechanism of patellofemoral pain. Currently, no non-invasive experimental techniques can measure individual muscle force in vivo in humans. However, individual muscle force can be approximated from a combination of biomechanical and muscle activation measures under specific conditions.

Aim: To determine whether the force, torque distribution, or resting moment arms relative to the patellar centre of the vastus medialis and lateralis differ between adolescents with and without patellofemoral pain.

Material and Methods: Twenty adolescents with patellofemoral pain and 20 matched control participants were included. We quantified muscle volumes and resting moment arms from magnetic resonance images and fascicle lengths from panoramic ultrasound. Muscle activation was estimated using surface electromyography during submaximal isometric wall-squat and seated tasks. We estimated the muscle forces as the product of muscle physiological cross-sectional area and activation. Muscle torques were estimated as the product of the moment arm and force.

Results: Across force levels, the force ratio (vastus medialis over vastii) was $33.7 \pm 7.7\%$ for controls and $33.7 \pm 9.1\%$ for adolescents with patellofemoral pain. No group differences in the distribution of vastus medialis and lateralis force, torque or moment arm were identified (group effect: $p > 0.36$, > 0.34 , $= 0.83$, respectively).

Conclusion: Although a relative loss of vastus medialis strength has been associated with patellofemoral pain in adults, we provide no evidence that lower vastus medialis (relative to vastus lateralis) force or torque generation exists in adolescents with patellofemoral pain for the tasks and positions investigated in our study.

MANUAL ESTIMATION OF HIP ABDUCTOR STRENGTH – A PRACTICAL ALTERNATIVE TO CONVENTIONAL ASSESSMENT TOOLS?

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Introduction: Information about gluteus muscles strength, symmetry or pain are of interest in many sport settings. Various studies have proven the reliability of handheld dynamometers for measuring isometric muscle strength. However, in clinical practice, this requires the availability of a device-based assessment tool in every situation.

Aim: The study aimed to assess the validity of hip abductor muscles strength between-limbs differences estimation subjectively done by the examiner by relating it to handheld dynamometry.

Materials and methods: 28 healthy participants were tested in terms of the strength of hip abductor muscles using manual muscle testing and a handheld dynamometer MicroFET®2. Three repetitions in a supine position using each method were carried out bilaterally by the same examiner. The between-limbs differences expressed in percentages (%) determined using the two assessment methods were statistically analysed in terms of a relationship by a linear Pearson's correlation coefficient (r) and coefficient of determination.

Results: The handheld dynamometer testing showed excellent reliability ICC [0.89-0.94]. The correlation between the hip abductor force ratio and the tester's self-assessment was $r = 0.57$ ($p < 0.05$), with binominal correctly asymmetry detection in 85%. Hip abductor strength was in average overestimated by 5%; MinMax[-40%;49%] on the right side compared to the left side.

Conclusion: In terms of clinical relevance, self-assessment might be a promising and feasible tool for a fast and economic determination of between-limbs differences strength. Still, no valid grading seems possible and transferability of results to intersession reliability and certain diseases and sport settings needs to be proven.

“I FEEL LIKE I HAVE LOST PART OF MY IDENTITY” A QUALITATIVE STUDY EXPLORING PATIENTS WITH CHRONIC ANKLE INSTABILITY

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Introduction: Lateral ankle sprain (LAS) is the most common ankle injury in sports, and one in two patients will develop chronic ankle instability (CAI). Current guidelines focus on the biomechanical and physiological impairments associated with CAI. There is a lack of research describing

the psychological and social impact of CAI on the patient and their expectations and thoughts about care.

Aim: To explore the thoughts and expectations of patients with CAI concerning their condition and expectations of care in an orthopedic setting.

Materials and Methods: A qualitative study comprising semi-structured one-to-one interviews with nine patients screened and diagnosed with CAI. Interviews were recorded with the consent, fully transcribed, and analyzed using systematic text condensation with an inductive goal free approach.

Results: From the analysis, seven themes emerged. The themes were Injury history and symptoms (LAS during sport and pain and instability), Information from health professional (conflicting information about management and prognosis), Management (mental and physical challenges), Expectation and hope (explanation of symptoms and prognosis, imaging able to provide clarification of condition), Activity and participation (restricted in sport and daily life and feeling uncertain), Support (support from family and friends) and Identity (low ability to participate in sport and social life result in loss of identity).

Conclusion: The experience of living with CAI exceeds an experience of pain and instability. Patients described a loss of identity, having to manage uncertainty regarding their diagnosis and prognosis and had hopes of imaging being able to explain their condition.

HOP TESTS AS PREDICTORS OF FUTURE KNEE-RELATED OUTCOMES FOLLOWING ANTERIOR CRUCIATE LIGAMENT INJURY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: After anterior cruciate ligament (ACL) injury, functional deficits (e.g., strength/power) are common and hop tests are used to assess knee function and guide progression of rehabilitation.

Aim: To investigate the prognostic capacity of hop tests following ACL injury.

Materials and methods: Design: Systematic review with meta-analysis.

Data Sources: Six databases searched up to June 2021.

Eligibility criteria: Studies reporting associations between hop tests following ACL injury and future (≥ 3 months) outcomes.

Results: 41 included studies (13,096 participants), all assessed the single-forward hop test and 32 assessed repeated-forward hop tests (crossover-hop, triple-hop and 6m-timed hop), up to one year after ACL injury or reconstruction (ACLR). Higher single- and repeated-forward hop scores were associated with higher odds of return-to-sport 1-3 years post-ACLR (odds ratio (OR) 2.15; 95%CI 1.30 to 3.54; OR 2.11; 95%CI 1.23 to 3.60, respectively). These tests were also associated with better self-reported symptoms and function 1-37 years after ACL injury and reconstruction (OR 2.51; 95%CI 1.62 to 3.88; and 4.28; 95%CI 1.65 to 11.08,

respectively). Achieving $\geq 90\%$ limb symmetry on the single-forward hop was associated with lower odds of knee osteoarthritis 5-37 years after ACL injury and reconstruction (OR 0.46; 95%CI 0.23 to 0.94). Higher scores on a repeated-forward hop was associated with success without ACL reconstruction post-injury (OR 1.57; 95% CI 1.03 to 2.40).

Conclusion: Hop tests are prognostic indicators for important outcomes in individuals after ACL injury and might be used to stratify individuals at risk of poor medium- to long-term outcomes to target rehabilitation interventions.

WHICH YOUTH ARE MOST LIKELY TO RESPOND TO NEUROMUSCULAR TRAINING INJURY PREVENTION WARM-UPS?

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Introduction: Neuromuscular training (NMT) warm-up programs can reduce injury risk among youth, but some individuals do not respond to NMT warm-up programs as well as the average participant.

Aim: Factors predicting the response to NMT in reducing injury risk are unknown, making this the aim of the study.

Materials and methods: This is a secondary analysis of the intervention groups of randomized controlled trials evaluating NMT warm-up programs in youth basketball (n=494), youth soccer (n=378), junior high school physical education (PE; n=903). A total of 1651 youth (11-18 years) with complete data were included. Analyzed covariates were age, sex, height, weight, sport/PE, one-year injury history, number of weekly NMT sessions, and timed single-leg balance. Generalized estimating equation analysis was used to estimate odds ratios (OR) with clustering on team/class, exchangeable correlation structure, robust variance estimator, and offset for exposure hours.

