sprinting capacity. This implicates that introducing eccentric hamstring strengthening during pre/early season seems relevant as this may both increase sprinting performance and mitigate the risk of HI during the in-season.

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**HIGH CONCUSSION RATE AMONGST SOUTH AFRICAN UNIVERSITY RUGBY STUDENT TOURNAMENT**

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**Background** Of all injuries common to collision sports, concussions have received the most attention due to the potentially negative cognitive effects in the short- and long-term. Stellenbosch Rugby Football Club (‘Maties’), the official rugby club of Stellenbosch University, represents one of the world’s largest non-professional Rugby clubs, making this an ideal cohort for community level injury surveillance.

**Objective** To describe the incidence and events associated with concussion in this large non-professional homogenous cohort.

**Design** A one-season prospective cohort injury surveillance study.

**Setting** Students (young adults) athletes competing in the Maties Rugby Club in 2018.

**Patients (or Participants)** All 807 male players registered for the Koshuis tournament in 2018, which was comprised of 101 matches and 2,915 of exposure hours. The average age, height and weight of this cohort was 20±2 years, 182±7 cm and 88±14 kg, respectively.

**Interventions (or Assessment of Risk Factors)** Recording of all injuries, and factors associated with injury, according to the consensus statement for injury recording in rugby.

**Main Outcome Measurements** Overall, there were 89 time-loss injuries, which equated to an injury rate of 31 per 1000 match hours (95% confidence intervals [CIs]: 24–37), or about one injury per match. The most common injury diagnosis was ‘concussion’ (n=27 out of 90 injuries, 30%), at a rate of 9 per 1000 match hours (95% CIs: 6–12).

**Results** The three most common mechanisms of concussion in the present study were performing a tackle (33%), accidental collision (30%) and being tackled (11%).

**Conclusions** Concussion was the most common injury in this population, at a rate that was six times higher than a comparable cohort in the UK. Future studies should try to explain this higher rate and subsequently reduce these concussions.

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**ABSTRACT WITHDRAWN**

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**GENDER DIFFERENCES IN HEAD IMPACT RATE AND MECHANISM IN HIGH SCHOOL LACROSSE**

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**Background** There is debate as to whether protective headwear should be mandated in female lacrosse; however, a lack of quantitative evidence exists regarding the effectiveness of, and case for, protective headwear in female lacrosse.

**Objective** To compare head impacts in male and female lacrosse in terms of rate recorded by headband-mounted sensors and mechanism determined by video analysis.

**Design** Prospective observational study.

**Setting** One season of suburban high school female (12 games) and male (15 games) lacrosse competition.

**Participants** Adolescent female (n=15) and male (n=33) lacrosse players.

**Main Outcome Measurements** Head impact rate as calculated by the number of video-confirmed head impacts above 16 g recorded by SIM-G (Triax Technologies) headband-mounted impact sensors divided by the number of player-games during one season. Mechanism of impact (i.e. player contact, fall, stick-to-head or ball-to-head) determined by detailed video analysis of sensor-recorded events.

**Results** For male lacrosse, 226 head impacts were recorded during 272 player-games for an impact rate of 0.83 impacts per player-game. The most common mechanism for head impacts to male lacrosse players was player contact (57%) followed by stick-to-head (27%), falls (15%) and ball-to-head (7%). For female lacrosse, 7 head impacts were recorded during 109 player-games for an impact rate of 0.06 impacts per player-game. Of the seven head impacts to female lacrosse players, three were player contact (43%), three were stick-to-head (43%) and one was a fall (14%).

**Conclusions** The impact rate for female lacrosse players is less than 8% of the rate for male lacrosse players, which suggests that head impacts in female high school lacrosse are rare. However, nearly half of the head impacts in female lacrosse were stick-to-head, for which protective headwear may reduce the risk of injury. Therefore, further investigation of the association between head impact mechanism and injury in female lacrosse is required.

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**NORMATIVE BASELINE SCAT5 SCORES IN A POPULATION OF UNITED STATES OLYMPIC ATHLETES**

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**Background** The Sport Concussion Assessment Tool 5th Edition (SCAT5) is the most recent version of the concussion
evaluation tool used by clinicians to evaluate athletes with suspected concussions.

