

Background Professional American football players (PAFP) are at high risk for musculoskeletal (MSK) injuries during their season. Little is known about how artificial intelligence (AI) enhanced force plate counter movement jump (CMJ) indices measure musculoskeletal and physiological change, and if these changes across seasons contribute to increased injury risk, especially after an extended layoff from training and participation such as occurred with the Covid-19 lockdown.

Objective Examine longitudinal changes in force plate CMJ measures in PAFP over multiple seasons and to determine if these measures were valid indicators of MSK health. Hypotheses tested: force plate CMJ indices are a valid measure of MSK health and these measures would decrease as injury risk would increase after Covid-19 lockdown.

Design Longitudinal force plate study

Setting Professional American Football

Patients (or Participants) 483 PAFP

Interventions (or Assessment of Risk Factors) Force plate measures in PAFP

Main Outcome Measurements CMJ force plate measures in PAFP

Results 483 unique individuals scanned over four pre-seasons. 109 unique individuals had repeat pre-seasons during that time. 949 force plate CMJ tests were performed over those four pre-seasons. The AI-generated conglomerate variable MSK_Health was on average 47.8 ± 9.7 in 2017, 47.4 ± 10.1 in 2018, 47.5 ± 10.1 in 2019, and 45.0 ± 11.2 in 2020 post-Covid lockdown. ANOVA showed that 2020 measures of MSK_Health were significantly decreased relative to the 3 prior seasons. Logistic regression analysis demonstrated a significant effect of the MSK_Health variable on MSK injury risk.

Conclusions Across multiple seasons of force plate CMJ measures in PAFP, MSK_Health decreased following Covid-19 lockdown, which may be associated with higher risk for MSK injury. This greater understanding of the changes in longitudinal CMJ force plate measures in PAFP across seasons and after extended layoffs may assist in the development of effective MSK injury reduction measures.

442 ABSTRACT WITHDRAWN

443 INJURIES AMONG FOOTBALL GOALKEEPERS: RISK FACTORS AND INJURY PREVENTION PROGRAM – A SYSTEMATIC REVIEW

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Background Previous studies have confirmed different localization of injuries in football goalkeepers (FG) compared to outfield players. However, there is a lack of systematic data regarding the injury epidemiology and potential injury prevention programs that might be implemented in this unique group of players.

Objective 1) To analyze the type and localization of injuries among FG and what are the associated risk factors for these injuries **2)** To verify whether there is any injury prevention program tailored for FG.

Design Systematic review of MEDLINE, SPORTDiscus, Web of Science, Scopus, and Cochrane Library electronic databases (search strategy available via the PROSPERO database; 2020 CRD42020183296).

Setting Any football competition level.

Patients (or Participants) The study population consisted of both sexes of amateur or professional FG.

Interventions (or Assessment of Risk Factors) Any paper addressing the issue of injury incidence and/or prevalence and describing injury prevention program/warm-up tailored for goalkeepers.

Main Outcome Measurements Type of injuries, localization of injuries, types of injury prevention programs, injury incidence (injuries/1000 training or match-play hours), percentage distribution of injury type, percentage distribution of injury localization.

Results Our searches identified 813 potentially relevant articles. By reviewing titles and abstracts, we identified 52 potential articles examining type and localization, and risk factors of injuries amongst FG, and biomechanical effects of applying injury prevention accessories (e.g., shorts, pads, etc.). There were no original scientific papers reporting the effectiveness of any tailored injury prevention programs implemented in a FG population. However, there was one short communication published as an abstract, confirming significant reductions in the total number of the upper extremity injuries following the application of FIFA 11+ program (RR=0.42 [0.31–0.56]; $p < 0.00001$, NNT=5.1).

Conclusions More investigations are needed to develop and evaluate effectiveness of injury prevention strategies tailored for FG.

444 ATHLETE PERCEPTIONS OF INTENTIONAL INJURY (ABUSE): A QUALITATIVE STUDY ACROSS THREE COUNTRIES

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Background Para athletes from less-resourced countries have the highest need for protection against abuse in sport; however, their experiences and perceptions of abuse have not been studied.

Objective To describe Para athletes' experiences and perceptions of abuse in sport, and systematically investigate the socio-cultural drivers of those perceptions to inform culturally-relevant strategies to better protect vulnerable athletes.

Design Qualitative data were collected in the form of focus groups with Para athletes from Ghana, Brazil, and India. Data were analyzed using the Framework Method for Multidisciplinary Qualitative Analysis and transcripts were coded and analyzed by the research team.

Setting Focus groups were conducted with Para athletes at the National Paralympic training center in Accra, Ghana and virtually via Zoom.

