ABSTRACT BOOK

25 YEARS OF PROTECTING ATHLETE HEALTH

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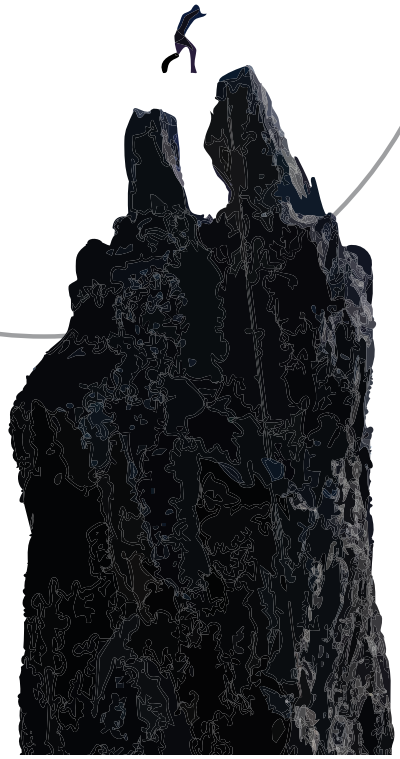

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Injury epidemiology and risk factors in TeamGym gymnasts: A prospective study on acute and overuse injuries across a full season

Anker-Petersen, Charlotte

Co-authors: Mikkel Bek Clausen, Birgit Juul-Kristensen, Per Hölmich, Carsten Bogh Juhl, Kristian Thorborg

Institutions: Sports Orthopedic Research Center-Copenhagen, Department of Orthopedic Surgery, Amager-Hvidovre Hospital, Copenhagen University Hospital, Denmark; Department of Midwifery, Physiotherapy, Occupational Therapy and Psychomotor Therapy, Faculty of Health, University College Copenhagen, Copenhagen, Denmark; Department of Sports Science and Clinical Biomechanics, Research Unit for Musculoskeletal Function and Physiotherapy, University of Southern Denmark, Odense, Denmark; Department of Physioterapy and Occupational Therapy, Herlev and Gentofte Hospital, University of Copenhagen. Copenhagen, Denmark

Abstract

Background: Despite the high prevalence of pain among TeamGym gymnasts, comprehensive epidemiological studies on injuries are lacking.

Objective: To investigate in competitive TeamGym gymnasts aged 10–30 years **(**1) the incidence, type, severity, and time-loss of acute and overuse injuries by body region, (2) risk factors for these injuries, and (3) clinical symptoms in those with prolonged overuse injuries in the lower extremities (LE).

Design: Prospective Cohort study

Methods: From August 2021-June 2022, 519 gymnasts (71% women) were followed weekly via text-message queries on injuries, time-loss (partial/full absence from training/competition caused by injury), and gymnastic exposure. Injuries were verified and categorized through standardized telephone interviews. Severe injuries were defined as those causing ≥4 weeks of time-loss. Gymnasts with LE overuse injuries lasting ≥3 weeks underwent clinical examination. At baseline, the Five-Part Questionnaire for generalized joint hypermobility was completed, and from October-December 2021, data for calculating age at peak height velocity were collected. Incidence rates were estimated using Generalized Poisson regression.

Results: In total, 1382 injuries were recorded, with an incidence rate of 14.7 injuries per 1,000 exposure hours (95% CI: 13.3;16.3). Incidence rate was 14.0 in women and 17.2 in men. For both sexes, the most frequently injured regions were the foot (24.5%), knee (22.0%), lower leg (10.4%), and lower back (10.4%), with >60% due to overuse. The severe injury incidence rate was 0.5 (95% CI: 0.4;0.7), predominantly affecting the foot, lower back, and knee. Among 290 clinical examinations, 37% of injuries originated from apophyseal tender spots, two-thirds in the knee.

Conclusions: The injury incidence rate in TeamGym is high, with three-quarters of injuries being non-time-loss, and nearly two-thirds caused by overuse. Over half of injuries affected the foot, knee and lower back. One-fourth of prolonged overuse injuries in the LE involved apophyseal tender spots in the knee.

Did you see the hit coming? – Examining the relationship between scanning, protective actions and concussion in elite ice hockey

Bespomoshchnov, Vladislav

Co-authors: Geir Jordet, Roald Bahr, Anine Nordstrøm, Tron Krosshaug

Institutions: Department of Sport and Social Sciences, Norwegian School of Sport Sciences; Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport of Sport Sciences

Abstract

*Background***:** Ice hockey is a fast-paced sport where intentional and unintentional collisions occur frequently. These are been responsible for large proportion of injuries, concussions in particular. Research indicates that unanticipated collisions (Mihalik et al., 2010) and illegal body-contact result in significantly higher linear or rotational accelerations, potentially increasing injury risk (Mihalik et al., 2019; Tuominen et al., 2017). Rugby has pioneered the study of tackling skill, utilizing longitudinal data to investigate perceptual and technical characteristics associated with improved performance and safer contact (Burger et al., 2017; Hendricks et al., 2018; Hollander et al., 2021). Hence, there is a potential gap to close in ice hockey to better understand the role of visual exploratory behavior and technical proficiency.

*Objective***:** To develop a more nuanced understanding of how visual perception could contribute to mitigating concussion risk in ice hockey.

*Design***:** Retrospective nested case-control study.

*Setting***:** National Hockey League (NHL) – the highest level of professional ice hockey competition.

*Participants***:** NHL players who sustained a concussion (identified from publicly available records). Participant inclusion is contingent on the feasibility of record identification.

*Data Collection***:** Video clips are being collected from the past five NHL seasons. Collision events resulting in concussion ("cases") are being analyzed and compared to both illegal and legal collisions ("controls"). Controls are matched to cases by tactical game context and stage of the season.

*Assessment of Risk Factors***:** Independent variables will be derived from validated assessment tools, including the HeadsUp Checklist (for contextual information and contact characteristics - Hutchison et al., 2014), the Collision Readiness Scale (for contact awareness - Lincoln et al., 2013), and "Checking the Right Way" Manual (for technical bodychecking characteristics - Brennan et al., 2009).

*Main Outcome Measures***:** Injury status (concussed or non-concussed) and injury severity (measured by games lost).

*Results***:** Data collection is ongoing at the time of this conference.

Do running biomechanics return to 'normal' after ACL reconstruction at the time of return to sport? Insights across running types, from acceleration to high-speed running

Butler, Brendan

Co-authors: Roula Kotsifaki, Grethe Myklebust, Enda King, Rod Whiteley, Joao Marques, Vasilis Siders, Tron Krosshaug

Institutions: Aspetar Orthopedic and Sports Medicine Hospital; Norweigan School of Sport Sciences

Abstract

Background: Despite the existence of return-to-sport (RTS) criteria, limited research has objectively assessed whether running mechanics are fully restored following anterior cruciate ligament reconstruction (ACLR). There is no clear consensus on when running retraining can be considered normalised, particularly for field sport athletes who rely on multiple running types, including acceleration, mid-speed, and high-speed running.

Objective: This study aims to evaluate the biomechanical status of athletes after ACLR across different running types at 4.5 months, 6 months, and return to sport (RTS) to examine how running mechanics develop and whether they are restored by the time of RTS.

Design: Observational and prospective studies will be conducted to track rehabilitation progress and assess biomechanics at the time to RTS. A control group of healthy athletes will be included for comparison.

Setting – Participants: Competitive, adult, field sports athletes (football, rugby etc) undergoing standardised rehabilitation at Aspetar Hospital. We will include athletes with an index ACLR using a bone-patellar tendon-bone, hamstring, or quadriceps graft. A cohort of approximately 30 healthy, matched athletes will serve as controls.

Methods: Biomechanical assessments will be conducted at the Riadh Assessment and Movement Analysis Lab, Aspetar. A 3D motion capture system with embedded force plates will measure kinematics and kinetics during acceleration, mid-speed and high-speed running. Athletes after ACLR will be tested after the completion of the running rehabilitation program and every 6 weeks until the time to RTS. Healthy athletes will be measured once.

Outcomes: Whole body kinematics and kinetics differences between limbs and between groups will be analysed, with a focus on joint moments and power.

Conclusion: This study seeks to establish objective criteria for evaluating running restoration post-ACLR, contributing to evidence-based rehabilitation and RTS decision-making. Findings will guide best practices for optimising rehabilitation and reducing reinjury risk.

#ReadyToPlayJr – Health problems in female academy level adolescent football

Christensen, Camilla

Co-authors: Anine Nordstrøm, Håvard Moksnes, Roald Bahr, Joar Harøy

Institution: Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway

Abstract

*Background***:** There is limited knowledge about health problems in female academy level adolescent football players, especially regarding growth-related injuries and potential risk factors for injury or illness.

*Objective***:** To describe the prevalence and burden of all health problems, with a special focus on growth-related injuries, in female academy level adolescent football players. Furthermore, examining the association between workload and risk of injury, and wellness and risk of injury.

*Study Design***:** A two-year prospective cohort study during the 2025 and 2026 seasons.

*Setting***:** The study is conducted with female academy level adolescent football players who are part of the 'Top Groups' in the Norwegian Talent Development Model, known as the National Team School, initiated by the Football Association of Norway.

*Participants***:** All female adolescent football players (aged 13-16) in the 'Top Groups' will be invited and continuously included during both seasons, with an estimated 300-400 participants.

*Methods***:** Participants will complete a baseline questionnaire to provide demographic information. During the 2025 and 2026 seasons, participants will report all health problems weekly using the Oslo Sport Trauma Research Centre Questionnaire on Health Problems. Those who report symptoms in the lower extremities or hip/groin for ≥ 2 weeks or ≥ 2 times per season will undergo magnetic resonance imaging and a standardized clinical examination conducted by an allocated specialized physiotherapist. During the 2026 season, participants will report daily workload (training and match load) and wellness, as independent variables.

*Main Outcome Measures***:** The prevalence and burden of all health problems will be calculated, as well as the prevalence, burden, and characteristics of growth-related injuries. Injury risk, as the dependent variable, will be analysed in relation to workload and wellness.

Influence of growth and maturation on injury incidence and burden in Scottish professional football academies

Curnyn, Steven

Co-authors: Mark Leslie, Debbie Palmer, Sean Williams, Sean Cumming

Institutions: Dept of Health, University of Bath, UK; UK Collaborating Centre on Injury and Illness Prevention in Sport, University of Edinburgh, United Kingdom; Scottish Football Association, Hampden, UK.

Abstract

Background: Maturation is a recognised risk factor for injury in youth football, with maturity status (pre-, circa-, or post-peak height velocity [PHV]) and timing (early, late, or on-time) associated with injury risk. However, the specific impact of growth and maturation on injuries in Scottish football academies remains unexplored, as does the epidemiology of injuries in this setting.

Objective: This study aims to investigate the influence of growth and maturation on injury incidence and burden, and to characterise injury epidemiology, in male youth players from professional football academies in Scotland.

Design: Time-loss injuries, along with match and training exposure minutes, were prospectively monitored in male academy players (U10–U18) across four Club Academy Scotland (CAS) programs during the 2024/25 season (data collection ongoing). Injuries were classified as contact or non-contact, with incidence (injuries/1000 h), and burden (days lost/1000 h) reported.

Results: To date, 176 injuries have been recorded; 53 contact and 127 non-contact. The most affected body sites were the knee (17%), ankle/heel (15%), hamstring (12%) and hip (10%). Non-contact injuries during matches showed a higher incidence (10.5 injuries/1000 h) than contact injuries (8.7 injuries/1000 h), while contact injuries carried a greater match burden (272 days/1000 h) compared to non-contact injuries (251 days/1000 h). In training, non-contact injuries had a higher incidence (3.5 injuries/1000 h) and burden (62 days/1000 h) than contact injuries (0.7 injuries/1000 h, and 11 days/1000 h, respectively).

Conclusion: Analysis of the influence of growth and maturation on these injury patterns is ongoing. Current data indicate that players face a significantly higher injury risk during matches compared to training, with non-contact injuries predominating in incidence and contact injuries contributing to greater time loss during matches.