**Objective** To describe normative baseline SCAT5 scores among United States Olympic athletes.

**Design** Retrospective descriptive epidemiology.

**Setting** United States Olympic and Paralympic Sports Medicine Centers.

**Participants** Two hundred fifty-seven Olympic athletes (48.2% female, mean age ± standard deviation (SD) = 22.5±4.8 years) representing 19 sport federations underwent baseline SCAT5 testing between April 2018 and July 2019.

**Main Outcome Measurements** Baseline SCAT5 scores of healthy Olympic athletes. T-tests were used to compare scores by sex.

**Results** Athletes reported a mean of 4.0±4.9 symptoms (median=2, IQR=0–6) with an average severity score of 7.9 ±12.3 (median=2, interquartile range=0–10). Most (71.8%) athletes reported never having sustained a concussion prior to testing; 17.5% reported one prior concussion (range=0–10). Most (71.8%) athletes reported never having sustained a concussion prior to testing; 17.5% reported one prior concussion (range=0–10 reported concussions). Mean scores ± SD for major components of the SCAT5: 4.8±0.53 for orientation, 20.7±4.0 for immediate memory, 3.8±1.3 for concentration, 4.0±4.2 for balance, 6.9±1.9 for delayed recall, and 12.4±3.0 for Standardized Assessment of Concussion. No sex differences were observed for concussion history or the number and severity of current symptoms. Females scored higher than males in the immediate memory (21.7 vs. 19.8, p<0.001), orientation (4.9 vs. 4.8, p=0.047), and delayed recall tasks (7.3 vs. 6.5, p=0.001).

**Conclusions** Normative values for baseline SCAT5 performance are presented for a population of healthy Olympic athletes. This information can be considered by clinicians interpreting SCAT5 results in athletes who do not have a known baseline score.

**Setting** Community rugby in three New Zealand provincial unions.

**Patients (or Participants)** Community rugby male and female players (n=1893) were invited to participate of which 1540 provided pre-season baseline data.

**Interventions (or Assessment of Risk Factors)** Pre-season, players were baseline tested using a modified SCAT5. In season, suspected concussions were logged on an App, notifying relevant stakeholders and entering the player into the CMP. Players were referred to a doctor who assessed them for a concussion while comparing to the player’s baseline assessment via a customized online portal. This information was also used by the doctor at the time of medical clearance. To gain a deeper understanding of the participants’ experience with the CMP, 130 stakeholders were interviewed post-season.

**Results** Two-hundred suspected concussions were logged, of these 154 saw a doctor for a diagnosis, 171 obtained medical clearance following completion of GRTP and 17 were referred on for further investigation/treatment by a doctor involved in the pilot.

Stakeholders agreed that having a clearly defined pathway facilitated an efficient and informed management process for concussions and encouraged compliance with seeking medical advice/clearance.

**Conclusions** The CMP provides an electronic platform for monitoring compliance with medical visits and the safe RTP while ensuring all stakeholders are aware of the player’s status. The system provides controlled access to centrally stored baseline information to help inform medical decisions. Stakeholders supported the use of the CMP.

**Background** Concussion is a global sport injury, however, in Africa this public health concern has yet to be studied. Currently, there are no concussion management programs implementing baseline or post-concussion measures among football clubs in the Football Association of Zambia (FAZ). Furthermore, it is unknown if tests such as the Immediate Post-Concussion Assessment and Cognitive Test (ImPACT) Quick Test (QT) would be culturally appropriate measures for implementation as part of a concussion screening protocol in Zambia or other African nations.

**Objective** To determine baseline neurocognitive percentile ranks among Zambian football athletes on the ImPACT QT.

**Design** Cohort study.

**Setting** Premier league football clubs based in Lusaka, Zambia.

**Patients (or Participants)** Male premier league football athletes from Zambia (n=119) aged 24.48±5.41.

**Interventions (or Assessment of Risk Factors)** The ImPACT QT (5–7 min) neurocognitive assessment administered on an iOS/Apple iPad prior to a preseason team practice.

**Main Outcome Measurements** Outcome measures were average performance on 3 factor scores: Motor Speed, Memory, and...