Results: Based on the multivariable model, individuals with history of injury (OR=1.73, 95% CI: 1.23-2.43) and females (OR=1.56, 95% CI: 1.13-2.15) had higher odds of injury during the NMT intervention. Balance time (OR=0.96, 95%CI: 0.92-1.00) and number of weekly NMT sessions (OR=1.06, 95% CI 0.67-1.68) did not show an effect. When participants averaged 3 NMT sessions per week, soccer players had lower (OR=0.90, 95%CI: 0.38-2.11) and basket-

ball players had higher odds of injury (OR=3.74,95%CI: 1.87-7.48) compared to PE.

Conclusions: History of injury and being female increased the odds of injury. Higher weekly adherence was protective in soccer players. Future studies should focus on primary prevention, taking these findings into account.

EFFECTS OF 448 KHZ CAPACITIVE RESISTIVE MONOPOLAR RADIOFREQUENCY OF THE LUMBAR REGION ON MUSCLE TISSUE ELASTICITY

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Introduction: Worldwide, low back pain (LBP) is highly prevalent injury. LBP symptoms may impair performance for athlete.

AIM: Our purpose was to clarify the effects of 448 kHz monopolar radiofrequency (CRMRF) and other physical stimulation of the lumbar region on muscle tissue elastic modulus.

Materials and Methods: The participants were 20 university students (12 participants in the LBP group with current LBP symptoms, and 8 participants in the previous LBP group who had LBP symptoms within the past 6 months) who were engaged in sports activities on a daily basis.

Muscle tissue elasticity was assessed in the lumbar multifidus muscle (MF) and iliocostalis lumborum muscle (erector spinae muscle [ES] group) during supine rest and seated stretching using a shear wave ultrasound imaging system.

Temporal changes were examined in the LBP group for 448 kHz CRMRF, Hot pack, Sham-high-frequency thermal stimulation (Sham) on MF and ES tissue elastic modulus.

Results: In terms of the temporal changes induced by each physical stimulus on MF and ES tissue elastic modulus, significance was shown for the interaction of MF during seated stretching ($F_{4,76}=3.937$, $p=0.006$, $\eta^2=0.168$).

With follow-up testing, we found that 448 kHz CRMRF significantly decreased MF tissue elastic modulus immediately after the intervention compared with Sham ($p=0.019$).

Conclusion: This study revealed that 448 kHz CRMRF immediately increased MF extensibility.

AN ANALYSIS OF BURNOUT AND AVAILABILITY OF WELLBEING AND MENTAL HEALTH SUPPORT AMONG HEALTHCARE PROFESSIONALS WORKING IN THE SPORTING ENVIRONMENT.

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Introduction: Burnout commonly occurs among healthcare professionals, sports coaches and trainers. Healthcare

professionals working in sport are known to be exposed to stressful working conditions, but there is limited literature exploring burnout among healthcare professionals working in sport. Therefore this study set out to explore burnout and mental wellbeing among healthcare professionals working in sport.

Methods: A cross-sectional survey study, using an electronic questionnaire.

Data gathered for workplace supervision, wellbeing and mental health resources, Maslach Burnout Inventory- human services survey (MBI), Demographics. Descriptive analysis was completed using percentage difference, mean and standard deviations.

Results: 55 responses were obtained. Results showed that this sample of healthcare professionals demonstrated low levels of potential occupational burnout, 43.64% scored a 'Low Degree' of emotional exhaustion, 70.91% scored a 'Low Degree' of depersonalisation, and 50.91% scored a 'High Degree' of personal accomplishment.

Exploring MBI scores and subgroups highlighted that there was a significant lack of supervision and wellbeing support provided to healthcare professionals working in sport, with 56;36% of the population not receiving regular supervision and 63.64% not receiving any mental health and wellbeing training. Those who had more regular supervision and dedicated time for wellbeing had lower emotional exhaustion scores, suggesting a lower risk of burnout.

Conclusion: Low levels of burnout was found among these healthcare professionals working in sport, despite poor provision of wellbeing support. However the small sample and disproportionate representation of different professions limited these results. Therefore further studies obtaining a larger sample are needed to further explore this important topic.

WHICH EXERCISE THERAPY CLASS IS BEST FOR ROTATOR CUFF-RELATED SHOULDER PAIN? A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS

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Introduction: Rotator cuff-related shoulder pain (RCRSP) is a prevalent musculoskeletal disorder frequently managed conservatively with exercise therapy. There is no consensus on which exercise therapy class is most effective.

Aim: To compare the efficacy of different exercise therapy classes to better establish a treatment hierarchy for RCRSP.

Materials and Methods: A systematic review including network meta-analysis (NMA) with comparative standardised mean difference effect sizes was conducted. Trials with at least two exercise therapy arms were included and based on the available data, categorised into three dominant therapy classes (resistance, flexibility, proprioception) across six core outcome domains (disability, physical function capacity, function, pain, range of motion and quality of life). A hierarchical Bayesian model was conducted to account for reporting of multiple data points within trials, with the analysis combined across all outcomes. Results were summarised through effect size estimates expressed relative to resistance dominant therapies, and Surface Under the Cumulative Ranking curve (SUCRA).

Results: Ten studies comprising eleven head-to-head comparisons with 573 participants and 161 outcomes were included. Pooled effect size estimates provided some evidence that flexibility (SUCRA: 0.68; $d(\text{Resistance:Flexibility}_{0.5})=0.15$ [95%CrI: -0.03 to 0.32]) and to a lesser extent proprioception (SUCRA: 0.52; $d(\text{Resistance:Proprioception}_{0.5})=0.11$ [95%CrI: -0.09 to 0.28]) dominant therapies were superior to resistance (SUCRA: 0.30) dominant therapies for management of RCRSP.

Conclusion: Therapies focussing on flexibility and proprioceptive exercise appear superior to those focussing on resistance exercise for the management of RCRSP. Future research and clinical practice should consider these findings when addressing more specific research questions and prescribing exercise.

BRAIN PLASTICITY IN PATIENTS WITH LATERAL ANKLE SPRAIN AND CHRONIC ANKLE INSTABILITY: A SYSTEMATIC REVIEW

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Introduction: Lateral ankle sprains (LAS) are one of the most prevalent injuries in sport. It is still regarded as an innocuous sport injury in spite of an increased re-injury risk and almost half of LAS patients developing chronic ankle instability (CAI) with persistent dysfunctions and potential long-term sequelae. In addition, researchers found preliminary evidence of neuroplasticity at the spinal and supraspinal level after (repeated) LAS. Nevertheless, An overview of possible brain adaptations after LAS and CAI is currently lacking.

Aim: To systematically review and synthesize the literature on brain plasticity following LAS and CAI.

Methods: Included studies investigated functional and/or structural brain adaptations in patients with LAS or CAI.

We used 7 electronic databases and performed the last search on 19 October 2021.

Results: Ultimately, we included 14 articles. 1 study included LAS patients, 13 patients included CAI patients. Following LAS, white matter microstructural changes occurred in the cerebellum. In CAI patients brain plasticity was demonstrated in the somatosensory, prefrontal and motor cortex, pre- and postcentral gyrus, superior parietal lobe and cerebellum. CAI patients mainly demonstrated alterations in corticomotor excitability and inhibition, grey matter volume, oxyhaemoglobin and event-related desynchronisation.

Conclusion: The included studies demonstrated brain adaptations after LAS and in CAI patients. These alterations might explain the persisting dysfunctions, increased re-injury risk and long-term sequelae seen in these populations. Clinicians should be aware of brain plasticity since it may not be so harmless after all. Rehabilitation programs should integrate sensorimotor and motor control rehabilitation strategies.