Muscle regeneration is improved by hot water immersion but unchanged by cold following electrically stimulated eccentric contractions causing muscle injury

Dablainville, Valentin

Co-authors: Adèle Mornas, Tom Normand-Gravier, Maha Al-Mulla, Emmanouil Papakostas, Bruno Olory, Theodorakys Marin Fermin, Frantzeska Zampeli, Nelda Nader, Marine Alhammoud, Freya Bayne, Anthony MJ Sanchez, Marco Cardinale, Robin Candau, Henri Bernardi, Sébastien Racinais

Institutions: Aspetar Orthopaedic and Sports Medicine Hospital, Research and Scientific Support Department, Doha, Qatar; DMEM, University of Montpellier, INRAE, Montpellier, France.

Abstract

Background: Cryotherapy is a popular strategy for treating skeletal muscle injuries. However, its effect on post-injury human muscle regeneration remains unclear. In contrast, promising results have recently emerged using heat therapy to facilitate recovery from muscle injury.

Objective: To examine the effect of three different thermal treatments on muscle recovery following muscle injury in humans.
Study design: Counterbalanced between-subjects study

Participants: Thirty-four out of thirty-six initially recruited participants completed the study. They were healthy and recreationally active.
Method: Participants underwent a muscle damage protocol induced by electrically stimulated eccentric contractions, triggering regenerative processes following myofiber necrosis. They were counterbalanced in three interventional groups based on their body mass and maximum voluntary contraction force (MVC). The intervention began an hour after the induction of muscle damage and consisted of daily lower body water immersion for 10 days in either cold (CWI, 15 min at 12°C), thermoneutral (TWI, 30 min at 32°C), or hot water (HWI, 60 min at 42°C). Muscle biopsies were obtained before, and at +5 (D5) and +11 (D11) days post-damage.

Main outcome measures: MVC, pain, blood creatine kinase (CK) and myoglobin, and muscle remodelling biomarkers.

Results: None of the water immersions significantly differed in MVC recovery ($p=0.108$). HWI induced a lower perceived muscle pain than TWI ($p=0.035$) and lower levels of circulating CK ($p\leq0.012$) and myoglobin ($p<0.001$) than TWI and CWI. CWI did not significantly improve perceived muscle pain or reduce circulating markers of muscle damage ($p\geq0.207$). HSP 27 and 70 expressions were significantly increased in HWI ($p<0.038$) at D11 and appeared blunted with CWI. Furthermore, NF-κB expression significantly increased in all conditions except HWI, while IL-10 increased only in HWI at D11 ($p=0.014$).

Conclusion: Our results support the use of hot water immersion, but not cold, to improve muscle regeneration following an injury.

Identifying Risk Factors for Osgood-Schlatter's Disease: A Retrospective Study on Elite Academy Footballers

Dadd, Liam

Co-authors: Sean Cumming, Sean Williams, Sinead, Holden

Institution: University of Bath; University College Dublin

Abstract

Background: Osgood-Schlatter's Disease (OSD) is a growth-related apophyseal injury associated with periods of rapid growth and maturation. Cross-sectional research highlights decreased strength and range of motion as potential risk factors, but it remains uncertain whether these drive the onset of OSD symptoms or emerge as their consequence.

Objective: Identify functional, and growth and maturation related risk factors of OSD in elite youth soccer players from a Premier League academy.

Design: Retrospective Nested Case-Control Study.

*Methods***:** Five years of data were analysed retrospectively for elite male youth footballers (n = 88, 48 in OSD group) from U9 to U18 age-groups. Percent of predicted adult height (PAH) was used as an estimate of maturation. The period of peak height velocity (Circa-PHV) was categorised as 88-93%, (<88% = Pre-PHV, >93% = Post-PHV). Using the Freeman[(1)] reference dataset, we calculated maturity offset for each player by subtracting chronological age from biological age. Exploratory analyses were conducted on functional variables (countermovement jump height, hip internal and external rotation, hamstring strength, and weight-bearing dorsiflexion). Generalised linear mixed-effects models analysed the relationship between all risk factors and onset of OSD.

Results: The mean duration of symptoms was 15.5 ± 9.5 months. The %PAH demonstrated a non-linear relationship with OSD onset ($p = 0.002$), with peak risk occurring at 90% PAH. A non-linear relationship was also found with lower limb growth rate ($p = 0.025$) with peak risk occurring at 4.59 cm/year. Modelled together, these factors increased OSD risk by 25%. Functional measurements were not associated with OSD onset.

Conclusions: The risk of OSD is increased in players with a moderate lower limb growth rate and those who are Circa-PHV. No evidence was found for functional measures. This information could offer useful insights into proactive monitoring strategies to identify players at greater risk of OSD.

Brain health in female former top-level football players

Dahlén, Sara Christina

Co-authors: John Bjørneboe, Stian Kirkerud Sandmo, Lena Bache-Mathisen, Peter Filipcik, Emilie Isager Howe, Einar August Høgestøl, Geir Selbæk, Truls Straume-Næsheim, Lars T Westlye, Roald Bahr, Thor Einar Andersen

Institution: Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway

Abstract

Background: Repetitive head impacts (RHI) in sports may represent a risk factor for long-term cognitive and neurological sequelae. Recent studies have identified an association between playing football at the top level and an elevated risk of cognitive impairment and neurodegenerative disease. However, these were conducted on men, and there is a knowledge gap regarding these risks in female athletes.

Objective: This study aims to investigate whether head impacts influence brain health in female former top-level football players. The hypothesis is that RHI may adversely affect cognitive function and increase neurodegenerative disease risk in this population.

Design: This is a prospective cohort study involving female former top-level football players and athletes from sports without inherent RHI risk.

Participants: Female former football players will be recruited alongside top-level athletes from sports without RHI. Participants must have been born in 1980 or earlier to be eligible for entry.

Assessment of Risk Factors: Participants will undergo comprehensive assessments including self-reported health and sports career histories, neurocognitive tests, neurological examinations, advanced MRI scans, and evaluations of fluid biomarkers.

Main Outcome Measures: We will compare and validate the self-reported heading data with video footage of matches played by the Norwegian women's national team. The study will primarily assess changes in cognitive function, self-reported neurocognitive outcomes, and detect neurological alterations via imaging and biomarker profiles over time.

Results: Data collection is ongoing.

Prediction of Post-Treatment Outcomes for Osteochondral Lesions of the Ankle: Development of a Clinical Prediction Model Using a Machine-Learning Algorithm

Dahmen, Jari

Co-authors: JJ Hollander, JN Doornberg, SAS Stufkens, GMMJ Kerkhoffs, on behalf of the Amsterdam Ankle Cartilage Team

Institutions: Department of Orthopedic Surgery and Sports Medicine, Amsterdam Movement Sciences, Amsterdam UMC, Location AMC University of Amsterdam Amsterdam the Netherlands; Academic Center for Evidence-based Sports Medicine (ACES) Amsterdam UMC Amsterdam the Netherlands; Amsterdam Collaboration for Health & Safety in Sports (ACHSS), International Olympic Committee (IOC) Research Center Amsterdam UMC Amsterdam the Netherlands.

Abstract

Background: Ankle sprains and fractures frequently lead to early cartilage damage, affecting over 70% of patients and initiating a degenerative cascade toward osteoarthritis. This progression results in physical disability, reduced quality of life, and a significant socioeconomic burden. Despite various treatment options, a personalized, evidence-based approach to managing osteochondral lesions of the ankle remains lacking.

Objective: This study aims to identify prognostic factors influencing treatment, sports outcomes, and osteoarthritis progression. Using machine learning, we aim to develop a data-driven model to optimize and individualize management strategies.

Design: A prospective cohort study utilizing a clinical database and machine learning techniques to develop predictive models for treatment outcomes.

Setting: A tertiary academic IOC-accredited orthopedic referral center specializing in foot and ankle disorders.

Patients: Over 1,000 prospectively enrolled patients with symptomatic osteochondral lesions of the ankle. Data include demographics, imaging, treatment, and patient-reported and sports-related outcomes.

Interventions: Independent variables, including patient-specific, radiological, and treatment-related factors, will be analyzed using machine learning to predict treatment responses.

Methods: Supervised machine learning models will be developed using standardized data, multiple imputation, and feature selection via recursive feature elimination (RFE) and LASSO regression. Model validation will occur on an independent test set and a multicenter cohort.

Main Outcome Measures: Primary: Predictive accuracy of AI-based models for treatment optimization. Secondary: Functional outcomes and osteoarthritis progression.

Results: Data collection and analysis are ongoing. This study will develop and validate a predictive model to enhance treatment personalization and shared decision-making.

Conclusion: By integrating AI into clinical decision-making, this study aims to establish a precision-medicine approach for ankle cartilage damage, improving patient outcomes and reducing the socioeconomic burden of osteoarthritis. Further validation is required before clinical implementation.

Progression of functional and psychosocial outcomes in athletes with acute ankle injuries undergoing conservative rehabilitation

Dalansi, Feriel

Co-authors: Marco Cardinale, Johannes Tol, Abdulaziz Farooq, Louis Holtzhausen, Rodney Whiteley

Institutions: Aspetar Orthopedic and Sports Medicine Hospital; Amsterdam University – Amsterdam UMC

Abstract

Background: Despite 15-30% of athletes experiencing ankle injuries, the progression of functional and psychosocial outcomes during conservative rehabilitation remains unclear in the literature. Additionally, there is no established consensus on return-to-play protocols or management strategies for acute ankle injuries

Objective: The objective of this systematic review was to identify and analyze the scientific literature to identify the progression of functional and psychological outcomes following acute ankle injuries among professional athletes.

Study Design: Systematic Review

Methods: Following the PRISMA guidelines. A comprehensive search of 6 databases (MEDLINE, EMBASE, PsycINFO, SPORTS Discus, The Cochrane Library, Web of Science) was performed to identify relevant studies up until April 2024. Inclusion criteria included: longitudinal studies like RCT's and cohort studies, that reported any functional and psychological outcomes over time. Studies that involved non-conservative or surgical interventions and/or studied non-athletes were excluded. Two independent reviewers screened titles, abstracts and full text. Data extraction was reviewed by two investigators and included study characteristics, follow-up timeline, key functional outcomes (range of motion and pain) and psychological outcomes (e.g. quality of life).

Results: The initial search identified 9691 studies, after two stages of screening only 15 articles met the inclusion criteria. 7 studies reported longitudinal changes in pain while only 4 studies reported changes in range of motion in dorsiflexion and plantar flexion. Functional outcomes such as strength and balance could not be collated due to inconsistent methods of assessment across studies. 40% of the studies (6/15) included a 2-week follow-up and very few 13% (2/15) reported follow-ups longer than 3 months post injury.

Conclusion: to our knowledge, this is the first systematic review to highlight a significant gap in the literature regarding return-to-play (RTP) guidelines for athletes recovering from ankle injuries. There are inconsistencies and no standardized guidelines on the assessments required to inform RTP decisions as well as typical clinical outcomes in athletes.

Exceeding the Guidelines: Acute and Long-Term Effects of High Exercise Intensities and Volumes on Maternal and Fetal Health Outcomes in Pregnant Athletes

Dalhaug, Emilie Mass

Co-authors: Birgitte Sanda, Kari Bø, Wendy J Brown, Kaia Øvstedal, Sofia Brevik-Persson, Lene Annette Hagen Haakstad

Institutions: Norwegian School of Sports Sciences, Department of Sports Medicine; Arendal Gynekologi AS; Akershus University Hospital, Department of Obstetrics and Gynecology; Bond University, Faculty of Health Sciences and Medicine, Gold Coast, Australia; University of Queensland, School of Human Movement and Nutrition Sciences, Brisbane, Australia

Abstract

*Background***:** Moderate intensity exercise during pregnancy benefits both maternal and fetal health, but the effects of higher intensities and volumes remain unclear.

*Objectives***:** To explore the acute and long-term effects of exercise exceeding the current guidelines on maternal and fetal health in pregnant athletes.

*Study design***:** Observational and experimental study

*Methods***:** Sixty athletes completed two exercise protocols: (1) HIIT, 5×5-minute intervals of running and cycling (target intensity of 17 on Borg's RPE scale and 90% of estimated maximal maternal heart rate (MHRmax)) with 4-minute rest for ultrasound measurements, and (2) a heavy-load resistance protocol (3 sets × 8 repetitions with one repetition in reserve in sumo deadlift, bench press, and incline bench press). FHR and uteroplacental blood flow were assessed before and after each HIIT interval and resistance exercise set. Participants also completed a survey during pregnancy and a telephone interview postpartum, collecting data on health outcomes.

