

the pandemic and generate practice recommendations from assessing electronic-pain-annotation and pen-to-paper-annotation by producing a detailed usability framework.

Materials and Methods This study followed the PRISMA scoping review guidelines. Online databases were searched from January 2015 to February 2021 for studies evaluating pain diagram usability in adults with musculoskeletal pain. Study quality was assessed using STROBE. An evidence gap map, framework and infographic were constructed.

Results 22 observational studies, 1 systematic review and 1 app review were included; of which 9 were high quality, 13 medium and 1 low (App review not assessed). 9 studies reviewed pen-to-paper-annotation, 14 reviewed electronic-pain-annotation and 1 both. Pen-to-paper-annotation and electronic-pain-annotations were found to be highly reliable (ICC 0.81–0.998), valid, and successful communication tools. Both had a positive relationship with outcome measures assessing psychological comorbidities, such as the widespread pain index. Gender specific electronic-pain-annotations enable better identification with the diagram and enhance communication about pain. Barriers involved lack of technology, interpretation, age, and pain experience. Automated weekly reminders were a completion facilitator. There were no studies directly comparing electronic-pain-annotation to pen-to-paper-annotation.

Conclusion Electronic-pain-annotation and pen-to-paper-annotation were both effective at communicating pain with electronic-pain-annotation allowing for more accurate quantification of pain extent. Gender specific electronic-pain-annotation allowed for better reporting of pain. Gaps included responsiveness in both modes and usability in electronic-pain-annotations which needs to be addressed to optimise integration into electronic health records.

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PROTECTIVE EQUIPMENT IN YOUTH ICE HOCKEY: ARE MOUTHGUARDS AND HELMET AGE RELEVANT IN EVALUATING CONCUSSION RISK?

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Introduction The high concussion burden in youth ice hockey is concerning. An important yet understudied area for prevention is protective equipment (e.g., wearing a mouthguard, age of helmet). Therefore, the objective of this study was to compare incidence rates of concussion between players based on mouthguard use and helmet age.

Materials and Methods This prospective cohort collected concussion information and player participation over five seasons (2013/14–2017/18) in male and female youth ice hockey players (ages 11–18). Baseline assessments were completed near the season start and collected reports on mouthguard use (yes, no), helmet age (newer/<2 years old, older/≥2

years old), and other important covariables (i.e., weight, age group, position of play, concussion history, body checking). Moreover, each player's participation hours and the number of therapist-suspected and physician-diagnosed concussions were collected throughout each season. A multilevel negative binomial regression model was used to estimate the concussion incidence rate and incidence rate ratio (IRR) for equipment.

Results The model included 426 player concussions (suffered by 369 players) with 271,148.7 player-hours and was adjusted for covariables, clustered by team, and offset by player-hours. Results showed that players who reported wearing a mouthguard had a 28% lower concussion rate compared with non-wearers (IRR=0.72, 95%CI: 0.55–0.93) while no differences in the concussion rate between newer and older helmet ages (IRR=0.94, 95%CI: 0.76–1.16) were detected.

Conclusions Wearing a mouthguard was associated with significantly lower concussion rates; thus, policy mandating use should be considered in youth ice hockey. More specific helmet age categories may require further investigation.

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PREDICTORS OF RESPONSE TO NEUROMUSCULAR TRAINING WARM-UP PROGRAMS AMONG YOUTH

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Introduction Neuromuscular training (NMT) warm-ups are effective in reducing injury risk in youth. Factors predicting the response to NMT in reducing injury risk are unknown, making this the objective of the present study.

Materials and Methods This is a secondary analysis of the intervention groups of randomized controlled trials evaluating NMT warm-ups among youth (11–18 years) [basketball (n=494), soccer (n=380), physical education (PE; n=919)]. Response was predicted based on age, sex, height, weight, sport/PE, one-year injury history, adherence (weekly sessions) to NMT, and balance ability (timed single-leg on balance pad). 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 Adjusting for age, balance, injury history, sex and sport/PE, balance ability reduced the odds of injury [OR=0.955, (95%CI: 0.912–0.999)]. Predictors of non-response include previous injury [OR=1.895, (95%CI: 1.335–2.691), female sex [OR=1.595, (95%CI: 1.119–2.274), and playing basketball [OR=3.151, (95%CI: 1.616–6.142)]. Stratifying by sex, weekly NMT sessions did not predict injury in females, however injury history [OR=2.148, (95% CI: 1.394–3.311)] and basketball [OR=3.677, (95% CI: 1.558–8.679)] were associated with increased odds. Stratifying by sex and sport, female soccer players had lower odds associated with

greater weekly mean NMT sessions [OR=0.282, (95%CI: 0.090–0.882)].