WHO DEVELOPS KNEE OA 5 YEARS AFTER ACL RUPTURE? A DELAWARE-OSLO COHORT STUDY

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Introduction: Anterior cruciate ligament (ACL) ruptures are common and a devastating traumatic knee injury in young adults with highly variable outcomes. Developing knee osteoarthritis (OA) is one of the most concerning long-term outcomes.

Aim: To use subgroups of ACL injured individuals previously identified by latent class analysis based on patient characteristics, patient-reported outcomes (IKDC, KOS, Global Rating Score), and functional performance to determine subgroup differences in the development of posttraumatic OA at 5 years after ACL rupture.

Materials and Methods: Four previously identified subgroups at baseline were used: (Group 1[n=64]: younger(24.6 ± 1.3) with good patient-reported outcomes; group 2[n=77]: younger(22.7 ± 0.9) with low patient-reported outcomes; group 3[n=36] older(31.3 ± 2.7) with poor patient-reported outcomes; group 4[n=19] older(36.3 ± 3.0) with good patient-reported outcomes. Presence of joint changes in line with the development of OA were graded using the Kellgren-Lawrence (KL) system and operationally defined as KL grade of ≥ 1 . Chi square tests assessed differences between subgroups and radiographic OA presence in the involved knees at 5 years after ACL rupture. 196 individuals had radiographs at 5 years and were included in the analysis.

Results: There were no significant differences in percentage of OA among subgroups($p=0.059$). 30% of group 1, 31% of group 2, 50% of group 3, and 53% of group 4 had involved knee OA.

Conclusions: Group 4, the oldest subgroup, had the highest prevalence of OA at 5 years. Though lower, the preva-

lence of OA at 5 years in the two young groups is highly concerning.

THE PREDICTIVE VALIDITY OF THE BRAZILIAN ADDUCTOR PERFORMANCE TEST FOR THE RISK OF HIP ADDUCTORS INJURY IN ELITE SOCCER ATHLETES

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Introduction: Injuries are very common in professional soccer athletes and can negatively affect performance and career, as they are associated with reduced athlete performance. Aim: Our objective was to validate the Brazilian Adductor Performance Test (BAPT) as a test able of predicting muscle injuries of the hip adductors.

Materials and Methods: A methodological study of development and predictive validity, in which 108 soccer athletes were evaluated and followed up for three months and evaluated regarding their history of adductor injury in the six months before the evaluation. The Shapiro-Wilk test was the normality test. The Mann-Whitney U test was used to compare BAPT scores between injured and uninjured athletes. Binary logistic regression was performed to identify the athletes' risk of injury from the BAPT score. The ROC curve was used to determine the cut-off point for the number of repetitions in the BAPT and Spearman's bivariate correlation to identify factors that could influence the test score.

Results: There was no difference in BAPT scores for hip adductor injury history ($p = 0.08$). There was a significant deficit in BAPT scores for the injured athletes at the three-month follow-up ($p = 0.0001$). The cut-off point identified was 33 repetitions. Low BAPT scores increase the chance of injuring the adductor by 20% (Odds ratio = 1.20%, $p = 0.001$). Furthermore, age, weight, and height factors do not influence the BAPT result. Conclusion: This study evidenced a significant deficit in BAPT scores for injured athletes compared to uninjured ones.

STATIC STRETCHING EFFECTS IN COLD EXPOSURES

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Introduction: Exposure to cold is known to affect physiological reactions such as tissue metabolic rates, neuromuscular function, and athletic performance. Musculo-tendinous stiffness also increases in cold exposures so that static stretching is considered important. However, the effects of static stretching in cold exposures are not determined well yet.

Aim: To determine the effects of static stretching on the ankle plantar flexors in cold exposures.

Materials and Methods: Ten healthy young male university students (22.4 ± 1.1 years) volunteered for this study. All participants were exposed to the 2 following conditions - warm (25°C) and cold (10°C) for 30 minutes. The skin and muscle temperatures were measured with a probe thermometer. Static stretching of the ankle plantar flexors and the ankle dorsiflexion range of motion (ROM) measurements were conducted using a dynamometer.

Results: The skin temperature and the muscle temperature in the cold condition were significantly lower than in the warm condition ($p < 0.05$). Hence, no significant differences of the ankle dorsiflexion ROM changes with static stretching were found between the cold and the warm conditions.

Conclusion: Although skin and muscle temperatures were significantly lower in the cold conditions than the warm condition, the static stretching effects on ROM were unchanged. In cold environments, static stretching is indicated to be beneficial for maintaining ROM.

EFFECT SIZE THRESHOLDS TO INTERPRET COMPARATIVE INTERVENTIONS FOR TENDINOPATHY MANAGEMENT: A META-ANALYSIS.

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Introduction: The purpose of this meta-analysis was to develop tendinopathy specific effect size thresholds to interpret relative effectiveness of interventions compared within a single study.

Methods: A literature search for interventions comparing exercise, non-exercise and combined therapies for the management of tendinopathy was conducted. Controlled trials comprising active interventions with any persons with a diagnosis of rotator cuff, lateral elbow, gluteal, patellar or Achilles tendinopathy of any severity or duration were included. Controlled standardised mean difference effect sizes were combined with Bayesian hierarchical models. To obtain symmetric distributions centred on zero, the sign of effect sizes were randomly flipped and boot-strap samples used to create meta-analysis models with the small, medium and large effect thresholds calculated from the 0.625-, 0.75-, and 0.875-quantiles, respectively. Analyses were combined across all tendinopathy locations and separated according to outcome domains including disability, function, pain, physical function capacity, range of motion and quality of life.

Results: Data were obtained from 181 studies. Across all tendinopathy locations and outcome domains the meta-analysis models identified 0.15 [75%CrI:0.10-0.20], 0.36 [75%CrI:0.29-0.42], and 0.71 [75%CrI:0.62-0.84] as the small, medium, and large thresholds, respectively. Consistent estimates were obtained across all outcome domains.

Discussion: Previous non-context specific effect size thresholds used to interpret comparative effectiveness (e.g.

small: 0.20, medium: 0.50 and large: 0.80) for tendinopathy management are reasonable but may slightly underestimate each category, and by extension, sample size requirements. It is recommended that the context specific thresholds obtained in the present study be used to interpret and inform future tendinopathy research.

COMPARATIVE EFFICACY OF EXERCISE, NON-EXERCISE AND COMBINED THERAPIES FOR THE MANAGEMENT OF TENDINOPATHY. A SYSTEMATIC REVIEW AND NETWORK-META ANALYSIS.

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Introduction: The purpose of this large systematic review and network meta-analysis (NMA) was to compare the efficacy of common therapies used to manage the most prevalent tendinopathies.

Methods: A search for interventions comparing exercise, non-exercise (e.g. electro-therapy, injection, manual-therapy, kinetics, non-active, and surgery), and combined therapies was conducted. Interventions with any persons with a diagnosis of rotator cuff, lateral elbow, gluteal, patellar or Achilles tendinopathy of any severity or duration were included. Controlled standardised mean difference effect sizes were used with Bayesian hierarchical NMA models combining data across tendinopathy locations and separating results across six outcome domains including disability, function, pain, physical function capacity, range of motion and quality of life. Results were summarised through pooled effect size estimates and Surface Under the Cumulative Ranking curve (SUCRA).