*Results***:** During HIIT, mean intensity was 16.4 RPE (89.4% MHRmax) for running and 16.0 RPE (84.6% MHRmax) for cycling. Fetal bradycardia (<100 bpm for >3 minutes) occurred in six cases during running, all resolving within eight minutes, but was not observed during cycling. Exercise was stopped in three women during running and two during cycling due to fetal tachycardia (≥180 bpm for >4 minutes). During resistance training, one case of fetal bradycardia occurred after bench press, resolving within three minutes. Mean FHR remained within the normal range (110–160 bpm) after all resistance exercises, while uterine artery PI decreased and umbilical artery PI remained unchanged. Few cases of adverse outcomes were reported, with all babies being born healthy.

*Conclusion***:** Pregnant athletes can safely engage in HIIT and heavy resistance training, though high-intensity running may increase the risk of transient fetal bradycardia. Overall, high exercise volumes had no significant impact on health outcomes.

Making rugby tackling safer for Canadian girls: co-creating and evaluating innovations to reduce concussions in adolescent girls' rugby union

Dane, Kathryn

Co-autors: Multiple authors across various phases of the project, some yet to be determined for later phases. Supervised by Carolyn Emery.

Institution: Faculty of Kinesiology, University of Calgary, Alberta, Canada

Abstract

Background: Tackle-related injuries, including concussions, have lasting physical and mental effects, with tackling accounting for 70% of injuries in Canadian girls' rugby. Limited research on girls' rugby highlights a gap in safe coaching practices, making collaboration essential to develop effective, evidence-based tackle preparation strategies to reduce concussions.

Objective: To co-create and evaluate innovations to reduce tackle-related concussions in girls' rugby.

Study design: Co-creation study with mixed-methods and a quasi-experimental pilot trial.
Methods Phase 1 informing co-creation: 1A) Existing data from multi-year prospective injury surveillance will examine the epidemiology of concussion (index and recurrent) and subsequent musculoskeletal injury. 1B) Parallel mixed method approaches (surveys and interviews) with players, coaches and health-care professionals (HCPs) will explore the processes, barriers, and facilitators in the return-to-play process following concussion. 1C) Video analysis and instrumented mouthguards (iMG) will evaluate current tackle training practices.
Phase 2 co-creation: Data from Phase 1 will inform a tackle preparation innovation. Rugby knowledge users (10 players, 10 coaches, 10 HCPs) will be purposively recruited for co-creation through four virtual meetings over four months. Participation will be monitored by validated tools and an external evaluator. A one-season pilot feasibility randomized control trial will be conducted in 12 girls' teams with players randomised to the innovation group or usual preparation group. Baseline testing includes questionnaires and video analysis (tackle behaviours).
Phase 3 evaluation: The innovation will be evaluated through focus groups and surveys to assess acceptability and feasibility. Between-group differences in injury rates and tackle behaviours will be measured using video analysis, injury surveillance, and iMG data.

Expected results: The project will generate data on training practices, tackle-related injuries, and barriers to effective practice, while evaluating a co-creation to advance concussion management in girls' rugby. The findings will inform policy, establish a standard of practice, and have broader implications for contact sports.

Pre-injury factors associated with persisting post-concussion symptoms in adolescent ice hockey players

Eliason, Paul

Co-authors: Jean-Michel Galarneau, Kathryn J Schneider, Sean Dukelow, Roger Zemek, Keith O. Yeates, Carolyn A. Emery

Institutions: Sport Injury Prevention Research Centre, Faculty of Kinesiology, University of Calgary, Calgary, Canada; Alberta Children's Hospital Research Institute, University of Calgary, Calgary, Canada; O'Brien Institute for Public Health, University of Calgary, Calgary, Canada; Hotchkiss Brain Institute, University of Calgary, Calgary, Canada; Community Health Sciences, Cumming School of Medicine, University of Calgary, Calgary, Canada; Children's Hospital of Eastern Ontario Research Institute, Ottawa, Canada ; Department of Pediatrics, Faculty of Medicine, University of Ottawa, Ottawa, Canada; Department of Psychology, University of Calgary, Calgary, Canada; Pediatrics, Cumming School of Medicine, University of Calgary, Calgary, Canada

Abstract

Background: While most adolescents recover from concussion within 30 days, 30% may develop persisting post-concussion symptoms (PPCS). Identifying youth at risk for PPCS can be clinically useful to support prevention of recurrence.

Objective: To evaluate pre-injury factors associated with PPCS in adolescent ice hockey players.

Design: 5-year longitudinal cohort ("Safe2Play").

Participants: 4419 players aged 10-18 (male/female) representing 6585 player-seasons.

Assessment of Risk Factors: Separate bivariate logistic regression for males and females, accounting for clustering for individual and multiple imputation, examined pre-injury factors to inform multivariable modelling. The factors included ice hockey age group; bodychecking policy; prior symptomatic concussion; physician diagnosed migraine history; Balance Error Scoring System tandem stance errors (≥4 errors/≤3 errors); symptoms of headache, sensitivity to noise, and fatigue; and total number of baseline symptoms (/22).

Main Outcome Measures: Players with suspected concussion were identified using validated injury surveillance with physician follow-up. PPCS was defined as symptoms persisting >28 days.

Results: Out of 605 suspected concussions (524 male/83% diagnosed; 81female/89% diagnosed), 113 (96 male/18%; 17 female/21%) were classified with PPCS. Bivariate analysis and clinical relevance suggested male factors include bodychecking policy within age group, headache, sensitivity to noise, fatigue, and total number of symptoms. Female factors included age group, tandem stance errors, and total number of symptoms. Due to multicollinearity concerns, two multivariable models for males were conducted. Significant male factors identified in Model 1 (excluding headache, sensitivity to noise, and fatigue) included ages 15-17 participating in a non-bodychecking league (OR=6.16; 95%CI: 1.54-24.61) and total number of symptoms (OR=1.16; 95%CI:1.03-1.30) while Model 2 (excluding total number of symptoms) identified ages 15-17 participating in a non-bodychecking league (OR=3.86; 95%CI:1.11-13.44) and headache (OR=2.58; 95%CI:1.22-5.48). For females, total number of symptoms was significantly associated (OR=1.22; 95%CI;1.05-1.41).

Conclusions: A range of pre-season, pre-injury factors were examined in relation to the risk of PPCS in youth ice hockey players with a unique opportunity to apply and refine various modelling techniques.

Musculoskeletal Injuries in Canadian Adolescent Sport: Informing Primary and Secondary Prevention Strategies

Gibson, Eric

Co-authors: Carolyn Emery, Jackie Whittaker, Jean-Michel Galarneau, Garrett Bullock, David Howell

Institution: Sport Injury Prevention Research Centre, University of Calgary, Canada

Abstract

Background: Adolescent sport participation provides numerous health benefits, however carries a risk of musculoskeletal (MSK) injury. Understanding injury incidence rates (IR), burden, risk factors, and mechanisms across sports will inform injury prevention strategies.

Objective: To examine MSK injury epidemiology in Canadian adolescent sports, including IRs, types, severity, burden, risk factors, and prevention strategies.

Design: A prospective cohort study (with nested quasi-experimental prevention sub-studies) within the SHRed Concussions, five-year, multisite cohort.

Setting: Canadian high school/community adolescent club sport settings.

Participants: Adolescent athletes (all genders; ages 10–19) from 14 sports (2020 to 2025).

Assessment of Risk Factors: Preseason demographic/sport-specific intrinsic (e.g., age, sex, injury history, position, personal-protective-equipment use;PPE-use) and extrinsic factors (e.g., playing surface, team-based neuromuscular training-exposure;NMT-exposure) will be considered. Weekly participation hours (individual practice and game) and injuries (physical complaint, medical-attention, time-loss) were collected and validated by a study therapist.

Main Outcome Measures: Musculoskeletal injury IRs (/1000 game- or practice-exposure-hours), location, type, severity, burden, mechanisms, and risk factors, and subsequent MSK injuries following concussion will be examined.

Expected Results/Analysis: Poisson regression will be used to estimate injury IRs (95% confidence intervals). Multilevel multivariable Poisson models will be used to assess injury risk factors and prevention strategies (e.g., PPE-use, NMT-exposure) while accounting for clustering by team and individual (multiple seasons), offset by exposure hours. Injury incidence rate ratios will be used to evaluate risk factors and prevention strategies (sex, gender, age, sport, previous injury/concussion history, PPE-use, NMT-exposure). It is expected that girl athletes will have the highest IRs and that NMT-exposure will reduce MSK injury rates across sports,

Conclusions: Findings from the largest pan-Canadian adolescent cohort study using validated injury surveillance methodology will inform sport-specific prevention strategies including policy changes, PPE, and training programs with the goal of reducing the burden of MSK injury in Canadian adolescent sports.

Tackle height law variation trial in Scottish men's community rugby: an evaluation of match official's interpretation and enforcement of the law variation

Gornall, Hamish

Co-authors: Isla Shill, Debbie Palmer

Institutions: Edinburgh Sports Medicine Research Network, Institute for Sport, PE and Health Sciences, Moray House School of Education and Sport, University of Edinburgh, Edinburgh, United Kingdom; UK Collaborating Centre on Injury and Illness Prevention in Sport, United Kingdom; Sports Injury Prevention Research Centre, Faculty of Kinesiology, University of Calgary, Canada

Abstract

Background: The tackle is the most concussive event in rugby union. To decrease the concussion rate, a law variation trial reducing the maximum legal height of the tackle from the shoulder to the base of the sternum was introduced in Scottish community rugby. The law variation saw a reduction in the rate of upright tackling and head-to-head contacts, while the rate of high-tackle sanctions increased. To maintain these player behaviour changes, match-officials (MO) must correctly interpret and enforce the law variation.

Design and Objective: This cross-sectional study aims to evaluate the level of agreement regarding the 1) interpretation and 2) enforcement of the law variation across Scottish community rugby MOs after the 2023-25 trial seasons.

Methods: To assess the level of agreement, MOs with varied levels of experience and qualifications, and Scottish Rugby Union (SRU) MO development managers (gold standard) will be recruited. Participants will be provided with a set of tackle video clips from SRU community match play. The clips will be shown to the participants once, followed by a set of 4 questions from the SRU tackle height officiating framework. MO's will be asked to repeat this evaluation 7-days (minimum) later to determine their intra-rater reliability. The clip order will be randomised between attempts.

Outcome Measure: The interrater reliability measurement between MO's will use Fleiss' Kappa and the Intra-rater measurement between the gold standard and MO's will use Cohen's Kappa. Gwet's agreement coefficient may be used to avoid underestimating agreement. Factors including qualification level, quantity of officiated trial matches, and officiating experience will be accounted for during analysis. Data collection will begin May 2025.

Significance: The results will identify potential inconsistencies in MOs decision making, thus indicating where further training may be required to ensure the law variation is interpreted and enforced consistently in Scottish community rugby games.

Integrating visual stimuli and reaction time into functional testing

Gramage Medina, Kevin

Co-authors: François Delvaux, Cédric Schwartz, Gilles Berwart, Jean-Louis Croisier, Jean-François Kaux

Institution: Réseau Francophone Olympique de la Recherche en Médecine du Sport (ReFORM), International Olympic Committee (IOC) Research Centre for Prevention of Injury and Protection of Athlete Health, Liège, Belgium

Abstract

Background: Current lower limb injury prevention and return to sport research recommends testing performance and biomechanics during injury-risk movements (e.g., change of direction (COD), jump landing, single hop task). The usual testing conditions (laboratory setting, no external perturbations) has been said to reduce their capacity of assessing the athlete's (re-)injury risk during sport competition. Several authors have addressed this by integrating decision making and neuro-cognitive tasks in the evaluations, to better simulate the sport competition environment (nearby athletes, simultaneous decision making, etc.). Using these adaptations (e.g., COD based on visual stimuli, count backwards while jumping) enabled better identification of movement quality and physical performance deficits. However, most research has remained in laboratory settings (i.e., using complicated and costly 3D motion capture systems and force plates), limiting its use by clinicians and field practitioners. Some researchers have proposed adaptations with simpler setups (e.g., performing a COD after the evaluator kicked a ball), but the lack of test standardization limits its use for data comparison purposes (establishing normative values, or athlete monitoring across time). Finally, few studies used these methods among injured populations, nor conducted follow-up interventions.

Objective: To propose easy-to-use ways to integrate visual stimuli and reaction time into clinical and field-test practice.

