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Development and reliability of the Physical Literacy in Children Questionnaire (PL-C Quest): a self-report scale to assess children's perceived physical literacy

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Objective: In 2017 Sport Australia led the development of a physical literacy definition for Australia. The associated Australian Physical Literacy Framework (APLF) (released in 2019) includes 30 elements within four domains (physical - 12 items, psychological - 7 items, social - 4 items and cognitive - 7 items), e.g. motivation is an element in the psychological domain and tactics is an element within the cognitive domain. It is important now to develop robust measurements which align with the APLF. This paper will: 1) briefly outline development of the Physical Literacy in Children Questionnaire (PL-C Quest) – a pictorial scale designed in 2020 to measure children's perceived physical literacy and 2) report on reliability values for the PL-C Quest.

Methods: 1) Scale development: Qualitative research methods were used to determine a) a gender and race neutral character that appealed to children and b) how children understood the images and wording designed for the PL-C Quest. Input was provided by an expert reference committee and 17 children aged 4 to 12 years. 2) In sample 2, 60 children (and their parents) aged from 6.9 to 12.4 years (mean = 9.7 years, SD = 1.5) were recruited via social media to conduct reliability analyses. Parents reported on demographics and children completed the PL-C Quest online twice. Test retest (mixed two way models for consistency) and internal consistency (polychloric alphas) were conducted.

Results: 1) Children preferred a 'bunny' character. Children interpreted most images as intended with some images redrawn based on feedback. 2) Parents were largely University educated (n = 52, 86.7%) and spoke English at home (n = 55, 91.7%). Children completed the survey twice 15.8 days apart (SD = 3.2). Test-retest values for the complete scale were good (ICC = 0.83) and domain values ranged from adequate to good [social: ICC = 0.67, cognitive: ICC= 0.74, psychological: ICC = 0.77 and physical: ICC = 0.80]. Internal consistency was adequate to good for the cognitive (T1=0.60, T2=0.71), social (T1=0.63, T2=0.70), and physical (T1=0.76, T2 =0.83) domains and lower for the psychological domain (T1=0.53, T2=0.47).

Discussion: The PL-C Quest is the first instrument designed to comprehensively measure young children's perceived physical literacy. The reliability results are promising with the next step construct validity testing in larger diverse samples. The PL-C Quest can be used with children in education and sport settings to understand how to assist children to develop their physical literacy potential.

No conflicts of interest to declare.

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Runners with chronic mid-portion Achilles tendinopathy have greater Triceps surae intracortical inhibition than healthy controls

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Background: Achilles tendinopathy (AT) is an overload injury, affecting mostly runners. Persistent triceps surae muscle weakness has been reported in AT patients. Muscle force is influenced by inhibitory and excitatory circuits, and imbalances between these (e.g., increased short-interval intracortical inhibition - SICI) may negatively affect strength. Increased SICI has been observed with patella tendinopathy; however, it is unclear if this increased inhibition is present in chronic mid-portion AT patients. Thus, this study aimed to investigate the intracortical inhibitory mechanisms in runners with mid-portion AT.

Methods: Runners with chronic mid-portion AT (n=11; 44.1±8.4 years) and healthy controls (n=13; 33.9±4.25 years), with a running routine of at least twice weekly for more than 4 months, were recruited. All completed the VISA-A questionnaire AT (AT= 70.7±7.0) and Control (100±0). The most symptomatic leg (8 unilateral AT and 3 bilateral AT) was compared with control group dominant legs. Plantar flexor maximal voluntary isometric contraction (MVIC) torque was measured via isokinetic dynamometer (knee fully extended, ankle at 0°). Triceps surae endurance was measured with standing single leg heel raise to failure (SLHR) test. SICI was assessed using paired-pulse transcranial magnetic stimulation to the motor cortex area associated with the leg, delivering 20 paired-pulses at 0.8x (first pulse) and 1.2x (second pulse) of active motor threshold (AMT) with 3ms interval and 20 single pulse stimulation at 1.2 AMT, all during a 10% plantar flexion contraction. Two-way repeated measures ANOVA was used to compare SICI between muscles (Soleus, and Gastrocnemii) and groups. Independent t-test was used to compare SLHR and MVIC peak torque between groups.