Results: A total of 201 studies comprising 460 treatment arms and 11,888 participants were included. In all but one model, the SUCRA and pairwise effect sizes indicated the superiority of interventions combining exercise and non-exercise therapies relative to all other classifications. Median effect size estimates indicated that the combination of exercise with non-exercise therapies tended to improve outcomes by effect sizes of approximately 0.1 to 0.3. Less consistency was observed in the treatment hierarchy across the remaining broad treatment classes; however, non-active treatments ranked lowest.

Discussion: The findings from this large systematic review and NMA indicate that clinicians and researchers should consider prescribing and further studying the combination of exercise with other conservative modalities such as electrotherapy for the management of common tendinopathies.

TRICEPS SURAE MUSCLE FORCES DURING THE ECCENTRIC HEEL DROP EXERCISE IN PATIENTS WITH ACHILLES TENDINOPATHY COMPARED TO CONTROLS

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INTRODUCTION: Achilles tendinopathy (AT) is an overuse injury in which excessive loading is associated with degenerative changes in the Achilles tendon. A differential distribution in triceps surae muscle forces has been found during isometric conditions for the AT group, however, it remains unknown whether this also occurs during dynamic exercises.

AIM: The aim of this study was to investigate the individual triceps surae muscle forces during the execution of the bilateral and unilateral heel drop exercise in patients with AT compared to a control group.

MATERIALS AND METHODS: Eight AT patients (6F & 2M, 35 ± 15.2 yr) and nine controls (4F & 5M, 25.5 ± 7.2 yr) participated in this study. Joint kinetics, kinematics and electromyography of the soleus (SOL), gastrocnemius medialis (GM) and gastrocnemius lateralis (GL) were recorded during the execution of a bi- and unilateral heel drop exercise. Individual triceps surae muscle forces were determined through a combination of experimental data and musculoskeletal modelling.

RESULTS: Although not significant, the AT group had a greater SOL force at the peak plantarflexion moment of 0.78 and 1.76 N/kg for the bilateral and unilateral drop, compared to controls reaching 0.61 and 1.31 N/kg, respectively. Correspondingly for the bilateral drop, lesser GM (0.71 N/kg) and GL force (0.17 N/kg) are used compared to the control group (0.75 N/kg [GM] and 0.22 N/kg [GL]). Similar results were obtained for the unilateral variant.

CONCLUSION: In the current study, triceps surae muscle forces are not different between the two groups during eccentric tasks.

INCLUSION OF BIOPSYCHOSOCIAL MODEL DOMAINS IN CLINICAL PRACTICE GUIDELINES FOR RETURN TO SPORT AFTER ACL INJURY: A SYSTEMATIC REVIEW

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Context: The return to sport criteria can be understood from the International Classification of Functioning, Disability, and Health (ICF) which emphasizes an individual-centered approach and inclusion of all domains of human functioning, ensuring the multifactorial and biopsychosocial nature of decision-making.

Objective: To analyze the inclusion of biopsychosocial model domains in clinical practice guidelines (CPGs) for RTS after ACL injury.

Search strategy: Two independent reviewers developed the search strategy. Data Sources: Ovid/Medline®, Embase®, and PEDro without restriction dates. Study Selection: CPGs for RTS after ACL injury, at any age or sport level, and published in English.

Data Extraction: Two independent reviewers codified the RTS criteria recommended in the CPGs according to ICF domains and used the AGREE II for critical appraisal.

Results: A total of 715 records were identified, and seven CPGs were included. The frequency distribution of the biopsychosocial model domains was as follows: body functions (37.77%), activity and participation (20.00%), body structure (13.33%), environmental factors (11.11%), and personal factors (8.88%). In the AGREE II Checklist, the lowest mean domain scores were for rigour of development (37.86±36.35) and applicability (49.29±22.30). 71.42% were of low or moderate quality. Conclusion: The CPGs cannot address the biopsychosocial model domains satisfactorily and some do not address all components of the ICF conceptual model, emphasizing the body functions and activity and participation domains. Therefore, the functioning model advocated by the World Health Organization (WHO) has not yet been adequately incorporated into the recommendations for RTS after ACL injury.

THE EFFECTS OF MOTOR IMAGERY ON THERAPEUTIC REGIMES IN ATHLETES WITH LOWER LIMB SPORT INJURIES

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Background: Lower limb sport injuries affect athletes' career as it has a connection between bio-psycho-social factors and well-being. Motor Imagery (MI) has been progressively included in rehabilitation as an adjunct therapeutic modality for sports injuries management.

Objectives: This systematic review evaluated the efficacy of MI intervention in athletes with lower limb sport injuries that could affect their pain levels, muscle strength, and sport's functional ability.

Methodology: A systematic search of the research literature was administered for RCT studies in athletes with lower limb musculoskeletal sports injuries. We searched 3 major databases, PubMed, Scopus and ScienceDirect with the search period ranging from their inception until the December of 2020. Study quality was assessed using Downs and Black Scale. The data was recorded and extracted with the use of Mendeley software.

Results: The search strategies depicted an exploratory pool of 5.021 possible articles. Upon completion of the selection procedure only 4 RCT studies met the inclusion criteria with a total of 80 injured athletes (n=38 with ankle sprain and n=42 with ACL injury). In 3 studies MI efficacy on pain and/or muscle strength and/or functional ability in both ACL and ankle sprain sport injuries was found.

Discussion: The results suggested that the use of MI as an adjunct therapeutic modality should be effective on pain, muscle strength and functional ability in lower limb sport injuries. Further research is needed on a larger scale of RCT studies and on targeted athletic groups with less clinical heterogeneity of lower limbs sports injuries.

SHOULD WE BE ASSESSING FOR BALANCE IMPAIRMENTS IN ACHILLES TENDINOPATHY?

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Introduction: Alterations in triceps surae muscle activation patterns and Achilles tendon mechanical properties are associated with Achilles tendinopathy. These impairments are also related to balance. Balance has not been investigated in a large cohort with Achilles tendinopathy and it is unknown if differences exist among previously established subgroups.

Aim: The purpose of this study was to evaluate single leg balance in individuals with midportion Achilles tendinopathy.

Materials and Methods: Participants were categorized into four subgroups: Older activity-dominant (OAD), young activity-dominant (YAD), psychosocial-dominant (PD), and structure-dominant (SD). Participants completed single leg balance tasks with eyes open and eyes closed for maximal time up to 60 seconds. One-way ANOVA was completed comparing single leg balance in seconds on the symptomatic limb among subgroups.

Results: 106 participants (mean±SD; 47.3±12.1; 50 female) with midportion Achilles tendinopathy were categorized as OAD (n=35), YAD (n=33), PD (n=23), SD (n=15). There was a significant main effect of group for eyes open (49.0±18.0 s, 56.6±10.9 s, 37.6±21.2 s, 42.9±24.1 s; p=.001) and eyes closed (12.1±14.5 s, 21.8±18.8 s, 5.6±8.0 s, 4.9±5.0 s; p<.001). The PD group demonstrated significantly decreased single leg balance with eyes open compared to the YAD group (p=.001). Both the PD and SD groups demonstrated significantly decreased single leg balance with eyes closed compared to the YAD group (p<.001).

Conclusion: Current gold standard of treatment is tendon loading exercise. However, individuals with psychosocial and structural impairments also present with balance deficits. Balance training may be an appropriate adjunct to exercise treatment for these individuals.

SYMPTOM DURATION IS NOT OF RELEVANCE FOR INJURY SEVERITY OR RECOVERY WITH TREATMENT IN ACHILLES TENDINOPATHY

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Introduction: In patients with Achilles tendinopathy, it is often assumed that a longer duration of symptoms is related to worse tendon health and recovery.

