

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