Conclusions Predictors of non-response to NMT in youth include being female, playing basketball, and history of injury. Better balance was associated with lower odds of injury. Higher weekly adherence was protective in female soccer players.

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OUTCOME PREDICTORS FOR RECOVERY OF ROTATOR CUFF TENDINOPATHY: AN INTERNATIONAL PROSPECTIVE COHORT STUDY

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Introduction There is inadequate data about outcome predictors for rotator cuff (RC) tendinopathy recovery. This international prospective cohort study aimed to determine outcome predictors of RC tendinopathy recovery and build an explanatory model.

Materials and Methods After completing the baseline survey, which included over 40 potentially plausible bio-psycho-social and demographic variables, recovery was assessed using the Global Rating of Change scale at monthly follow-ups for one year. Univariate cox proportional-hazards regression was used to analyse individual predictive associations, and multivariate cox regression was used for model building. Bootstrapping was used for internal validity.

Results 73 people with RC tendinopathy (43.9±14.0 years; 45 females; Shoulder Pain and Disability Index = 37.7±24.4) provided 15,284 days total analysis time at risk (208±129 days). Recovery rate was 47%, occurring around the 7th month. According to the final model, higher health status (HR = 1.03) and being moderately active (HR = 2.23) were associated with RC tendinopathy recovery. The internal validity showed that there was minimal overestimation in the predicted outcome (average optimism=0.01). The model partially predicted RC tendinopathy recovery with almost acceptable performance (optimism-corrected Harrell's C discrimination = 0.66 and Calibration Slope = 0.99).

Conclusion Self-reported online surveys may be useful to understand RC tendinopathy prognosis. The combination of self-reported factors, including activity level and health status, partially predicted RC tendinopathy recovery. Therefore, these modifiable self-reported variables could help guide clinical decision making.

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CARBOHYDRATE AVAILABILITY IN FEMALE ENDURANCE ATHLETES WITH SYMPTOMS OF RELATIVE ENERGY DEFICIENCY IN SPORT (RED-S)

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Introduction Endurance athletes with high training loads and weight focus have increased risk of low energy and carbohydrate (CHO) availability. This is the first study aiming to investigate the timing of CHO intake in relation to training load in athletes with symptoms of relative energy deficiency in sport (RED-S).

Materials and Methods Female endurance athletes (n=12) (25.9 ± 4.4) years, BMI 20.9 ± 2.1), with symptoms of RED-S (Low Energy Availability in Females Questionnaire total score 11.9 ± 2.9) without disordered eating behavior, performed a 7-day weighed dietary and training registration (heart rate monitors, online training logs). CHO intake was analyzed for key (high intensity/>120 min) and easy training sessions (all other sessions >30 min) as well as hard (including >1 key session) and light training days (all other days). Mean difference, 95% confidence intervals (CI) not including 0, and a paired student t-test were used to determine differences between CHO intake and international sport nutrition recommendations.

Results None of the participants met the recommended daily CHO intake [CI -1.7 (-2.4 to -0.9)], or CHO intake immediate after [CI -0.7 (-0.9 to -0.5)], between [CI -1.2 (-2.0 to -0.4)] or during [CI -15.2 (-29.1 to -1.3)] key training sessions. CHO recommendations were more difficult to fulfill during hard compared to light training days (p=0.014).

Conclusion Female endurance athletes with symptoms of RED-S have difficulties matching CHO intake in relation to training load according to the recommendations. Hence, to prevent RED-S focus on optimizing CHO intake is needed.

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MENISCAL SURGERY OR EXERCISE THERAPY IN ALLEVIATING PATIENT-REPORTED MECHANICAL SYMPTOMS IN YOUNG ADULTS WITH A MENISCAL TEAR

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Introduction A common treatment strategy to alleviate mechanical symptoms in young patients with meniscal tears is meniscal surgery, however, it is unknown whether this is superior to a non-surgical strategy. Therefore, we aimed to compare meniscal surgery to early exercise therapy and patient education.

Materials and Methods In the DREAM trial 121 patients aged 18–40 were randomized to surgery (partial meniscectomy or meniscal repair) or 12-weeks of supervised exercise therapy and patient education, with the option of later surgery if needed. In this secondary analysis we included patients with self-reported mechanical symptoms (yes/no) at