Aim: To explore how Achilles tendinopathy symptom duration impacts tendon health and patient outcomes following 12 months of a comprehensive rehabilitation program.

Materials and Methods: 136 participants (49% female, age 47±13 years) with midportion Achilles tendinopathy were allocated into 4 groups based on duration of symptoms: “0-3 months”, “3-6 months”, “6-12 months”, “>12 months”. Outcomes including the Victorian Institute of Sport Assessment-Achilles (VISA-A), Foot and Ankle Outcomes Survey-Quality of Life subscore (FAOS-QoL), heel-rise endurance test, and ultrasound examination measuring tendon thickening were evaluated at baseline, 4-, 8-, and 12-months while participants completed a comprehensive rehabilitation program with a physical therapist. Main effects of group, time, and interaction effect (Group*Time) were evaluated using General Linear Mixed Models.

Results: No significant effect of group was observed for any outcome measures at baseline. No significant interaction effects were observed among any outcomes, indicating similar improvement for all groups. Significant effects of time were observed for VISA-A ($p<.001$), FAOS-QoL ($p<.001$), and heel-rise work ($p<.001$) in all groups.

Conclusion: Clinical presentation and tendon health measures were similar at baseline, regardless of symptom duration. Additionally, each group responded similarly to treatment over 12 months. Therefore, clinicians should not rely on symptom duration for treatment decisions or outcome expectations for patients with Achilles tendinopathy.

STATIC FOOT POSTURE MEASURES: IS THERE VARIANCE BETWEEN ACHILLES TENDINOPATHY SUBGROUPS?

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Introduction: Achilles Tendinopathy has been proposed as a “pronation-related injury” with overpronation suggested to be an important factor in the etiology of Achilles Tendinopathy. Recent research has identified distinct subgroups of patients with Achilles Tendinopathy. Clinical Measurements to determine static foot posture are easily accessible to clinicians, however it is unknown if static foot posture is of relevance for subgrouping.

Aim: The aim of this study was to evaluate if static foot posture varies among subgroups of individuals with Achilles Tendinopathy.

Materials and Methods: Subjects with midportion Achilles Tendinopathy were classified into four subgroups based on the patient characteristics and domains of tendon

health: Older Activity Dominant (OAD), Younger Activity Dominant (YAD), Psychosocial Dominant (PD), and Structural Dominant (SD). Static foot posture measurements were taken by a physical therapist and include: Foot Posture Index (FPI), Longitudinal Arch Angle (LAA), Navicular Drop, and Navicular Drift. A one-way ANOVA was used to compare static foot posture measurements between subgroups.

Results: 122 Subjects (Age 47.2±12.1, 55 females) were included and classified into the subgroups: OAD (n=38), YAD (n=33), PD (n=26), SD (n=15). There were no significant differences in FPI (4.1±3.5, 4.5±2.6, 3.6±3.3, 4.1±3.6; $p=.794$), LAA (145±9.6, 145.2±11.6, 144.5±13.0, 140.1±7.8 deg; $p=.411$), Navicular Drift (5.9±3.4, 6.9±4.3, 5.9±4.5, 3.9±3.6 mm; $p=.123$), and Navicular Drop (7.7±3.8, 8.1±4.1, 7.5±4.6, 6.4±4.5 mm; $p=.641$) between the subgroups.

Conclusion: Static foot posture measurements are not different between subgroup, therefore may not be of relevance for the clinical evaluation of patients with Achilles Tendinopathy.

ACHILLES TENDON NEOVASCULARIZATION DECREASES WITH EXERCISE TREATMENT

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Introduction: Neovascularization (the formation of intratendinous blood vessels) has been shown to occur in patients with Achilles tendinopathy. The presence of neovascularization is a sign of tendon pathology. The impact of exercise treatment on neovascularization remains unknown.

Aim: The objectives were 1) to measure the difference in neovascularization area before and after exercise treatment 2) to explore if the degree of change in neovascularization area relates to changes in tendon structure and symptom severity.

Materials and Methods: 21 subjects with Achilles tendinopathy and neovascularization were recruited from an ongoing clinical trial. Power Doppler imaging recorded video clips of neovascularization, and Quantitative Analysis software measured the neovascularization area. B-mode ultrasound imaging was used to measure tendon cross-sectional area and thickness. The Victorian Institute of Sports Assessment-Achilles (VISA-A) questionnaire measured symptom severity. Subjects completed tendon loading exercises under the guidance of a physical therapist. Subjects were evaluated at baseline and after 8 weeks. The changes in the outcomes were used for analysis. A correlation analysis was used to explore associations between change in neovascularization area and change in tendon structure and symptom severity.

Results: Neovascularization area decreased by mean±SD -3.1±17.4 mm². There was a moderate correlation between the changes in neovascularization area and symptom severity ($r=-0.459$, $p=.037$) but not for measures of tendon structure ([CSA $p=0.246$], [thickest portion $p=0.093$]).

Conclusion: Following exercise treatment of Achilles tendinopathy, there was a decrease in neovascularization area that related to improvements in symptoms

APPLICATION OF AN ONLINE PREVENTION PROTOCOL REDUCES ANTERIOR CRUCIATE LIGAMENT INJURIES RISK FACTORS AMONG FEMALE ATHLETES

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Introduction: Anterior cruciate ligament (ACL) injury is one of the most common sports injuries, which often requires ligament reconstruction surgery, especially for athletes who want to go back to sport and competition. However, after the reconstruction, the prolonged rehabilitation period will delay the athletes' return to sport. Furthermore, recent studies connect ACL reconstruction with long-term complications, knee joint degeneration, and osteoarthritis.

Aim: To study the effect of the Knäkontroll ACL prevention protocol on the mechanical risk factors of developing non-contact ACL injuries among female athletes.

Methods and materials: A pre-post intervention design was followed. Tuck jump test, static balance, dynamic balance, and hop tests were tested pre-intervention, 2 and 4 weeks after the intervention. The Knäkontroll ACL prevention program was performed three times per week for four weeks. Instructions and videos were delivered via video calls (remotely) in the first session of each week, and the remaining two sessions were done as a home program. The exercises gradually increased in level based on the participant's progression.

Results: Thirty females (age 21.4±2.7) playing different sports at an amateur level participated voluntarily. There were statistically significant improvements in all outcome measures at 2 and 4 weeks after the prevention protocol ($P < 0.001$).

Conclusion: The Knäkontroll ACL prevention protocol effectively reduces ACL injuries risk factors by improving the static and dynamic balance, jump and hop abilities. It can also be applied to athletes remotely as a quick intervention before sporting events.

THE CAPABILITY OF A SCREENING QUESTIONNAIRE IN DETECTING SPORTS-RELATED SUDDEN CARDIAC DEATH (SSCD) RISK FACTORS AMONG ACTIVE BAHRAINI POPULATION

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Introduction: Sport-Related Sudden Cardiac Death (SSCD) is a leading cause of mortality in the athletic pop-

ulation. Cardiovascular pre-participation screening can be lifesaving. Yet, there are no definite recommendations nor official screening protocols to specify who and how they should be screened in Bahrain or the region.

Aim: To design a multi-phase screening protocol starting with a self-administered screening questionnaire as the first phase.

Materials and Methods: Exploratory research using an online self-administered questionnaire. It was designed based on evidence-based international recommendations and aims to identify risk factors, signs, and symptoms of SSCD, family history, drugs, and supplements across the Bahraini population. Experts in the field validated the questionnaire followed by a pilot study.