Participants Twenty-six national- and international-level Para athletes with varying disabilities, 18 years or above, living and training in Ghana, India, or Brazil.

Main Outcome Measurements Four a priori themes with multiple subthemes were considered: characteristics of, effects of, growth after, and strategies to address abuse.

Results Athletes described a wide range of harms experienced both within and outside of sport. In addition to more commonly recognized modes of abuse such as physical and sexual, athletes focused on three less easily recognized forms of abuse: financial abuse, neglect, and disability stigma. Athletes described abuse as operating on both interpersonal and systemic levels. Cultural and societal factors influenced athletes' perceptions and experiences of harms.

Conclusions Para athletes from less-resourced countries represent the largest pool of global sportspersons eligible for Olympic-level participation, and have the highest need for protection against abuse, but their voices are seldom heard. Sport stakeholders concerned with abuse prevention must understand their experiences and integrate their insights and priorities into sport safeguarding policies, programs, and interventions. As new insights are added to the current evidence base, athlete-generated and locally-relevant preventative strategies can better protect all athletes.

445

ABSTRACT WITHDRAWN

446

INCIDENCE OF HEAD CONTACTS, PENALTIES AND PLAYER BEHAVIOUR IN YOUTH ICE HOCKEY: EVALUATING THE 'ZERO TOLERANCE FOR HEAD CONTACT' POLICY CHANGE

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Background Concussion risk in ice hockey is amongst the highest for youth sport. To reduce this burden, in 2011 Hockey Canada implemented a national 'zero tolerance for head contact (HC)' policy mandating referees to penalize all player HCs; however, higher concussion rates have been observed following this policy in players aged 11–14.

Objective To compare HC rates and HC-policy enforcement in U15 (previously Bantam) ice hockey leagues before (2008–09) and after (2013–14) the 'zero tolerance for HC' policy implementation.

Design Prospective cohort.

Setting Calgary, Alberta, Canada.

Participants Thirty-two elite (upper 30% by division, allow body checking) U15 games pre ($n_{2008-09}=16$, $n=510$ players)

and post ($n_{2013-14}=16$, $n=486$ players) HC-policy implementation.

Assessment of Risk Factors The 2011 HC-policy change mandates the penalization of any intentional or unintentional player/direct HC.

Main Outcome Measurements Dartfish video-analysis software with validated criteria for identifying HC types [direct HC (HC1), indirect HC (e.g., boards) (HC2)] and other player-to-player contact behaviours were used. Univariate Poisson regression [adjusted for cluster by team-game, offset by game length (minutes)] was used to estimate HC incidence rates (IR) and incidence rate-ratios (IRR) between cohorts.

Results A total of 506 HCs ($n_{2008-09}=261$, $n_{2013-14}=245$) were analyzed (IR₂₀₀₈₋₀₉=16.6/100 team-minutes; IR₂₀₁₃₋₁₄=15.5/100 team-minutes). The rate of HC1 (IRR=1.05, 95% CI: 0.86–1.28) and HC2 (IRR=0.74, 95% CI: 0.50–1.11) did not differ with the implementation of the HC-policy. Only 12.0% and 13.6% of HC1s were penalized pre- and post-policy respectively. Pre-policy, HC1s were commonly penalized as roughing or elbowing penalties (59%), while post-policy HC1s were penalized with the HC penalty (76%).

Conclusions Despite policy implementation for mandatory enforcement of direct HCs, there was no difference in the rate of HC1s and HC2s, or the proportion of HC1 penalized pre- and post-HC-policy enforcement. This research will be instrumental to inform Hockey Canada's future referee training and rule enforcement modifications.

447

SURVIVAL AND RISK ANALYSIS OF 10 MONTHS SURVEILLANCE IN ELITE PARA ATHLETES

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Background Injury and illness surveillance in Paralympic athletes was implemented in the past. First studies reported high incidences but are often limited to rates per exposure.

Objective Survival and risk analysis of longitudinal data on health problems and their burden were performed.

Design Prospective observational study

Setting Surveillance of elite Paralympic athletes from May 2019 until February 2020.

Participants 85 German Paralympic athletes preparing for Tokyo 2020 were included. Six athletes dropped-out during the monitoring phase, leaving 79 athletes included in the evaluation (30 females; 49 males; age: 29.5±10.9 years).

Intervention Weekly completion of the Oslo Sports Trauma Research Center questionnaire on health problems using a web application.

Main Outcome Measurements Median time to first severe health problem, leading to time loss or restriction of full participation in training or competition, and hazard ratio (HR) depending on sex, age or impairment. Calculation of the burden (time loss days per athlete per year) of health problems.