Patients (or Participants) We enrolled 66 student-athletes (53.0% Female, Age: 20.0 ± 1.1 years old, Height: 1.75 ± 0.11 m, Weight: 78.7 ± 20.9 kg) from 16 sports who were diagnosed with sports-related concussions.

Interventions (or Assessment of Risk Factors) Electronic medical records were tracked for a year following the concussion for diagnosed lower extremity MSK injuries.

Main Outcome Measurements All participants completed a multifaceted concussion baseline consisting of 1) 22-item 0–6 self-reported symptom checklist with outcomes including, 1) number of symptoms endorsed, 2) total symptom score, 3) Standard Assessment of Concussion, 4) Balance Error Scoring System, 5) Immediate Post-Concussion Assessment and Cognitive Testing composite scores, 6) clinical reaction time, and 7) the King-Devick test. The concussion participants completed the same exam acutely post-concussion (<48 hours) and binary logistic regression was used to identify predictors of subsequent MSK from the change scores (Acute minus Baseline).

Results The participant demographics and injury characteristics ($p=0.318$, $\text{Exp}(B)=1.020$) and concussion clinical outcomes ($p=0.461$, $\text{Exp}(B)=1.200$) did not predict subsequent MSK. Exploratory analysis failed to identify any individual predictive variable from the clinical measures including total symptoms ($\Delta=9.3$, $p=0.738$), symptoms severity ($\Delta=21.1$, $p=0.738$), BESS ($\Delta=-0.6$ errors, $p=0.474$), SAC ($\Delta=-0.7$, $p=0.938$), Verbal Memory ($\Delta=1.6$, $p=0.064$), Visual Memory ($\Delta=5.1$, $p=0.724$), Motor Speed ($\Delta=0.6$, $p=0.297$), Reaction Time ($\Delta=0.04$ s, $p=0.642$), CRT ($\Delta=15.8$ ms, $p=0.446$), King-Devick ($\Delta=6.9$ s, $p=0.792$).

Conclusions None of the standard concussion assessments significantly predicted MSK injury in the year following concussion. Thus, clinicians are not able to utilize common neurological measures or participant demographics to identify those at risk for subsequent LE MSK suggesting injury prevention programs should be implemented for all post-concussion athletes

171 MSK INJURY LIKELIHOOD IS INCREASED DURING THE 4-MONTH PERIOD AFTER A CONCUSSION

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Background There is evidence that concussion can increase the risk of sustaining a subsequent musculoskeletal (MSK) injury up to 24-months post injury. The reason for increased risk is unknown although irregularities in brain and motor function post-concussion that are sustained beyond clinical recovery have been implicated.

Objective To determine the likelihood of UK High Performance System athletes sustaining a subsequent MSK injury within a 4-month period post-concussion.

Design Retrospective Cohort Study. A concussion was identified by a medical records diagnostic code of 'concussion without loss of consciousness', 'concussion with loss of consciousness', or 'concussion not otherwise specified'. The attrition rate is the average occurrence of an MSK injury during the 4-month period. An attrition rate for all MSK injuries was determined using the formula; 'Number of MSK Injuries'/'Number of Athletes'. An attrition rate for all MSK injuries subsequent to a concussion was determined by the formula;

'Number of MSK injuries that occur in the 4-months after a concussion'/'Number of Athletes who sustained a concussion'.

Setting UK High Performance System Olympic and Paralympic athletes

Participants 1979 athletes from 33 sports

Main Outcome Measurements MSK attrition rate compared to MSK/Concussion attrition rate.

Results Athletes were found to have a 27% increased risk of suffering a MSK injury 4-months post-concussion, with the overall MSK attrition rate of 0.78, increasing to 0.99 post-concussion. A higher MSK/Concussion attrition rate was identified in 26 of 33 sports.

Conclusions There is an increased risk of sustaining a MSK injury post-concussion amongst UK Olympic and Paralympic programme athletes. Therefore, identifying and addressing risk factors for subsequent MSK injury should be considered during concussion rehabilitation. This might include visio-motor, oculo-motor, balance and neuromuscular impairments alongside screening, monitoring and programming physical preparation to ensure any work-load imbalances associated with time away from sport are addressed.

172 THE EFFECT OF ANXIETY DURING CONCUSSION ASSESSMENT IN RURAL LOW SOCIOECONOMIC ADOLESCENT ATHLETES

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Background In youth, anxiety is the most prevalent mental illness in the US, effecting 31.9% of adolescents. During concussion assessment, athletes may experience high levels of anxiety due to concerns such as the inability to perform in their sport. While it is commonly assumed lower socioeconomic (SES) adolescents are more resilient in handling anxiety, this has not been examined.

Objective Determine the effect of anxiety on neuropsychological testing in rural low SES adolescent athletes.

Design Cross-sectional between-groups cohort design.

Setting and Participants Rural low SES adolescent athletes ($n=126$) were recruited prior to their competitive season to establish anxiety levels during baseline concussion assessment.

Interventions Participants were given baseline tests including computerized neuropsychological test battery (ImpACT™) and the State Trait Anxiety Inventory (STAI-Y) to determine cognitive function and levels of anxiety, respectively. Participants were divided into groups based upon STAI-Y scores. Using SPSS, one-way ANOVAs were calculated on ImpACT composite scores, using an alpha level of .05 for all tests.