Study Design: Cross-sectional, interventional study. Population: ACL-injured and uninjured athletes.

Methods: Main test: adapted version of unplanned COD test using FITLIGHT® Trainer and video-based evaluations. Secondary tests: Landing Error Scoring System (LESS), Y-balance test, Isometric force, single-leg jumps, KOOS and ACL-RSI Scale questionnaires.

Results & Conclusion: Work in progress. Based on COD results (planned vs unplanned, and ACL injured vs uninjured), and potential secondary test correlations, an intervention program will be designed.

‘Mental heAlth and well-being in rUgby pLayers’ (MAUL) study: an online survey of diverse cohorts of rugby union players internationally

Griffin, Steffan

Co-authors: Rebecca Syed Sheriff, Kathryn Dane, Kearnan Myall, Kaitlin Simpson, Heather Lewis, Caithriona Yeomans, Jon Patricios, Simon Kemp, Karim Khan, Debbie Palmer, Samantha Fawkner, Paul Kelly

Institutions: University of Edinburgh Physical Activity for Health Research Centre, Edinburgh, UK; Medical Services Department, Rugby Football Union, Twickenham, UK

Abstract

Background: Mental health and well-being is a relatively under-researched area in rugby, especially outside of the elite men’s setting.

Objectives: To understand the self-reported effect rugby has on players’ mental health and well-being, as well as the mental health and well-being status of those who play rugby (and whether these vary by gender, type of rugby, and level of participation).

Design: Cross-sectional study.

Methods: We engaged with national governing bodies to purposively sample across a pre-determined diverse range of rugby settings. Participants completed an online survey which consisted of demographic questions followed by self-reported mental health and well-being measures, the Kessler Psychological Distress Scale (K10) and the Short Warwick-Edinburgh Mental Well-being Scale (SWEMWBS).

Results: 500 rugby players completed the survey. 44% of participants were female, and 55% male. England (67%), Ireland (15%) and South Africa (12%) had highest representation. 71% of participants were amateur players, with elite players making up 20% of the population. 87% of players participated in contact forms of the game, with 9% predominantly playing non-contact rugby. Over half reported that rugby impacted ‘extremely’ positively on both their mental health and well-being. Based on the K10 scores, 58% of all respondents belonged to the ‘psychologically well’ group. Males were more likely to belong to this group than females ($p=0.01$). Non-contact and amateur players had lower scores of psychological distress than contact and professional players ($p=0.001$ and $p=0.006$), respectively. Non-contact players had higher well-being (SWEMWBS) scores than contact players ($p<0.001$).

Conclusion: This study provides new insights into the mental health and well-being of a diverse group of rugby players. Most participants self-reported that rugby positively affected their mental health and well-being. Male, amateur and non-contact players could be considered to have a better mental health and wellbeing profile compared to their female, professional and contact-playing counterparts, respectively.

From risk to prevention: Injury surveillance, video-analysis, and concussion reporting behaviours in Para sport

Grimes, Alyssa

Co-author: Carolyn Emery, Amy Latimer-Cheung, Jeffrey Caron, Jennifer Tomasone

Institution: Sport Injury Prevention Research Centre, Kinesiology, University of Calgary, Calgary, Alberta, Canada and School of Kinesiology and Health Studies, Queen's University, Kingston, Ontario, Canada

Abstract

Background: Para athletes face unique risks that may increase their likelihood of sustaining an injury or concussion during sport participation. However, research on the epidemiology and experience of injury and concussion in Para sport is limited, especially among non-elite and youth cohorts.

Objectives: (1) To examine the injury and concussion incidence rates (IR) and mechanisms in community level Para ice hockey; (2) To explore concussion reporting behaviours among youth Para ice hockey players; (3) To compare physical contact (PC), head contact (HC), and suspected-injury and suspected-concussion between elite and non-elite wheelchair rugby play.

Design: Multi-method study, including a prospective cohort study, cross-sectional video-analysis, and qualitative interviews.

Setting: Canada.

Methods: Para ice hockey teams from Alberta (n=8 team-seasons; 60 player-years) were recruited during the 2023-24 and 2024-25 seasons. Validated injury surveillance supported baseline, exposure-hours, and injury data collection. Any player with a suspected concussion was referred to a study physician. In Year 2, players were given an additional survey to examine their knowledge and attitudes towards concussion at baseline. Qualitative data will be collected post-season via semi-structured interviews to explore factors influencing concussion reporting behaviours among youth Para ice hockey players (n=15). Video-analysis software was used to analyze and compare PCs, HCs, falls, suspected-injury, and suspected-concussion rates between elite (n=12) and non-elite (n=12) wheelchair rugby game footage.

Main Outcome Measures: Injury and concussion IR adjusted for cluster based on Poisson regression (surveillance and video-analysis); PC, HC, and penalty call proportions for illegal contacts (video-analysis); athletes' knowledge and attitudes towards concussion (survey); and barriers and facilitators to concussion reporting among Para ice hockey players (interviews).

Conclusions: Data collection and analyses are ongoing. These studies will facilitate an improved understanding and awareness of the epidemiology of concussion in Para ice hockey and wheelchair rugby. Findings will provide evidence for targeted prevention strategies.

Injury and illness risk profiles in Qatar professional football: application of risk management principles

Bahar Hassanmirzaei

Co-authors: Montassar Tabben, Yorck Olaf Schumacher, Hafid Mammeri, Mokhtar Chabbane, Raouf Nader Rekik, Rui Drumond, Souhail Chebbi, Roald Bahr

Institutions: Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar; Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway.

Abstract

Background: Risk management is an essential framework, aiming to systematically identify, assess, and mitigate risks while optimizing performance. Despite its widespread use in various industries, structured risk management approaches remain underutilized in professional sport. Traditional injury prevention models often focus on general strategies rather than team-specific risk assessment and mitigation. The Aspetar Risk Management Plan (RMP) tool was developed to bridge this gap by providing a structured, stakeholder-driven approach to risk identification and mitigation in professional football.

Objective: To evaluate the injury and illness risk profile in Qatar professional football, focusing on identifying, prioritizing, and mitigating risks.

Design: Observational study using in-person workshops involving medical and technical staff in professional football clubs. Risk identification, prioritization, and mitigation planning were conducted using a newly developed RMP tool with a standardized scoring system.

Setting: Qatar professional football setting prior to the 2022–2023 season.

Participants: Medical and technical staff from 18 football clubs.

Main Outcome Measures: Teams identified that most of their risks are individual player-related, with musculoskeletal issues being the most prevalent. However, not all players were at risk, and most identified risks were not addressed.

Results: Teams selected 33% of identified risks for mitigation, with the most common interventions focusing on individualized training, communication improvements, and load management. Mitigation efforts involved 354 tasks planned among 58 team staff members, underscoring that risk management is a teamwork.

Conclusion: The structured implementation of the Aspetar RMP tool enabled professional football clubs to move beyond traditional injury prevention by systematically assessing and prioritizing risks. The findings highlight the importance of individualized risk assessment and collaborative mitigation efforts, reinforcing that injury and illness prevention should be an integrated, team-wide responsibility rather than solely the athlete’s burden.

Athletes in the Making: Development of Prep to be PRO

Heiestad, Hege

Co-authors: Grethe Myklebust, Roald Bahr, Christine Holm Moseid

Institution: Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway

Abstract

*Background***:** The most talented young athletes often face challenges related to injuries and illness, largely due to inappropriate training and condensed competition schedules. Previous preventive measures in Norway have highlighted the need for a systematic approach to safeguarding their health.

*Objective***:** To document the development of Prep to be PRO, an educational module-based program, designed to support the development and protect the health of young athletes enrolled in Sports Junior High Schools and Sports Academy High Schools.

*Methods***:** The development process, guided by the Translating Research into Injury Prevention Practice (TRIPP) framework, involved extensive collaboration with school leaders, coaches, and athletes. From June 2019 to June 2023, the process incorporated multidisciplinary input from over 40 stakeholders, including health personnel and experts in sports science, nutrition, and sports psychology.

*Results***:** Prep to be PRO consists of 10 modules divided between Sports Junior High Schools and Sports Academy High Schools. The modules cover a range of topics, including performance training, growth and maturation, load progression, recovery, total load, nutrition, and sports psychology. The program is athlete centered, but coach driven, -including student-active approaches, use of digital tools, and deep learning. Prep to be PRO is anchored in the National High School Curriculum, ensuring relevance and alignment with educational standards.

*Conclusion***:** Prep to be PRO introduce an individualized approach, may enhance the focus on overall health and foster long-term athlete development. The integration into the national curriculum and the involvement of school staff in its delivery is expected to facilitate implementation. Future work focuses on further implementation, through systematic data collection from coaches and athletes, ongoing stakeholder engagement, continuous adaptation, and support for educators to ensure fidelity and relevance. Next step is to analyze the program's effectiveness. Long-term sustainability will be secured by organizational commitment, resource alignment, and integrating the initiative into existing structures.

Skating toward safety: A multifaceted approach to injury prevention in adolescent ringette players

Heming, Emily

Co-authors: Carolyn Emery, Kathryn Schneider, Debbie Palmer, Cheryl Barnabe, Kelly Russell

Institution: Sport Injury Prevention Research Centre, University of Calgary, Calgary, Alberta, Canada

Abstract

Background: Ringette is a popular female/girl ice sport in Canada with over 30,000 registered players annually. Despite bodychecking being prohibited at all levels, previous video-analysis studies have demonstrated high rates of bodychecking, head contacts (HCs), and suspected injuries and concussions. Additionally, low proportions of illegal bodychecks and HCs are penalized. Understanding injury epidemiology in ringette through validated injury surveillance methods is crucial. Research on injury prevention strategies in ringette, including personal protective equipment, rule enforcement, and neuromuscular training (NMT) remains limited.

Objective: This study aims to evaluate: (1) injury and concussion incidence rates (IR), mechanisms, and burden in adolescent (ages 11-18) ringette; (2) effectiveness of a ringette-specific NMT program; (3) behaviours and IRs associated with shoulder pad use; and (4) impact of a referee workshop on penalizing illegal bodychecks and HC.

Design: Prospective cohort and quasi-experimental studies within the SHRed Concussions (Surveillance in High Schools and Community Sports to Reduce Concussions and their Consequences) cohort study (injury surveillance and video-analysis).

Setting: Alberta, Canada adolescent ringette leagues during the 2021-22 to 2024-25 seasons.

Participants: Adolescent female ringette players (ages 11-18) recruited across four seasons.

Interventions: Prevention strategies evaluated include (1) a ringette-specific NMT warm-up program; (2) shoulder pad use; and (3) a referee education session aimed at increasing penalty calls for illegal bodychecks and HCs.

Main Outcome Measures: Injury and concussion rates (surveillance and video-analysis) and penalty call proportions (video-analysis) for illegal bodychecks and HCs.

Results: Data collection and analyses are ongoing with data across 4 seasons (N=64 team-seasons, n=850 player-years).

Conclusions: These studies will provide critical insights into injury prevention in ringette by evaluating ringette-specific strategies. Findings will inform evidence-based recommendations to enhance player safety and well-being.

From peak performance to post-retirement: Pulmonary changes in elite athletes.

Holmsve, Monica

Co-authors: Julie Stang, Hege Clemm, Thomas Halvorsen, Trine Stensrud

Institutions: Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway; Department of Clinical Science, Faculty of Medicine, University of Bergen, Bergen, Norway

Abstract

Background: Bronchial hyperresponsiveness (BHR) is more prevalent in elite athletes than in the general population. The long-term impact of high training volumes on pulmonary health following retirement from elite sports is not fully understood and requires further investigation.

Objective: To compare the prevalence of BHR and allergy, and the change in lung function, forced expiratory volume in 1 second (FEV1) and forced vital capacity (FVC), from active career to post-retirement in elite athletes.

Method: This longitudinal follow-up study including 152 elite athletes were pre-tested from 1993 to 2016, and post-tested from 2022 to 2024. The physiological assessments consisted of methacholine bronchial provocation (PD20met) (n=152), skin prick testing (n=110) and spirometry (n=147). Positive PD20met was defined as <1.18 mg (<6 µmol). Categorical variables were analyzed with McNemar test, and lung function variables with paired sample t-test.