Results: SICI was higher in AT group (67.4±9.0) than controls (54.0±9.0); (p=0.039,) independent of the tested muscle (no muscle vs group interaction; p =0.828). AT group performed ~28% fewer SLHR repetitions than the controls (AT, 27.5.0±6.8 and control 38.5±5.3 repetitions, p=0.004). There was no difference in MVIC peak torque corrected for body mass (N.m/Kg), (AT=1.4±0.3; Control=1.6±0.4, p =0.093).

Discussion: The AT group displayed greater intracortical inhibition of the triceps surae muscles and reduced SLHR endurance, without deficit in maximal isometric torque. SICI could be negatively influencing SLHR endurance in AT; thus, rehabilitation aiming to reduce intracortical inhibition should be considered for better outcomes.

Conflict of interest: The authors declare no conflict of interest related to the present work.

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Accuracy of standard MRI sequences for meniscal tears and grading of chondral lesions in the knee, relative to knee arthroscopy: A prospective study of 719 cases

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Introduction: Musculoskeletal magnetic resonance imaging (MRI) is commonly used for diagnosis and research, but its accuracy remains unproven and its clinical usefulness is questionable. The goal of this study was to compare the accuracy of knee MRI with clinical assessment for diagnosing meniscal tears, and to determine the accuracy of MRI for grading chondral lesions, relative to knee arthroscopy.

Methods: Physically active patients presenting with acute / sub-acute onset of mechanical symptoms, in the absence of grade 2-3 ligament injury or true locking, that had been preventing them from taking part in their usual physical activity for at least 4 weeks, and with clinical findings that warranted a knee arthroscopy, had both a knee arthroscopy and an MRI performed. Patients were over the age

of 18 years, fit for general anaesthetic, with no contraindications for arthroscopy or MRI, and prepared to undergo both. A standard knee arthroscopy was performed and the intra-operative findings were compared with those of the MRI, using the International Chondral Research Society (ICRS) grading for chondral damage, and the presence or absence of a meniscal tear. All MRIs were performed on either a 1.5T or 3.0T MRI machine, using standard sequences.

Results: 719 patients were recruited over a period of 6.5 years. Their average age was 52 years (standard deviation, SD 5.2), the male:female ratio was 493:226. Kappa scores with standard errors (SE) for agreement between MRI and knee arthroscopy were 0.41 (SE 0.1) for medial meniscal tears, and 0.44 (SE 0.1) for lateral meniscal tears. For the grade of chondral damage, the Kappa scores with SE values were 0.09 (0.1), 0.17 (0.1), and 0.22 (0.07) for anterior, medial and lateral compartments respectively. Using areas under the receiver operating characteristic curves, we found clinical assessment was more accurate than MRI for diagnosis of lateral meniscal tears (P<0.001), and of similar accuracy for the diagnosis of medial meniscal tears (P=0.12).

Discussion: MRI had relatively poor correlation with arthroscopic findings for grading chondral damage and was less accurate than clinical assessment for the diagnosis of lateral meniscal tears. Other research has suggested that MRI is overused in clinical practice and may increase the number of knee arthroscopies performed. Up to 40% of patients diagnosed with a meniscal tear on MRI had no meniscal tear at arthroscopy. Insufficient accuracy will undermine the validity of any research in which this imaging modality has a primary role in the study methodology.