Results: 421 individuals participated in the questionnaire (age range 15-69), mainly males (70%). The questionnaire revealed that 83% of the participants did not perform any medical examinations before physical activity, 9% experience tiredness and shortness of breath during exercise compared to their peers, 8% reported irregular heartbeats while exercising, and 5% complained from lightheadedness during training. Moreover, 21% of them indicated a history of familial death due to a heart condition before 50, 24% have a family history of SCAs, 26%, and 25% have a family history of cardiac disorders and a history of SSCD related signs and symptoms, respectively.

Conclusion: According to the American Heart Association, the detected signs and symptoms predispose individuals to develop cardiac pathologies. Thus, the developed questionnaire may help detect hidden risks of SSCD in athletes.

USE OF ULTRASOUND IMAGING TO FACILITATE TRANSITION FROM NON-SURGICAL TO SURGICAL MANAGEMENT OF ACUTE ACHILLES TENDON RUPTURE

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Introduction: Presence of Achilles tendon gap and gap width observed with ultrasound imaging can be used to aid in diagnosis and treatment decisions following acute Achilles tendon rupture and re-rupture.

Aim: To describe the use of ultrasound imaging to transition from non-surgical to surgical management and report on the patient and clinician perspectives on dealing with the dreaded re-rupture.

Materials and Methods: Measures of psychosocial factors (Tampa Scale of Kinesiophobia TSK-11) and function (seated heel-rise test). B-mode ultrasound imaging was performed to assess Achilles tendon gap and length.

Results: The 22-year-old male heard a "pop" in his ankle when planting and cutting during an intramural soccer game. B-mode ultrasound confirmed rupture and the patient was referred to an orthopedic surgeon. Based on small tendon gap (< 5 mm), non-operative management was initiated. However, the patient slipped (week 3) and reported

pain and difficulty with heel-rise. Ultrasound confirmed re-rupture with gap of (> 5 mm). Surgical repair was performed 4 days later.

9 weeks post surgery, patient had TSK-11 of 16. B-mode ultrasound demonstrated a 3 cm tendon elongation with clinical findings of 6.4 cm seated heel-rise height differential. The patient verbally expressed hesitancy with walking, despite minimal kinesiophobia. Treatment with progressive tendon load exercise, education, and objective measures were considered key for successful outcome by both patient and clinician.

Conclusion: Ultrasound imaging facilitated efficient and successful transition from non-operative to operative management following re-rupture. Psychological readiness should be monitored, particularly in those with significant pivots in rehabilitation strategies.

INTENSIVE SUPERVISED REHABILITATION VERSUS LESS SUPERVISED REHABILITATION FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION? A SYSTEMATIC REVIEW AND META-ANALYSIS

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Introduction: It is unknown if supervision leads to superior outcomes following ACL reconstruction.

Aim: To investigate whether intensive supervised rehabilitation following ACL reconstruction leads to superior self-reported function and sports participation compared to less supervised rehabilitation.

Materials and Method: We performed electronic database searches in several key databases and trial registries (e.g. MEDLINE, Embase, [ClinicalTrials.gov](https://www.clinicaltrials.gov)) to April 2020.

We included randomised controlled trials (RCTs) comparing supervised rehabilitation to rehabilitation with a similar protocol that used less supervised sessions for athletes following ACL reconstruction. Two reviewers independently screened studies and extracted data. The Physiotherapy Evidence Database (PEDro) scale was used to evaluate methodological quality and GRADE to evaluate overall quality of evidence. Self-reported function and sports participation were the primary outcomes. Data were pooled using random effects meta-analyses.

Results: Our search retrieved 4075 articles. Seven articles reporting on six RCTs were included (n=353). Very-low to low-certainty evidence suggests intensive supervised rehabilitation is not superior to less supervised rehabilitation following ACL reconstruction for improving self-reported function, sports participation, knee flexor and extensor strength, range of motion, sagittal plane knee laxity, single leg hop performance, or quality of life.

Conclusion: Based on uncertain evidence, intensive supervised rehabilitation is not superior to less supervised rehabilitation for athletes following ACL reconstruction. Although high-quality RCTs are needed to provide more certain evidence, clinicians should engage athletes in shared decision making to ensure athletes' rehabilitation decisions align with current evidence on supervised rehabilitation as well as their preferences and values.

TRANSIENT EXPERIMENTAL KNEE DEAFFERENTATION IMPACTS SENSORIMOTOR NEURAL ACTIVITY FOR KNEE MOTOR CONTROL: A PRELIMINARY ANALYSIS

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Introduction: After anterior cruciate ligament injury, a multitude of factors (joint deafferentation, surgery, rehabilitation, etc.) contribute to neural alterations for knee sensorimotor control. An improved understanding of the injury associated contributions to sensorimotor control would assist in the development of targeted nervous system interventions.

Aim: To evaluate if intraarticular experimental knee joint deafferentation alters knee sensorimotor neural activity.

Materials and Methods: 4 healthy college aged recreational athletes participated (23.3±1.0 years, 166.4±8.4cm, 63.6±4.8kg). Functional magnetic resonance imaging was used to quantify blood-oxygen-level-dependent signal with a 3-Tesla MR scanner using a 16-channel, phased array head coil. A unilateral knee flexion/extension task paced to an auditory metronome (1.2Hz) was performed under sham and deafferented conditions. The motor task consisted of alternating rest (n=5) and movement (n=4) blocks, each 30-seconds in duration. Task-related neural activity was contrasted between conditions with a single-group paired t-test analysis and restricted to the left superior parietal lobule (SPL) and supplementary motor area (SMA) as regions of interest due to their roles in sensorimotor coordination. A significance level of p<0.05, z-threshold >3.1 corrected for multiple comparisons using a gaussian random field cluster approach.

Results: The deafferentation condition increased neural activity in the left SPL (z-max=9.49, p<0.001, 534 voxels) and decreased in the left SMA (z-max=6.83, p<0.001, 111 voxels).

Conclusion: Experimental deafferentation decreased neural activity in the SMA indicating a potential role of knee sensory receptors for motor planning. Joint deafferentation also increased neural activity in the SPL a key region for multisensory-cognitive processing.

ASYMMETRICAL LOADING WITHIN THE PATELLAR TENDON AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION (ACLR) USING PATELLAR TENDON GRAFT: CASE REPORT

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Introduction: Patellar tendinopathy is common after ACLr using patellar tendon graft. Altered loading within the tendon may explain this morbidity. The loading behavior across the medial vs. lateral patellar tendon after ACLr, however, remains unknown.

Aim: To quantify differences in patellar tendon strain at the medial and lateral aspects of the tendon on the surgical knee and contralateral knee of an athlete after ACLr using patellar tendon graft.

Materials and Methods: A 24-year-old female football athlete 6-years after ACLr performed isometric knee extensions at 20%-40%-60%-80%-100% of her maximal voluntary contraction (MVC) on a dynamometer with the knees at 60°. Simultaneous ultrasound images of the patellar tendon were taken by a clinician during contractions. The process was repeated for the medial and lateral aspects of the tendon bilaterally. Tendon strain was calculated using the ratio between the tendon length during contraction and the length at rest.

Results: Higher strain was observed in the medial side of the tendon (11-28%) when compared to the lateral side (2-12%) of the ACLr limb during all levels of effort. Conversely, higher strain was observed in the lateral side (16-33%) of the tendon when compared to the medial side (11-28%) in the contralateral limb. MVC was lower in the ACLr limb (182Nm) compared to the contralateral side (232Nm).