Results: Our results showed no significant changes in BHR prevalence from active career to post-retirement, n (%); 64 (42%) to 53 (35%), respectively (p=0.117). Neither when divided into summer or winter athletes. The prevalence of allergy did not change, from active career 56 (51%) to post- retirement, 56 (51%) (p=1.00). FEV1 percentage of predicted (FEV1%) and FVC% increased from mean (SD); 98% (24.3) to 105% (11.0) (p<0.001) and 100% (28.6) to 112% (10.3) (p<0.001), respectively from active career to post-retirement. Winter athletes improved both FEV1% and FVC% (p=0.002, p< 0.001), while the summer athletes only improved FVC% (p=0.193 and p<0.003), respectively.

Conclusion: The prevalence of BHR and allergy did not change significantly from active career to post-retirement. FEV1% and FVC% showed a significant increase post-retirement, indicating that retirement may be associated with slight improvements in lung function. Further studies are needed to confirm these findings.

Head acceleration event exposure during elite men's and women's rugby union training

Hudson, Sam

Co-authors: James Tooby, Gregory Roe, Thomas Sawczuk, Dario Cazzola, Matt Cross, Ben Jones. Simon Kemp, Sarah Whitehead, Keith Stokes

Institutions: Centre for Health and Injury and Illness Prevention in Sport, University of Bath, United Kingdom; UK Collaborating Centre on Injury and Illness Prevention in Sport (UKCCIIS), University of Bath, United Kingdom; Carnegie Applied Rugby Research (CARR) centre, Carnegie School of Sport, Leeds Beckett University, Leeds, UK; Obesity Institute, Leeds Beckett University, Leeds, UK; Premiership Rugby, London, UK; Division of Physiological Sciences, Department of Human Biology, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa; School of Behavioural and Health Sciences, Faculty of Health Sciences, Australian Catholic University, Brisbane, QLD, Australia; Rugby Football League, Etihad Campus, Manchester, United Kingdom; Rugby Football Union, Twickenham, UK; Department of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine, London, UK

Abstract

*Background***:** Head acceleration event (HAE) exposure in elite men's and women's rugby union training is unknown.

*Objectives***:** To describe the incidence and magnitude of HAEs during elite men's and women's rugby union training for different contact training levels and drill types.

*Study Design***:** Prospective observational cohort study.

Methods: Data were collected during the 2022-23 and 2023-24 seasons from 203 men and 125 women playing in the highest level of rugby union in England, from seven men's and six women's clubs. Players wore instrumented mouthguards (iMGs), which measured the peak linear (*g*) and angular acceleration (Krad/s^2) of HAEs during in-season training sessions. Training videos were used to identify contact level and drill type. HAE incidence was calculated per player minute.

Results: For men's forwards and backs, only 4.7% and 5.8% of HAEs were ≥25 *g* and ≥1.5 Krad/s^2, and 3.4% and 4.4% for women's forwards and backs, respectively. The incidence of HAEs ≥5 *g* and ≥0.4 Krad/s^2 was highest during full-contact training for men's forwards (0.20/min) and backs (0.16/min) and women's forwards (0.10/min). HAE incidence was 2-3 times higher during repetition-based compared to game-based training drills for men's forwards (0.25/min vs. 0.09/min) and backs (0.22/min vs. 0.09/min) and women's forwards (0.09/min vs. 0.04/min) and backs (0.08/min vs. 0.03/min). HAE incidences were halved when repetition-based training drills used pads compared to without pads for men's forwards (0.21/min vs 0.44/min), and backs (0.17/min vs 0.30/min), and women's forwards (0.06/min vs. 0.14/min) and backs (0.06/min vs. 0.10/min).

*Conclusion***:** The average HAE incidence (~13-20% of weekly HAEs) and magnitude during an in-season training week is very low compared to matches. Opportunities to materially reduce HAE exposure in training are likely more limited than previously assumed. Future research on HAE load and injury, and understanding players' specific weekly training exposure, may inform effective individual player management.

Device-measured physical activity, sedentary time, and cardiometabolic risk markers in youth: Harmonized meta-analysis of individual participant data (Preliminary results from nine prospective studies)

Husøy, Anders

Co-authors: Bjørge H Hansen, Lauren Sherar, Esther van Sluijs, Sigmund A Anderssen, Knut E Dalene, Jostein Steene-Johannessen, Anna Bugge, Camilla Damsgaard, Niels Wedderkopp, Geir K Resaland, Jakob Tarp*, Ulf Ekelund*
On behalf of the International Children's Accelerometry Database (ICAD) Collaborators
*Shared last authors

Institutions: Department of Sports Medicine, Norwegian School of Sports Sciences, Oslo, Norway; Department of Sports Science and Physical Education, University of Agder, Kristiansand, Norway; School of Sport, Exercise and Health Sciences, Loughborough University, Loughborough, UK; MRC Epidemiology Unit, University of Cambridge, Cambridge, UK; Department of Chronic Diseases, Norwegian Institute of Public Health, Oslo, Norway; Department of Midwifery, Physiotherapy, Occupational Therapy and Psychomotor Therapy, University College Copenhagen, Copenhagen, Denmark; Department of Nutrition, Exercise and Sports, University of Copenhagen, Frederiksberg, Denmark; The Pediatric Research Unit, University of Southern Denmark, Odense, Denmark; Faculty of Teacher Education and Sports, Western Norway University of Applied Sciences, Bergen, Norway

Abstract

Background: The causal nature of the relationship between physical activity and sedentary time with cardiometabolic risk profiles in youth is unclear.

Objective: To determine the prospective associations between device-measured physical activity and sedentary time with cardiometabolic risk profiles in youth using harmonized individual participant data.

Study Selection: Eligible studies had hip-measured physical activity and sedentary time using accelerometry at baseline and at least one cardiometabolic risk marker at and after baseline in ostensibly healthy youth aged 5-17 years.

Main Outcome(s) and Measure(s): Body mass index (BMI), insulin, glucose, LDL-cholesterol, triglycerides, systolic blood pressure, analyzed individually and as composite scores. Associations are multivariable-adjusted beta-coefficients per standard deviation (SD) increase in exposures. Missing data was imputed using multiple imputation among participants with valid accelerometer data at baseline.

Results: Nine prospective cohort studies (n =7201 participants, mean [range] age 11.7 years [5.8 to 17.2], 52% girls) with mean (SD) 2.6 (2.1) years of follow-up were included. Higher MVPA and VPA, and lower sedentary time at baseline were favorably associated with most single and composite risk markers in a naïve model. Following adjustment for baseline BMI (main model), most of these associations were substantially attenuated and some directions of associations were reversed. MVPA was inversely associated with insulin (−1.76 pmol/L, 95CI: −2.68, -0.84), LDL-cholesterol (−0.03 mmol/L, 95CI: −0.05, −0.01), triglycerides (−0.02 mmol/L, 95CI: −0.02, −0.01) and the composite risk scores. There was no association with between MVPA and BMI and the association between MVPA and glucose and systolic blood pressure was positive. Higher sedentary time was associated with lower BMI and systolic blood pressure. The observed associations differed between levels of sex, adiposity, age-groups and length of follow-up, with the direction of associations varying from beneficial to detrimental across the different sub-groups.

Conclusions and Relevance: Physical activity and sedentary time may not be strong determinants of cardiometabolic risk profiles in youth, particularly during puberty.

Pathogen-Specific Acute Respiratory Infections in Athletes and Return-to-Sport

Jooste, Marcel

Co-authors: Martin Schwellnus

Institutions: SEMLI, University of Pretoria, South Africa

Abstract:

Aim/objectives: There are few data describing aetiology, clinical presentation and return-to-sport (RTS) outcomes of pathogen-specific acute respiratory infections (ARinf) in athletes. This research aims to determine: 1) differences in the clinical presentation between causative pathogens 2) total time-loss days, days to return-to-training (RTT), return-to-full-training (RTFT), and return-to-full-performance (RTFP) following pathogen-specific ARinf 3) other factors associated with RTS outcomes.

Design: Prospective cohort study with repeated measures

Setting: Sports medicine clinical facility

Participants: Inclusion criteria: 16-60 years, training ≥4 hours/week, evaluated ≤5 days post symptom onset. Confirmation of an ARinf was based on multiplex PCR testing, abnormalities in selected blood tests and clinical findings. 116 cases were included.

Methods: Initial and two repeat assessments (~11 and ~31 days after symptom onset) entailed a physician-guided history and physical examination, and selected special investigations. Total time-loss days and days to specific RTS outcomes (RTT, RTFT, RTFP) were recorded and compared among pathogen groups, symptom number and severity, and illness severity classifications.

Preliminary results: (Objectives 1+2) The most common aetiologies in this cohort were rhinovirus=34(29%), influenza=17(15%), SARS-CoV-2=15(13%), and common coronavirus=13(11%). Influenza had greater number and severity of total symptoms, lower respiratory & regional, and systemic & non-respiratory symptoms than rhinovirus ($p \leq 0.002$) and common coronavirus ($p < 0.05$). Influenza had the highest % of severe illnesses (88%) and common coronavirus the lowest (31%). 41% of rhinovirus presented with severe illness. There were significant differences in all RTS outcomes between the four common pathogens ($p < 0.002$). Common coronavirus had the least total time-loss days (median; IQR) (2; 0.5-12.5) and influenza the most (7; 5.5-8). Rhinovirus had the least days to RTT (1; 0-4), RTFT (6; 4-8), and RTFP (8; 0-7) and influenza the most (RTT:7; 6-8, RTFT:9; 8-15, RTFP:14; 13-16).

Conclusions: Clinical presentation and time to RTS outcomes differ between common pathogens causing ARinf in athletes. Further analyses are underway.

The prevalence of radiographic hip pathology in elite and former elite badminton players

Kaldau, Niels Christian

Co-author: Per Hölmich

Institution: Sports Orthopedic Research Center Copenhagen (SORC-C), Department of Orthopedic Surgery, University Hospital Copenhagen, Amager-Hvidovre Hospital, Hvidovre, Denmark

Abstract

Background: Badminton is played with high intensity, involving sudden change of direction, lunges, deep hip flexion and jumps which may play a role in developing hip osteoarthritis (OA). In other sports femoroacetabular impingement syndrome (FAIS) and hip OA are more common than in the general population. In a cohort of world junior elite badminton players, 35 % (n=100) had positive impingement test of the hip (Kaldau et al). The prevalence of FAIS, OA, and other hip and groin symptoms in badminton players is not known.

Objective: We hypothesize that the prevalence of radiographic cam morphology and hip OA in an adult elite badminton population is higher than the prevalence in a matched population. The primary aim of this study is to examine the prevalence of radiographic cam, dysplasia, or pincer and hip OA in an active and a former elite population of badminton players. Secondary aims are to examine any risk factors for developing OA and FAIS (eg. familiar dispositions, Sex, level of play, hours of play, years playing professional, singles/doubles category) and to describe patient reported outcome scores and clinical signs of OA and FAIS.

Design: A cross-sectional comparative study

Participants: One hundred Danish national team or former national team players in badminton playing or having played at the national center from 1985 until 2025 and a match-controlled population.

Interventions or assessment of risk factors:

1. Standardized X-rays of the pelvis and both hips
2. Clinical examination of the hip including impingement test
3. A questionnaire including basic demographics, badminton experience, previous injuries and current hip symptoms and PROMs

Perspectives: A more comprehensive understanding of hip injuries, symptoms, and the risk factors for developing OA in elite badminton players is essential. This knowledge could help prevent athletes from becoming disabled by their sport, ultimately improving long-term health outcomes.

The association of carbon-plated shoes with running-related injuries during marathon training: a Runner Health Consortium study

Toresdahl, Brett

Co-authors: Stephanie Kliethermes, Emily Kraus, Adam Tenforde, Mark A. Fontana

Institutions: Department of Orthopaedics, University of Utah, Salt Lake City, Utah, United States

Abstract

Background: Runners are increasingly using carbon-plated shoes during training and racing. The effect of carbon-plated shoes on the risk of running-related injury (RRI) is unknown.

Purpose: To examine the association of carbon-plated shoes with RRI sustained while training for a marathon.

Design: Observational cohort study.

Setting: Remote monitoring of runners during marathon training.

Participants: Adult runners who are US residents and uninjured 12 weeks before the marathon.

Assessment of Risk Factors: Baseline survey assessed age, gender, body mass index, baseline weekly running distance, and goal finish time. Biweekly surveys assessed the use of carbon-plated shoes.

Main Outcome Measures: RRI, defined as musculoskeletal pain that causes modification of training for at least 7 days (or 3 consecutive scheduled runs) and assessed biweekly.