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

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The association between prescribed and measured delivery intensity in elite male cricket fast bowlers

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Background: A common practice among sport scientists is to prescribe a targeted training load for each training session. Loads captured in training should ideally align with what was prescribed to ensure healthy adaptations. Otherwise, maladaptations to training may occur, predisposing the athlete to overreaching, burnout, illness, or injury. Most workload research in cricket fast bowling has not measured the intensity of a delivery; a key component in profiling the demand of an activity. Elite fast bowlers in Victoria have access to instantaneous feedback on their bowling speed during indoor training that may help them adhere to a prescribed delivery intensity throughout a session. Therefore, the purpose of this investigation was to determine the association between prescribed and measured delivery intensity operationalised as bowling speed.

Methods: Six elite male fast bowlers participated in this longitudinal, repeated-measures study conducted during the cricket pre-season of 2018/19. The pre-season bowling programme comprised 14 bowling sessions over 8 weeks (total of 570 deliveries per participant). Each session was planned with a fixed bowling volume (number of deliveries) and prescribed delivery intensity (absolute bowling speed individualised to each participant). Seven prescribed absolute bowling speed thresholds (delivery intensities) were derived and used for each bowler; these were based on approximate matching of absolute ball speeds to relative peak PlayerLoadTM data at 70%, 75%, 80%, 85%, 90%, 95%, and 100% profiled in the 2017/18 season. Absolute bowling speed data was converted to a relative peak for each participant and used for statistical analysis.

Mixed-effects linear regression was used to determine the association between prescribed and measured delivery intensity, while controlling for clustering of repeat trials for each participant. Statistical analyses were conducted in Stata, with statistical significance was set at p < 0.05.

Results: There was a significant, moderate positive relationship between prescribed and measured delivery intensity (r = 0.37, p = 0.0112). Relative bowling speed was on average 11–17% higher than prescribed, across prescriptions of 70-80%. This difference was reduced to 2.5% at the prescribed delivery intensity of 90%.

Discussion: As observed in recent studies, relative bowling speed is markedly elevated at lower prescribed delivery intensities. These findings indicate fast bowlers have difficulty in adhering to lower planned delivery intensities despite instantaneous feedback. Sessions planned at lower prescribed delivery intensities may result in larger variability in load experienced than those planned at higher intensities and contribute to unintended maladaptation's.

Conflict of Interest Statement: "Adrian Mott and Justin Forbes are employees of Cricket Victoria. The authors declare no other conflicts of interest."

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Invest in our future! Exploring the athletes' perspectives and experiences of injury prevention practices in women playing elite Australian Football

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Background: Women playing in the national elite Australian Football League for Women (AFLW) have a ten times greater risk of serious knee injury than men. Efficacious injury prevention programs exist for team ball-sports, yet their implementation is generally poor. Little is known about how women playing elite team ball-sports perceive and experience injury prevention programs in practice. Understanding the end-user's (athlete's) perspective is essential to improve program uptake and adherence. In this study we explored the athletes' perspectives and experiences of injury prevention practices in the AFLW.

Methods: We recruited a convenience sample of 13 athletes from three Melbourne based AFLW clubs who had developed and embedded an injury prevention program. Semi-structured interviews were audio-recorded in 2018 (post-Season 2), transcribed verbatim, analysed with a thematic analysis approach, and classified within the Socio-Ecological Model (SEM).

Results: Athletes were on average 25 years old (range 19–31), played a median of 2 AFLW seasons (range 1–2), and had a mean of 8.2 years (range 2-15) of Australian Football experience. Women playing elite Australian Football: 1) believe injury prevention programs can prevent injuries, enhance performance and prolong their football career, 2) perceive that injury prevention practices vary between and within AFLW clubs, 3) believe injury prevention program adoption and implementation is complex and multi-factorial, and 4) think implementing injury prevention programs in the AFLW could be enhanced through education and resource allocation. Barriers to program adoption included lack of knowledge and time, and competing demands. Holistic, gender-specific education, resources and a positive club culture facilitated program use. Athletes suggested that full-time professional contracts and improved resources might enhance implementation. Mapping our results onto the SEM highlighted that athletes perceive that individual, interpersonal, community, and organizational levels are important in sports injury prevention.