Conclusion: The medial versus lateral patellar tendon strain relationship during knee extension were different between limbs in an athlete after ACLr. This alterations in patellar tendon loading pattern may partly explain morbidities after ACLr using patellar tendon graft.

EXERCISE THERAPY FOR TENDINOPATHY: A SCOPING REVIEW MAPPING INTERVENTIONS AND OUTCOMES

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Title: Exercise therapy for tendinopathy: A scoping review mapping interventions and outcomes

Introduction: Tendinopathy is a common condition leading to pain, disability and reduced quality of life/participation. Exercise is the mainstay of conservative management and a mapping of this area is required to inform future research, both primary and secondary, and ultimately practice.

Aim: To map the evidence on exercise interventions and outcomes for tendinopathy.

Methods: JBI Scoping Review methodology and a-priori protocol guided this review. Inclusion criteria included i). Participants - studies including any age or gender with any tendinopathy, ii). Concept – Exercise therapy (any type or format) intervention, delivered in any setting by any professional with any outcomes related to evaluating exercise interventions for tendinopathy, iii). Context – any setting in any developed nation listed as having very high human development and published from 1998-2021.

Results: 22,550 sources were identified and 555 studies were included in the review representing 25,490 participants from 31 countries. Main tendinopathies reported were rotator cuff related shoulder pain (RCRSP), Achilles, lateral elbow and patellar.

Strength training approaches were most common followed by flexibility and motor re-training /proprioception exercise. Exercise interventions across tendinopathies were poorly reported with around 15% classed as fully reproducible using the TIDieR checklist.

There was variation across tendinopathies in domains (disability, pain and physical function capacity) reported with corresponding variation in primary outcome measures related to these.

Conclusion: Core recommendations to guide future research include specific study designs, study reporting and the need to understand clinician and patient experience.

SHARED DECISION-MAKING AND PATIENT EDUCATION IN MANAGING ACL INJURY: UNDERSTANDING TREATMENT OPTIONS

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Introduction: Many clinicians are unaware of how to integrate the current evidence in the management of ACL injuries in order to counsel their athletes to determine the best treatment option. The shared decision-making model can be applied to acute ACL injury, including the decision for operative vs. non-operative management.

Aim: To implement the use of a research-based algorithm to guide clinicians in the management of acute ACL injuries using shared decision-making framework, starting with education on treatment options and outcomes.

Materials and Methods: The ACL Injury Treatment Algorithm was developed by incorporating the best available

evidence into a clinical guideline that aids the physical therapist in the education and treatment of athletes with acute ACL injuries. The algorithm is rooted in the findings of the DE-OSLO Cohort Study, a longitudinal cohort study of 300 ACL-injured participants followed from injury through 10-year follow-up. The algorithm has been used for over 20 years in a large outpatient clinic with a high volume of ACL-injured athletes, with recent updates in conjunction with the development of new evidence.

Results: Clinicians have successfully implemented the algorithm, starting with evidence-based education, to determine the best treatment pathway for each individual by discussing treatment options and outcomes and considering the contextual factors impacting each athlete's treatment decision.

Conclusion: Use of this algorithm supports a shared-decision making model whereby clinicians are able to share the best available evidence and athletes are supported to consider their options and make informed decisions regarding treatment for their ACL injury.

VARIATION IN HIP MUSCLES FORCE PRODUCTION FOLLOWING TWO TYPES OF FEMORO-ACETABULAR IMPINGEMENT SURGERY

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Introduction: Femoroacetabular impingement (FAI) can be treated surgically by arthroscopy (AS) or hip dislocation (HD). While the positive effects of aforementioned surgeries on patients' quality of life are well known, the pre- to postoperative changes in force production of hip muscles were rarely evaluated.

Aim: To evaluate whether AS and HD surgical procedures significantly affect hip muscles strength in FAI patients.

Material and method: Forty-two patients (69% women) aged 20-45 years at index surgery underwent AS (n=29, 69%) or HD (n=13, 31%). Each patient was tested before (T1) and 3 months after surgery (T2). The force production of the hip muscles was measured in isometric mode using a hand-held dynamometer on both sides.

Results: No T1-T2 significant differences could be noted on the non-operated side. On the operated side, the AS group exhibited a decreased strength of hip flexors (7.7±2.2

vs 7.1±2.0 Nm/kg, p=0.047), abductors (2.6±0.6 vs 2.3±0.6 Nm/kg, p<0.001) and external rotators (7.1±4.2 vs 6.3±4.0 Nm/kg, p=0.038). The HD group exhibited a decreased strength of the gluteus muscle (8.8±3.1 vs 7.7±2.3 Nm/kg, p=0.003), abductors (2.3±0.6 vs 1.9±0.3 Nm/kg, p=0.009), as well as internal (7.9±3.4 vs 5.9±2.4 Nm/kg, p=0.013) and external rotators (7.9±3.3 vs 5.6±2.2 Nm/kg, p=0.017).

Conclusion: Abductors and external rotators strength was affected by both surgeries. Hip dislocation seems to additionally decrease gluteus and internal rotators strength while arthroscopy might decrease hip flexor strength. According to pain level, specific reinforcement is therefore necessary for patients with FAI if they are treated surgically.

MAPPING PRACTITIONERS APPROACHES TO RUNNING-RELATED INJURY (RRI) PREVENTION AND MANAGEMENT AND THEIR VIEWS ON A PROPOSED DIGITAL RRI INTERVENTION

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INTRODUCTION: Developing a digital RRI prevention and management intervention requires involvement of all stakeholders, including practitioners e.g physiotherapists, coaches and trainers. To develop an acceptable and effective intervention it is important to explore current practitioner RRI prevention or management approaches and their views on a proposed digital RRI prevention and management intervention.

AIM: 1) Establish participants' approaches to RRI prevention and management.

2) Map participants' views on the content of a proposed digital RRI prevention and management intervention.

MATERIALS AND METHODS: Following convenience sampling 6 online focus groups were conducted with 18 participants: 14 physiotherapists, 1 strength and conditioning coach and 3 personal trainers. Data analysis was via thematic analysis. Transcripts were coded and central themes and sub-themes identified.

RESULTS: Data analysis identified 5 key themes: 1) Approaches To Injury Prevention; 2) Barriers to Injury Prevention; 3) Use of Digital Technology; 4) The Ideal App; 5) Unintended Consequences of The Ideal App.

CONCLUSIONS: The consensus from the participant group views explored was that any digital intervention needs to be evidence based and easily accessible, providing a range of advice for RRI prevention and self-management, which would avoid the need to use too many different apps. Careful consideration needs to be given to the unintended consequences of providing unseen advice which is important in instilling trust in any intervention. The development of any future digital intervention should consider these findings.

USABILITY TESTING OF DIGITALLY ENHANCED REMOTE REHABILITATION FEEDBACK FOR INJURED DANCERS AND ATHLETES: AN INNOVATIVE PROTOCOL

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Introduction and purpose: During pandemic lockdowns, health professionals had to accelerate telehealth innovation. Rehabilitation adherence and fidelity were especially challenging. We aimed to develop and establish the feasibility of our CAPA_MORF (Computer-augmented-personalised-asynchronous-movement-tracking-overlay-for-remote-feedback) tool as a potential solution. Rapid response funding was secured.