Results: A total of 1513 runners participated, mean age of 38.4 (SD 11.2), 57% women, and 28% first-time marathon runners. Carbon-plated shoes were used very often or always by 10% of runners and never by 54% of runners. Overall, 34% of the cohort reported RRI, including 21% who sustained RRI in the lower leg, ankle, and foot. Incidence of RRI was highest in runners who did not train in carbon-plated shoes (40%) and lowest in runners training always or very often in carbon-plated shoes (25%; χ^2=27.4, p<0.001). A multivariable logistic regression revealed an inverse association between carbon-plated shoe usage and all RRI (OR 0.80 for each point on a 5-point Likert for carbon-plated shoe usage, CI 0.72-0.90, p<0.001) as well as injuries of the leg, ankle, and foot (OR 0.75, CI 0.64-0.86, p<0.001). No other factor was significantly associated with injury in the multivariable regressions.

Conclusions: In this cohort of runners training for a marathon, approximately one-third sustained RRI during training. The use of carbon-plated shoes was associated with a lower incidence of RRI. The impact of carbon-plated shoe use on RRI should be assessed through a randomized controlled trial.

#ReadyToPlay: risks and risk factors in women's premier league- club stakeholder's perceptions

Kåshagen, Ingvild Grønvold

Co-authors: Roar Amundsen, Håvard Moksnes, Merete Møller & Roald Bahr.

Institution: Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway

Abstract

Background: Women's premier league football suffers from a high risk of injury. Risk management has been proposed as a framework for reducing injury risk in sport, focusing on describing, assessing and prioritizing potential risks.

Objectives: To describe the risks and risk factors for injury and illness that stakeholders in women´s football perceive as important, their priority and how they plan to address them.

Methods: This descriptive study was conducted during the pre-season and competitive seasons of 2023 and 2024 in the Norwegian women's premier league (Toppserien). All key stakeholders in the eleven teams were included. Teams created their own tailored risk management plan prior to the 2024 season, describing potential risks and risk factors for injury and illness for their team, and seasonal risks related to the training and competition calendar. The risks were assessed, and a plan with preventive measures was made to address the prioritized risks.

Results: The teams identified 104 risks (49% team, 51% seasonal). Most risks were categorized as Training & match load (42) and Musculoskeletal (42). Further 248 risk factors were identified, most were categorized in Training & match load (66), Staff & player-related (55), Social/behavioural (52) and Equipment & facilities (47). Of the 104 risks ,61 risk were prioritized and 231 preventive measures planned to address them. The physiotherapist was responsible for the most measures, but most measures had a shared responsibility between multiple stakeholders.

Conclusion: This study shows the diversity of risk factors and planned preventive measures for injury and illness. It suggests the need for considering more than physical qualities as risk factors, and that a holistic approach engaging all stakeholder is needed to address them.

Assessing neuromuscular adaptations during recovery from hamstring strain injuries using high density electromyography

Kathuria, Sayyam

Co-authors: Valentin Dablainville, Marius Osswald, Marco Cardinale, Alessandro Del Vecchio.

Institutions: Research and Scientific Support, Aspetar Orthopaedic and Sports Medicine Hospital, Doha, Qatar; Department Artificial Intelligence in Biomedical Engineering, Friedrich-Alexander University Erlangen-Nürnberg, Erlangen, Germany.

Abstract

Background: Hamstring strain injury (HSI) is the most common non-contact muscle injury in many sports. Despite rehabilitation efforts, high re-injury rates suggest unclear return to sport (RTS) criteria and suboptimal neuromuscular recovery. Strength deficits, neural inhibition and imbalances within hamstring muscle are commonly observed following HSI, however, research on neuromuscular adaptations post-injury and during rehabilitation remains limited. This study aims to identify neuromuscular adaptations during rehabilitation and after RTS discharge in athletes and recreationally active individuals with HSI, contributing to RTS decision-making using high-density electromyography (HDEMG).

Study Design: Observational study.

Setting & Participants: Patients treated at Aspetar, with MRI-confirmed grade 1,2 or 3 hamstring lesions will be recruited. Eligible participants (n = 40; Age: 18 – 40 years) will undergo weekly unilateral hamstring strength testing and concurrent muscle activity assessments of the injured and contralateral uninjured (control) leg at least three times before RTS, with a follow-up assessment within two months of discharge.

Strength & muscle activity measurements: Participants will perform maximal voluntary isometric contractions (MVIC) and submaximal isometric contractions (35%, 50% and 70% of MVIC) with the knee angle fixed at 30° (0° = full extension) while laying prone on a custom-built medical bed instrumented with load cells. Surface HDEMG signals from the semitendinosus (ST) and bicep femoris long head (BFlh) will be recorded using two bi-dimensional grids of 64-electrod grids (5 columns × 13 rows) per muscle. Force and HDEMG signals will be captured via a multichannel amplifier (EMG-Quattrocento, OT Bioelettronica) and OTBioLab+ software.

Main Outcome Measures: HDEMG decomposition will identify individual motor unit discharge times, estimating the neural drive to the muscles. Motor unit recruitment threshold, motor unit discharge rate (MUDR) and coherence analysis assessing shared synaptic input between ST and BFlh will be used to identify deficits and compensatory mechanisms post-injury. Additionally, HDEMG amplitude and muscle fiber conduction velocity (MFCV) will provide insights into adaptations at the muscular level, with findings expected to enhance RTS decision-making and potentially reduce the risk of re-injuries.

Helmet fit and concussion in adolescent tackle football: A program informing coach education and player safety

Kolstad, Ash

Co-authors: Jean-Michel Galarneau, David Laperrière, Kelly Russell, Steven Broglio, Claude Goulet, Brent Hagel, Carolyn Emery.

Institution: Sport Injury Prevention Research Centre, Faculty of Kinesiology, University of Calgary, Calgary, Alberta, Canada

Abstract

Background: Many tackle football coaches do not receive any helmet fit training despite a responsibility to fit player helmets. Having a poor fitting helmet was associated with 2-fold higher odds of concussion in youth ice hockey players; however, evaluation in tackle football is needed.

Objective: Within adolescent tackle football teams, our objectives are [1] to evaluate a coach helmet fit training intervention based on concussion incidence rates (IRs) and time to concussion, and [2] to evaluate a developed 12-item helmet fit checklist's association with concussion.

Design: A clustered quasi-experimental design was used to evaluate a helmet fit training intervention and nested case-control study design to evaluate the 12-item helmet fit checklist.

Setting: Calgary and Québec City (Canada).

Participants: Adolescent tackle football players (males/females; ages 13-18).

Intervention: The training intervention included an educational and practical session for using the 12-item checklist and was administered to 14 teams (704 players) for comparison with 45 control teams (2068 players). The validated checklist spans five helmet fit domains (e.g., chinstrap, helmet-shell) and was implemented by the research team to compare helmet fit scores between players who sustained a concussion (cases; n=152) versus musculoskeletal (MSK) injury (controls; n=491) to evaluate if poor fit (≤10 of 12 items met) was associated with concussion.

Main Outcome Measures: Validated injury surveillance including baseline testing, weekly exposure-hours and injury follow-up was conducted. Outcomes include injury/concussion IRs and odds, injury type, and time-loss.

Results: Evaluation of the helmet fit training intervention on concussion IRs is underway. Bivariate logistic regression analyses suggests a poor fit score (≤10/12) was associated with a 2-fold higher concussion odds ($OR_{concussion/MSK}$=2.10, 95%CI:1.43-3.09), with criteria highlighting loose helmet fit (e.g., loose-shell, chin-strap, cheek-pads) demonstrating higher concussion odds.

Conclusions: Helmet fit is an efficient area for improving player safety and standardizing effective helmet fitting practices is critical.

Knee joint loading differences in isolated versus concomitant anterior cruciate ligament injuries 9 months – 2 years following reconstruction

Lundervold, Anders

Co-authors: May Arna Risberg, Hannah Rice, Tron Krosshaug

Institutions: Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway; Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway; Department of Physical Performance, Norwegian School of Sport Sciences, Oslo, Norway; Division of Orthopedic Surgery, Oslo University Hospital

Abstract

Background: Post-traumatic osteoarthritis (PTOA) is a major concern following anterior cruciate ligament (ACL) injuries, affecting many young, active individuals. Despite reconstruction (ACLR) and rehabilitation, the risk of developing PTOA remains significant. ACL injuries with concomitant injuries (e.g., meniscus) increased the likelyhood of PTOA compared to isolated ACL injuries.

Aims/Objectives: We aim to identify differences in knee joint loading patterns between individuals with isolated versus concomitant ACL injuries, specifically:

- Identyfining differences in patellofemoral(PFJ) loading during walking and running between individuals isolated versus concomitant ACL injury.
- Identyfing differences in medial and lateral compartment loading in the tibiofemoral joint (TFJ) during walking and running between individuals isolated versus concomitant ACL injury.
- Investigate if there are differences in knee joint loading patterns during the landing of vertical and horizontal single–leg jumps after concomitant or isolated ACL injury

Methods: Participants with primary unilateral ACLR are recruited from the Norwegian Knee Ligament Registry. We use musculoskeletal modeling based on 3D motion capture to estimate internal knee joint contact forces during walking, running, and single-leg jumps. Additionally, we assess maximal isokinetic knee flexion and extension strength, evaluate quadriceps muscle activation using interpolated twitch technique. Assess knee joint cartilage and subchondral tissue status using the semi-quantitative MRI Osteoarthritis Knee Score (MOAKS), and 3D ultrasound measures muscle volume of the quadriceps. Patient-reported outcomes are assessed through questionnaires (KOOS and IKDC).

Current status: Data collection at the Norwegian School of Sport Sciences is complete, MRI assessment are in progress at Oslo University Hospital. Data analysis has begun. We plan to publish three research articles and one systematic review.

The effects of breaking up sitting with different frequencies of physical activity on cardiometabolic risk factors

Magulas, Melina Meyer

Co-authors: Jostein Steene-Johannessen, Ulf Ekelund

Institution: Oslo Center for Physical Activity and Population Health, Department of Sports Medicine, Norwegian School of Sports Sciences

Abstract

Background: Norwegian men and women spend more than ~ 9.2 hours of awake time sedentary. Observational data suggest that sedentary time is associated with detrimental health outcomes. Breaking up sitting with bouts of physical activity (PA) is associated with improved cardiometabolic profile in clinical populations. However, whether this extends to healthy, young adults is unclear.

Objective: To examine whether breaking up sitting with different frequencies of PA bouts improves cardiometabolic profile compared to prolonged sitting.

Main outcome: Postparandial [blood glucose]

Methods: 22 healthy, men and women (32 ±4.7 years,) with sedentary occupations took part in this randomized controlled crossover study. Participants completed four iso-caloric 7-hr conditions: 1.) prolonged sitting (SIT), 2.) 32 min 30 seconds of PA followed by prolonged sitting (PA-SIT) and 3.) 5 min 25 seconds of PA every 60 min (PA-60) and 4.) 2 min 20 seconds of PA every 30 minutes (PA-30). PA modality was jogging at 60-65% of VO_{2max} on a treadmill. Blood pressure (BP) was measured 3 times every 30 minutes, and blood samples were drawn every 30 minutes throughout the trials and analyzed for blood glucose, including an extended blood panel of biomarkers. Total (tAUC) and incremental (iAUC) areas under the curves were calculated by the trapezoidal rule.

Results: Preliminary data (n=19) and comparison between trial 1, 2 ,3 show that tAUC and iAUC glucose was significantly lower in in SIT condition compared to PA-SIT (P = 0.014 and 0.002) and compared to PA-60 (P = 0.06 and 0.039). There were no differences in BP tAUC.

Conclusion: Neither PA-SIT, nor PA-60 showed acute improvements in glucose regulation compared to SIT. The increments in glucose tAUC and iAUC are negligible in young healthy men and women.

Sex differences in cutting biomechanics among handball players with and without previous ACL injury

Lasse Mausehund

Co-author: Simon Schild, Emil Carlsen, Lea Wiedemann, Britt Sollman, Linda Fischbacher, Lars Austnes, Kevin Bill, Patrick Mai, Tron Krosshaug

Institution: Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway

Abstract

Background: While female athletes have an anterior cruciate ligament (ACL) injury incidence approximately three times higher than males, the risk of secondary ACL injury appears to be independent of sex. Research on sex-related differences in cutting biomechanics shows conflicting results in healthy athletes and is notably lacking for those with a previous ACL injury. Addressing this gap could provide valuable insights into why females face higher first-time ACL injury risks yet similar secondary injury risks as males.