Main Outcome Measurements ImpACT composite scores.

Results 7% ($n=9$) and 17% ($n=21$) endorsed high state and trait anxiety respectively. Statistically significant differences existed between state anxiety groups on composite reaction time ($F_{(1,124)} = 6.72$, $p=0.011$, eta squared = .03), composite impulse control $F_{(1,124)} = 8.49$, $p=0.004$, eta squared = .01), and total symptoms ($F_{(1,124)} = 7.09$, $p<0.001$, eta squared = .01), with high state anxiety athletes performing worse and reporting more symptoms.

Conclusions Rural low SES athletes endorsed lower levels of anxiety than the general population, however those with high state anxiety endorsed more symptoms and performed worse on measures of impulsivity. This study provides initial

evidence that anxiety may influence cognitive test scores in this population. Future research should examine the influence of anxiety during post-concussion assessment when stakes may be higher in this underrepresented population.

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TESTING NEUROCOGNITIVE FUNCTION AND BALANCE FOLLOWING SPORT CONCUSSION – DO WE NEED BASELINES?

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Background While evaluating balance and neurocognitive function following concussion is clinically valuable for both diagnosis and treatment, it is unclear if these assessments are best employed in reference to a pre-injury evaluation, or to normative results sampled from a healthy population.

Objective To evaluate the performance of a computerized assessment of balance and neurocognitive function in athletes following a sport-related concussion (SRC) compared to either their own pre-injury test scores, or the scores of a normative sample of uninjured athletes.

Hypothesis SRC test scores would discriminate better from athlete's own pre-injury scores compared to those of an uninjured cohort.

Design Prospective observational study design.

Setting Sport medicine clinic at a Canadian University.

Participants One hundred and forty Canadian Interuniversity athletes (n = 73 male, n = 67 female) from 12 different sports. Seventy non-injured athletes (n = 31 male, n = 39 female) were assessed prior to the start of their competitive season, while 70 athletes (n = 42 male, n = 28 female) with SRC were assessed within one week of injury.

Assessment of Risk Factors At the time of testing, fourteen measures of neurocognitive function (n = 6) and balance (n = 8) were assessed using the C3 Logix application (NeuroLogix Technologies, Cleveland, Ohio).

Main Outcome Measures Presence or absence of SRC, as diagnosed by a sport medicine doctor.

Results Partial least squares discriminant analyses followed by the evaluation of model classification accuracy (Accur) revealed better discriminative performance when test scores in athletes with SRC were compared to an uninjured cohort (Accur = 0.74), as opposed to their own pre-injury test scores (Accur = 0.61).

Conclusions Contrary to our hypothesis, these initial results suggest that neurocognitive and balance testing following SRC may benefit from comparison to normative reference values sampled from a healthy population.

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DO FUTURE DOCTORS IN SCOTLAND NEED FURTHER EDUCATION TO ENSURE THEY CAN ADEQUATELY IDENTIFY AND MANAGE CONCUSSIONS?

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Background Preventing sports-related concussions is a medical priority across all levels of contact sports. Doctors play a key role in ensuring concussed athletes can safely return to sport, yet research has shown deficiencies in concussion knowledge and education amongst doctors and medical students. In the UK, studies assessing concussion knowledge and learning experiences have not previously been conducted in medical schools despite a parliamentary inquiry highlighting evidence regarding the links between sport and brain injury.

Objective To assess medical students' concussion knowledge and learning needs in Scottish Medical Schools.

Design An online survey with 23 questions assessing aspects of concussion prevention, detection and management was distributed to Scottish Medical schools. Data collection took place between October and December 2020. Scores were calculated based on correct recognition of symptom and management approaches.

Setting Clinical year medical students studying in Scotland.

Participants 200 medical students completed the survey (8% response rate).

Results On average, participants scored 87.3% (sd 9.56) on symptom recognition items but only 31% (sd 15.3) on questions relating to management and prevention. 38% incorrectly identified that brain imaging could diagnose a concussion. Only 15% of participants correctly identified that headgear does not prevent concussions and only one participant correctly identified the minimum 'return to sport' timeframes for adults and children. 15% of participants reported having learnt about concussion at medical school and 92.5% were interested in receiving concussion teaching at medical school.

Conclusions Medical students show competence in concussion recognition but there are gaps in knowledge concerning concussion prevention and management. Concussion is not frequently taught in medical schools despite a desire for it to be covered in curricula. Further studies are needed to understand how concussion education can best be incorporated to ensure future doctors are competent in managing concussions and minimising the risk of secondary harms.

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PREVENTION AND MANAGEMENT OF SPORT-RELATED CONCUSSIONS: CURRENT KNOWLEDGE AND PRACTICES AMONG FIELD STAKEHOLDERS OF THE FRENCH-SPEAKING IOC RESEARCH CENTRE (REFORM)

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Background Sport-related concussions (SRC) impact the practice of numerous athletes. Their appropriate management involves education and prevention among all field stakeholders including physicians, coaches and athletes themselves.