Methods: An innovative iterative-convergent-mixed-methods design was adapted with comprehensive stakeholder engagement of users, developers and therapists, to evaluate and improve digital tool feasibility, usability and acceptability. Twenty injured dancers and athletes aged 18-50 with 3+ years of training experience are being recruited in 4 sequential groups. They perform clinically indicated rehabilitation exercises with bespoke feedback on 2 occasions, alongside Telehab® use. Quantitative outcomes include the System-Usability-Scale and an electronic-health-literacy questionnaire alongside qualitative interviews. This information will be analysed using a matching integration strategy meaning qualitative data explains quantitatively-identified usability problems. Data will iteratively inform digital tool adaptation for subsequent participant groups, until the a-priori defined acceptable usability end point is reached and all major implementation barriers resolved.

Results: An innovative method has been designed suitable to address the evidence-practice gap and translate digital innovations into practice while enabling their improvement. Specific changes to CAPA_MORF presentation included overlay colour, contrast, instructions and set-up amendments. Identified problems were the consistency of the feedback and spinal tracking accuracy.

Conclusion: This study will provide evidence regarding the usability of an innovative digital tool. The developed iterative-convergent-mixed-methods design can be used as guidance for the development of similar complex digital interventions, as preparation for clinical trials.

RISK FACTORS FOR GROIN INJURY IN PROFESSIONAL MEN'S FOOTBALL: DOES ASYMMETRY MATTER?

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Introduction: Asymmetry between limbs can be identified through musculoskeletal screening. There is no research to date identifying association with asymmetry for risk of hip and groin injury in professional soccer players. Normative data for asymmetry is unknown in this population.:

Aim: To examine normative values for between-limb asymmetry within professional male soccer players for range of motion and strength. To evaluate the relationship between asymmetry and hip/groin injuries leading to time loss from training and/or match play.

Materials and methods: Retrospective cohort study; Level of evidence, 2. Adult male professional football players in Qatar, underwent musculoskeletal screening with time-loss/exposure monitored through injury surveillance. Asymmetry values for hip range of motion and strength tests were calculated and Cox regression analysis used to assess association for risk of hip/groin injury.

Results: No association for asymmetry variables with risk of hip/groin injury except for total rotation range of motion (p 0.040, HR 1.03). Asymmetry ranges between -20 to +20% are normal and exist for all measures.

Conclusion: Asymmetry was not associated with risk of hip and groin injury for six out of seven variables. Total rotation range of motion asymmetry was only associated favouring the dominant side. Identifying the total rotation for both limbs through musculoskeletal screening tools may be relevant however mechanisms/causality remain unknown. The study provides clinical reference values for normative ranges of asymmetry in male professional soccer players; providing context for profiling of players, injury prevention, management and return to play protocols.

PREVALENCE AND PERCEPTION OF ANKLE SPRAINS IN COLLEGE STUDENTS IN PAKISTAN AND THE UNITED STATES

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Introduction: There is a dearth of knowledge regarding the prevalence, treatment administered and people's perception of ankle sprains in developing countries such as Pakistan. Therefore, the purpose was to determine the differences in the prevalence, treatments applied following injury and perception of ankle sprains in Pakistan and the United States (US).

Materials and Methods: An online epidemiology and literacy survey was administered between January 2019 to April 2019 in both countries. A total of 291 college-aged students (135 Pakistani and 156 US) completed the survey.

Results: 49.6 % of the US and 48.7 % of the Pakistani college students self-reported a history of ankle sprains. In both countries students most commonly reported to doctors (43.48% US, 31.58% Pakistan) and physiotherapists (11.96% US, 10.53% Pakistan). However, Pakistani students (10.53 %) also reported to musculoskeletal quacks (bone-setters). Most common treatments used were rest (13.50 %), ice (13.4 %) and elevation (10.77 %) in the US and rest (25 %), massage (17.07%) and medications (12.80 %) in Pakistan. In terms of health literacy, 95 % of the US students think that one ankle sprain can lead to another but only 50 % of the Pakistani students thought the same way. 93.6 % of the US and 45.3 % of Pakistani students think that ankle sprain can result in chronic ankle instability.

Conclusions: Although the prevalence of the ankle sprains was similar in both countries (almost half of the college students self-reported) there were huge discrepancies found in health literacy and treatment interventions used.

RELIABILITY AND VALIDITY OF COMMON HIP ADDUCTION STRENGTH MEASURES: THE FORCEFRAME STRENGTH TESTING SYSTEM VERSUS THE SPHYGMOMANOMETER.

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Aim: Assess the criterion validity of the sphygmomanometer, relative to the Force Frame Strength Testing System. Determine the test-retest reliability for both hip adduction and abduction strength.

Materials and Methods: 50 asymptomatic, field-sport athletes were tested for maximal isometric hip adduction and abduction strength. Interclass correlation coefficient (ICC_{2,1}) with confidence intervals were calculated to evaluate the reliability of peak strength values. A Pearson product-moment correlation coefficient (r) was calculated to examine the criterion validity of the sphygmomanometer as a measure of force when compared to the ForceFrame.

Results: Intra-rater reliability for bilateral adduction testing using both ForceFrame and sphygmomanometer values revealed good-excellent reliability for both the 0° (Lower CI of ICC_{2,1} = 0.75 – 0.82) and 45° (Lower CI of ICC_{2,1} = 0.74 – 0.84) positions. ForceFrame values revealed good-excellent reliability for 0° abduction position and 45° abduction position. A poor relationship (Lower CI of r = 0.42) for 0° adduction position, and no relationship (Lower CI of r = 0.14) for 45° adduction position, were found between adduction squeeze values on ForceFrame and sphygmomanometer.

Conclusion: Excellent reliability in hip adduction squeeze strength testing for both modes. However, there exists a 'fair'-'no relationship' between the Force Frame and sphygmomanometer.

PATIENT-REPORTED OUTCOMES AND MUSCLE STRENGTH AFTER A PHYSIOTHERAPY-LED EXERCISE AND BRACE INTERVENTION OF ACUTE INJURY OF THE POSTERIOR CRUCIATE LIGAMENT

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Introduction: Posterior Cruciate Ligament (PCL) injuries can be treated surgically or with exercises and a brace. Larger prospective studies reporting outcomes of exercise-related interventions are lacking.

Aim: To investigate changes in patient-reported outcomes of a physiotherapy-led exercise and brace intervention in patients with acute injury of the PCL over a 2-year follow-up period. Furthermore, to investigate changes in isometric knee muscle strength, and to report conversion to surgical reconstruction.

Materials and Methods: Fifty patients were treated with a brace for 12 weeks and underwent a 16-week exercise intervention. Changes in patient-reported outcomes was investigated with the International Knee Documentation Committee Subjective Knee Form (IKDC-SKF), the Tegner Activity Scale and the Knee injury and Osteoarthritis Outcome Score from baseline to 2-year follow-up. Changes in isometric knee flexion and extension strength were measured from 16 weeks after diagnosis to 1-year follow-up. Conversion to surgery was prospectively extracted from medical records. Mean changes were analysed with a mixed effect model with time as a fixed factor.

Results: The IKDC-SKF score improved 28(95% CI 24-33) points from baseline to 2-year follow-up. Isometric knee flexion strength increased 0.15(95% CI 0.07-0.23)Nm/kg from 16 weeks after diagnosis to 1-year follow-up, corresponding to an increase of 16%. Knee extension strength did not change (0.10(95% CI -0.02-0.21)Nm/kg, p=0.107). Seven patients converted to PCL surgical reconstruction.

Conclusion: The physiotherapy-led exercise and support brace intervention demonstrated clinically relevant improvements in patient-reported outcome and knee flexion strength, and the risk of PCL surgical reconstruction was considered low within the first 2 years.