Objective: To assess sex-related differences in ACL-injury related biomechanics among handball players, both with and without previous ACL injury, during game-specific fake-cut maneuvers.

Design: Cross-sectional study.

Participants: The study included 105 handball players (≥16 years) competing in one of the top four Norwegian divisions. Among the participants, 54 were females (23 with prior ACL injury) and 51 males (20 with prior ACL injury).

Methods: All players were equipped with a full-body marker set of 72 markers before performing two handball-specific fake-cutting tasks with different cutting angles. During these tasks, we collected 3D biomechanical data using a 23-camera motion capture system and 2 force plates.

Main Outcome Measures: Seven knee-specific ACL-injury related biomechanical variables during early stance phase (peak knee abduction moment, peak knee flexion moment, peak knee internal rotation moment, knee valgus and flexion angle at initial contact, peak knee valgus and flexion angle).

Statistical analyses: To assess the effect of sex on cutting biomechanics and the interaction between sex and injury status, we will conduct a 2x2 ANOVA (sex x injury status). Additionally, we will perform an analysis adjusting for approach speed, reporting both adjusted and unadjusted results.

The weight of victory: Exploring short- and long-term health outcomes in former elite athletes from weight-sensitive sports

Mellbye, Anders

Co-authors: Jorunn Sundgot-Borgen, Therese Fostervold Mathisen

Institution: Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway

Abstract

Background: The health and well-being of former elite athletes have been identified as a key research area. Weight-sensitive sports, where body weight, body composition and/or figure is regarded as central factors for performance, present distinct challenges. Athletes representing weigh-sensitive sports are vulnerable to adverse health outcomes related to low energy-availability and disordered eating during their active careers, yet little is known about their long-term physical and mental trajectories. Another challenge is the transition from elite sport to everyday life, where a loss of "athletic identity" may heighten psychological distress and reduce well-being.

Objective: To assess the short- and long-term physical and mental health outcomes of former elite athletes from weight-sensitive sports and compare these findings with two reference groups.

Design: Cross-sectional study involving three groups. The primary group features former elite athletes from weight-sensitive sports; two comparison groups include former elite athletes from less weight-sensitive sports (team sports) and non-elite athletes matched by age representing the general population.

Participants: Men and women aged >18 years who retired from elite-level competition >1 year ago (elite groups) and one age matched non-former athlete reference group.

Recruitment: Former elite athletes will be recruited through sport federations, archival records, official competition lists, and targeted outreach. Non-elite athletes will be drawn from the Norwegian Population Register.

Measurement & main outcomes: An electronic questionnaire consisting of validated instruments will assess the physical and mental health among the participants. Main outcomes include mental health (including eating disorders), musculoskeletal status, and reproductive health.

Planned analyses: Descriptive analyses will characterize each group. Between-group statistical tests will compare health outcomes. Multiple and logistic regression models will identify explanatory variables, focusing on sports type, gender, weight-regulation history, and eating and dieting history.

Injury prevention in youth football and handball: development of a complex intervention

Moen, Christian

Co-authors: Emilie Scholten Sjølie, Solveig Hausken-Sutter, Christian Bjørndal, Grethe Myklebust, Merete Møller, Hege Grindem

Institutions: Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway; Oslo Sports Trauma Research Center, Department of Sport and Social Sciences, Norwegian School of Sport Sciences, Oslo, Norway

Abstract

Background: Despite demonstrated efficacy of injury prevention programs in reducing injuries in team sports, successful implementation does not automatically follow. Most interventions are developed from primarily biomedical perspectives with limited reporting on development processes.

Objective: To describe the development process and content of #Utviklingsklar, a complex intervention aimed at preventing first-time and recurrent injuries in youth handball and football.

Design: The intervention was developed following the Medical Research Council framework for complex interventions, integrating interdisciplinary research perspectives and stakeholder involvement throughout the development process.

Setting: Youth football and handball in Norway, targeting coaches and club leaders working with youth players.

Participants: The development involved sports organization project partners, researchers from multiple disciplines, and a user pool consisting of coaches, players, parents, and club managers.

Interventions: #Utviklingsklar consists of three components: (1) an e-learning course providing foundational knowledge on injury prevention, (2) an in-person workshop where coaches develop team-specific injury preventive plans, and (3) a mid-season club meeting to evaluate implementation progress.

Results: Feasibility testing revealed generally positive feedback with suggestions for refinement. Key modifications included improving information delivery, enhancing workshop leader training, streamlining implementation materials, and clarifying participant roles.

Conclusions: The development of #Utviklingsklar demonstrates how an interdisciplinary approach with substantial stakeholder involvement can produce a contextually relevant injury prevention intervention. This process provides a blueprint for developing complex interventions that address implementation challenges from the outset, potentially increasing the likelihood of sustainable adoption in real-world sport settings.

A Spirited Mind in a Broken Body: Associations between health problems and motivation

Moseid, Nils Holm

Co-authors: Nicolas Lemyre, Glyn C Roberts, Morten Wang Fagerland, Christine Holm Moseid & Roald Bahr

Institutions: Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway

Abstract

Background: The associations between motivation, illnesses and sports injuries have not previously been investigated.

Objective: To study the associations between the burden of health problems, coach- and social relations and motivation.

Design: Mixed prospective/retrospective cohort study.

Setting: We followed a population of elite adolescent athletes from Norwegian Sport Academy High Schools for 189 weeks.

Participants: Athletes starting their first year in Sport Academy High Schools in 2014 were invited. We included 128 athletes, 46 girls and 82 boys.

Assessment of Risk Factors: We used the Oslo Sports Trauma Centre's Questionnaire for Health Problems to collect health data. During the first 26 weeks, the athletes reported health data prospectively using a smartphone app. We interviewed the athletes at the end of their third year in Sport Academy High School, T1, and again one year later, T2. At the time of the interviews, the athletes also completed a web-based questionnaire.

Main Outcome Measurements: The Sport Motivation Scale, that measures levels of internal and external motivation and amotivation.

Results: Our main finding was that the burden of health problems had no consistent associations with motivation. We observed an association between an increase in overuse injuries from T1 to T2 and an increase in intrinsic motivation over the same period (B: 2,24 (0,13-4,34), p=0,038). For girls and team sports, we observed an association between an increase in acute injuries and increased amotivation and a similar, but not significant, effect in the total sample. The coach supporting the needs for autonomy, competence and relatedness was associated with high internal motivation in Year 4. Here we observed a similar effect in Year 3, with a p-value of 0.06.

Conclusions: A greater burden of health problems had no consistent association with health problems. The association between intrinsic motivation and overuse injuries should be further investigated.

Treatment on exercise-induced laryngeal obstruction (EILO) – a Randomized Controlled Trial (RCT)

Muralitharan, Praveen

Co-authors: Petter Helø Carlsen, Petrine Veierød Solli, Mette Engan, Maria Vollsæter, Ola Drange Røksund, Thomas Halvorsen, Hege Clemm

Institutions: Department of paediatric and adolescent Medicine, Haukeland university hospital, Norway; University of Bergen, Norway; Western university of applied sciences, Bergen, Norway; Department of Sports Medicine, The Norwegian School of Sport Sciences, Oslo, Norway

Abstract

Background: EILO is caused by adduction during exercise of normal-appearing laryngeal structures, leading to exertional breathing difficulties. No standardized treatment exists, and evidence supporting treatment efficacy is limited to observational studies. We compared four conservative treatment modes: (A) Information, breathing advice, and biofeedback (IBAB), (B) Inspiratory muscle training (IMT), (C) Speech and language therapy (SLT) and (D) IMT + SLT.

Objective: To investigate whether these different conservative treatment options have an effect on EILO and if so, which option is superior.

Study design: Randomized controlled study

Methods: The study was conducted at Haukeland University Hospital, Norway, using block randomization to assign patients to the four groups. Inclusion criteria: EILO confirmed during a maximal treadmill test with continuous laryngoscopy (CLE) with glottic/supraglottic obstruction graded using a validated scoring system (CLE subscore ≥2); age ≥12; no prior EILO treatment; and no respiratory conditions except well-controlled asthma. Treatment effect was graded on a 0–12 CLE-scale before vs. after treatment, with the second CLE test performed after ≥ 6 weeks.

Results: We included 303 patients (74-77 per group). The median interval between tests was 10 (SD 5) weeks. Paired t-test showed a significant overall mean CLE score reduction of 0.68 (Confidence Interval(CI): 0.53-0.83) after treatment. For each group the corresponding findings were: A:0.55 (CI: 0.27-0.83); B:0.59 (CI: 0.25-0.92); C: 0.74 (CI: 0.46, 1.01); D:0.85 (CI: 0.51,1.19), with no significant differences between the groups.

Conclusion: Findings from this RCT suggest that conservative treatment improves EILO as measured by the CLE score. However, preliminary analysis shows no single treatment was superior.

Prevalence of Severe Knee Injuries Among Norwegian Youth Handball Players: A Three-Year Follow-Up Study

Nagy, Cecilie Margrethe

Co-authors: Grethe Myklebust, Trine Stensrud

Institution: Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway

Abstract

Background: Injuries and illnesses are common in handball. Knee, shoulder and ankle injuries are most frequent. Severe knee injuries in young athletes can result in sport dropout and long-term impairment of knee function.

Objective: To evaluate the prevalence and change in prevalence of severe knee injuries (ACL and menisci injuries) among Norwegian youth handball players over a three-year period.

Methods: This longitudinal prospective cohort study in Norwegian youth handball players includes participants aged 15-19 years old attending high school. We included 216 (♀=120, ♂=96) participants in the first year, 154 (♀=92, ♂=62) and 131 (♀=78, ♂=53) participants continued to the second and third year, respectively. The high drop-out rate of the study is due to discontinuation of the sport. A self-reported questionnaire on injury and illness, based on Clarsen et al. (2014), was distributed every second week throughout the season. Specific information regarding severe knee injuries were obtained at the end of every handball season.

Results: Thirty-two (14.8%) handball players reported a severe knee injury the previous season at the end of the first year. Nineteen (8.8%) and 15 (6.9%) reported an ACL or meniscus injury, respectively. In the first year, 79% of the participants who reported an ACL injury were female, and 80% of those reporting a meniscus injury were male. Seventeen (11.0%) and 9 (6.9%) individuals reported a severe knee injury the previous seasons, during the second and third year of high school, respectively. Four ACL injured players experienced a re-rupture, three players in the opposite knee.

Conclusion: The highest prevalence of severe knee injuries was reported the first year of high school, with decreasing prevalence throughout the three-year follow-up period. This may imply that the transition to high school, along with a potential increase in training and game intensity, may contribute to a higher prevalence of injuries.

Cognitive Event Related Potentials Detect Sport-Related Neurological Depression

Neill, Matthew G.

Co-authors: Elizabeth KS Fletcher, Ember Larson, Michael J Esser, Jonathan D Smirl, Carolyn A Emery

Institutions: Sport Injury Prevention Research Centre, Faculty of Kinesiology, University of Calgary, Calgary, Alberta, Canada; Cerebrovascular Concussion Laboratory, Faculty of Kinesiology, University of Calgary, Calgary, Alberta, Canada; Alberta Children's Hospital Research Institute, University of Calgary, Calgary, Alberta, Canada; Hotchkiss Brain Institute, University of Calgary, Calgary, Alberta, Canada; Human Performance Laboratory, Faculty of Kinesiology, University of Calgary, Calgary, Alberta, Canada; Libin Cardiovascular Institute of Alberta, University of Calgary, Alberta, Canada

Abstract

Background: There is growing concern over potential neurological impairment associated with accumulation of non-concussive head acceleration events (HAE) in sport, particularly during periods of neurological development and vulnerability, such as adolescence. A season of collision-sport exposure has been shown to reduce cognitive processing performance in uninjured adolescent hockey and football players, approximated by the N400 Event Related Potential (ERP). Furthermore, despite the high volume of HAEs sustained during downhill (DH) mountain biking, it is currently unknown if this impairs neurological function in youth.

Objective: To investigate the association between exposure to downhill mountain bike racing and objective ERP indexes associated with sensory, attentional, and cognitive processing in youth.

Study Design: Prospective cohort.

Setting: 2024 Whistler (BC, Canada) Crankworx DH mountain biking competition.

Participants: Fifteen youth (age 15-24; 6 female, 9 male) DH mountain bikers.

Assessment of Risk Factors: Days ridden between neurological assessments (1-5).

Main Outcome Measures: ERPs: Amplitude and latency of sensory: N100, basic attention: P300 and cognitive/semantic: N400 ERPs neurological processing.

Results: Fifteen youth (6 female, 9 male) contributed 37 observations at baseline timepoints and follow-up ranging from 1-5 days of elite downhill mountain bike competition. A conditional linear regression model demonstrated an average marginal difference in N400 amplitude from baseline to post-ride of 1.26mV (95% CI: -2.16, -0.36; p=0.006). N400 latency, P300 amplitude and latency, and N100 amplitude and latency were unchanged from baseline by mountain biking (all p>0.26).

Conclusion: In agreement with studies in hockey and football, our results demonstrated that participation in downhill mountain biking is associated with acute impairment in cognitive neurological processing. Future studies should prioritize a greater understanding of the acute effects of exercise and focus on N400 amplitude, as these factors may confound the association between sport-related repetitive HAEs and ERPs.

Physical activity and risk of major adverse cardiovascular events and cardiovascular mortality in individuals with chronic conditions: prospective cohort study

Sanchez-Lastra, Miguel Adriano

Co-author: Borja del Pozo Cruz, Jakob Tarp, Knut Eirik Dalene, Tormod S. Nilsen, Ding Ding, Ulf Ekelund

Institutions: Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo 0806, Norway; Department of Sport Sciences, Faculty of Medicine, Health, and Sports, Universidad Europea de Madrid, Villaviciosa de Odón, Madrid, 28670, Spain; Department of Chronic Diseases, Norwegian Institute of Public Health, Oslo 0473, Norway; Department of Physical Performance, Norwegian School of Sport Sciences, Oslo 0806, Norway; Prevention Research Collaboration, Sydney School of Public Health, The University of Sydney, Camperdown, NSW 2006, Australia; Charles Perkins Centre, The University of Sydney, Camperdown, NSW 2050, Australia

Abstract

*Background***:** Physical activity is recommended to reduce the risk of major adverse cardiovascular events (MACE) and cardiovascular disease (CVD) mortality in individuals with chronic conditions such as CVD, type 2 diabetes mellitus (T2DM), or cancer. However, the minimum and optimal doses associated with lower CVD risk in these populations remain unclear.

*Objective***:** To investigate the dose-response associations between physical activity and MACE or CVD mortality in individuals with a history of CVD, T2DM, or cancer.

*Design***:** Prospective cohort study from UK Biobank (median follow-up 13.1 years).

*Participants***:** A total of 34,183 adults (CVD: n=8,703; T2DM: n=11,623; cancer: n=13,857; mean age ± SD = 60.0 ± 7.1 years; 45.3% women) with complete exposure, outcomes, and covariate data, and without mobility problems and other major chronic diseases at start of follow-up.

Assessment of Risk Factor(s): Physical activity was assessed using self-reported questionnaires and wrist-worn accelerometers in a subsample (n=6,077).

*Main Outcome***:** MACE and CVD mortality.

*Results***:** During follow-up, 8,729 MACE and 982 CVD deaths were recorded. Self-reported physical activity showed non-linear inverse associations with MACE risk, with the lowest risk observed at ≈4,000 MET-minutes/week for participants with CVD (HR=0.95) and cancer (HR=0.92), and ≈6,000 MET-minutes/week for T2DM (HR=0.91). For CVD mortality, the lowest risk was observed at ≈5,000 MET-minutes/week in CVD (HR=0.86) and cancer survivors (HR=0.62). Device-measured moderate-to-vigorous intensity physical activity showed the lowest MACE risk at ≈200 minutes/week for T2DM (HR=0.88) and ≈700 minutes/week for cancer survivors (HR=0.27).

*Conclusion***:** Physical activity could reduce MACE risk in people with history of CVD, T2DM, or cancer. Similarities were observed in the shape of the dose-response patterns, but while self-reported data indicated that the minimal dose might exceed current WHO recommendations, device-measured data supported the existing guidelines for individuals with T2DM and cancer survivors.

Examining the role of cognition in the risk of concussions and lower extremity musculoskeletal injuries among elite athletes

Sewell, Isabella J.

Co-Authors: Thomas Romeas, Johnathan Deslauriers, Suzanne Leclerc & Magdalena Wojtowicz

Institutions: Institut national du sport du Québec, Montreal, Quebec, Canada; Department of Psychology, York University, Toronto, Ontario, Canada; École d'Optométrie, Université de Montréal, Montreal, Quebec, Canada; Department of Family and Emergency Medicine, Université de Montréal, Montreal, Quebec, Canada

Abstract

Background: Recent evidence suggests that cognitive functioning and concussion history may be associated with risk of lower extremity musculoskeletal (LEMSK) injury. However, these relationships have largely been examined in isolation. Further, there is limited understanding regarding whether cognition may also predict the risk of concussion.

Objective: To understand the relationship between cognition, LEMSK injuries, and concussions among athletes. Specific research questions included: (i) Is pre-season cognition consistent across time; (ii) Does pre-season cognition predict subsequent concussion; and (iii) Does cognition mediate the relationship between concussion history and subsequent LEMSK injury.

Design: Observational study.

Setting: Elite/international-level athletes from a Canadian national sport institute.

Participants: Athletes from six sports: artistic swimming, boxing, diving, short-track speed skating, trampoline, and water polo. Longitudinal analyses (i) included 58 athletes (Nfemale=44; Mage=21.58±3.91 years, 16.30-35.58 years) who completed pre-season cognitive testing at two time points (9-21 months apart), 24 athletes of whom had an additional third time point (6-18 months following second time point). Cross-sectional analyses (ii, iii) included 145 athletes (Nfemale=86; Mage=21.50±4.05 years, 14.42-35.58 years).

Measures: Pre-season cognitive performance was measured by a computerized battery (Vienna Test System). Subsequent LEMSK injuries and concussions were documented prospectively in an injury surveillance program.

Results: Cognitive performance improved across time points on tests of cognitive flexibility, sustained attention, working memory, and planning ability (ps<.05), over and above expected practice effects. No cognitive measures predicted subsequent concussion (ps<.05). Concussion history did predict subsequent LEMSK injury (B=0.83, p=0.03), but cognition did not mediate this relationship.

Conclusions: Longitudinal findings suggest that cognitive performance may evolve with sustained physical activity training, independent of practice effects. Cross-sectional results suggest that cognition does not predict subsequent concussion and that the relationship between concussion history and subsequent LEMSK is not explained by cognition. Future research will shift from predicting subsequent concussion towards predicting concussion recovery trajectories.

The air we breathe: the effects of air pollution and exercise in athletes

Sewry, Nicola

Co-authors: Martin Schwellnus, Havenga, Henno

Institutions: SEMLI, University of Pretoria, South Africa; IOC Research Centre Pretoria, South Africa; North West University, South Africa

Abstract:

Background: The exercising population breathes high volumes of air (oral breathing) and air pollution is therefore a potential health concern. The acute and chronic health effects of air pollution (including particulate matter) in athletes is not fully understood. Risk mitigation strategies are yet to be implemented.

Objectives: To describe the air quality in sporting environments and investigate the effects (acute and long-term) of exposure to the exercising individual. Specific objectives: 1) to describe the fine particulate matter levels ($PM_{2.5}$) during a monitoring campaign executed at various track/field athletics events in South Africa, 2) the effects of $PM_{2.5}$ on lung function in athletes exercising in different environments.

Design: Prospective longitudinal study.

Methods: $PM_{2.5}$ concentrations were assessed events in three distinct settings (rural, central metropolitan, industrial metropolitan) during track and field athletics events in South Africa. The SidePak $PM_{2.5}$ monitoring devices were used for particulate matter detection. The instrument uses a light scattering principle to quantify the mass concentration of airborne particles. DS-2 sonic anemometers were used to measure wind speed and direction.

*Results***:** The mean concentrations at the sites were: rural (2 events)=28.6µg/m^3, 33.1µg/m^3, central metropolitan=61.0µg/m^3 and industrialised metropolitan=132.7µg/m^3. At all sites, maximum values>170µg/m^3 were recorded. The industrialised metropolitan displayed the highest maximum $PM_{2.5}$ =385µg/m^3. Factors such as local industries, food stalls and wind might contribute to these elevated levels.

Conclusions: This study shows the variability in $PM_{2.5}$ levels at different venues, and the need to establish standards for short-term $PM_{2.5}$ exposure during physical activities.

Next Step: We plan on investigating the acute effects of varying air pollution levels on lung function and airway inflammation during exercise. We will recruit participants to perform a 5km run (self-paced) in four different environments and evaluate the participants' lung function and fractional exhaled nitric oxide (FeNO) pre- and post-exercise.

Pre-race medical screening, risk stratification, and a targeted medical education program reduces the incidence of medical encounters during a 90km road running race

Shang, Gavin

Co-authors: Nicola Sewry; Mats Borjesson, Jeremy Boulter, Carolette Snyders, Martin Schwellnus

Institutions: Sport, Exercise Medicine and Lifestyle Institute (SEMLI), University of Pretoria; Section Sports Medicine, University of Pretoria; IOC Research Centre (South Africa); Goteborg University; Sahlgrenska University Hospital; Comrades Marathon

Abstract

Background: Previous studies have reported a high incidence of all medical encounters (MEs) and serious / life-threatening MEs (SLMEs) in longer road running distances. Limited studies have investigated prevention strategies to mitigate risks of all MEs and SLMEs at these events.

Aim/Objective: To determine if pre-race medical screening (PRMS), risk stratification, and a targeted medical education program (with / without additional medical education to all entrants) reduces the incidence of all MEs and SLMEs during a 90km road running race.

Study Design: 10-year observational study consisting of pre-intervention (PRE; 2014-2019) and post-intervention (INT; 2022-2025) periods.

Methods: Over the study period, all MEs and SLMEs were / will be documented on race day using standardized methodology. PRMS and risk stratification into very high-risk (VHR) and high-risk (HR) entrants, and targeted educational material to these entrants, was implemented in INT1 (2022-2023). Additional pre-race general medical education to all race entrants was / will be implemented in 2024-2025 (INT2). No general education was provided to all entrants during INT1. The incidence of all MEs and SLMEs (per 1000 starters; 95%CIs) are compared between PRE and INT1, with statistically significant differences determined by non-over-lapping 95%CIs.

Preliminary Results: There were 103131 starters with 1971 MEs and 189 SLMEs in PRE and 29286 starters with 471 MEs and 31 SLMEs in INT1. The incidence of all MEs was significantly reduced by 15.7% in INT1 (16.1; 95%CI= 14.6-17.5) vs. PRE (19.1; 95%CI=18.3-20.0), while SLMEs were significantly reduced by 61.1% in INT1 (0.7; 95%CI=0.4-1.0) vs. PRE (1.8; 95%CI=1.6-2.1). INT2 data collection is ongoing.

Conclusion: Preliminary data show that PRMS, risk stratification, and a targeted medical education program for VHR and HR race entrants reduced the incidence of all MEs and SLMEs in a 90km road running race. The effect of additional general pre-race education for all entrants (INT2 vs. INT1 and PRE) will be analysed following the 2025 race.

Sports Injury Prevention in Scottish School and Club Sport (SIPSS) modified Delphi study: Targets for concussion prevention research in Scottish youth sport

Shill, Isla

Co-authors: Chloe Williamson, Paul Eliason, Dave Collins, Debbie Palmer

Institutions: Edinburgh Sports Medicine Research Network, University of Edinburgh, Edinburgh, United Kingdom; UK Collaborating Centre on Injury and Illness Prevention in Sport, United Kingdom; Sport Injury Prevention Research Centre, University of Calgary, Calgary, Canada; Physical Activity for Health Research Centre (PAHRC), Institute for Sport, Physical Education and Health Sciences, University of Edinburgh, Edinburgh, United Kingdom; School of Health and Human Performance, Dublin City University, Dublin, Ireland.

Abstract

Background: The burden of concussion is high in youth sport. Concussion prevention strategies have been evaluated in some youth sports; however, the need and feasibility of applying and evaluating these concussions prevention strategies in Scottish youth sport is unknown. An understanding of what key Scottish governing bodies consider the most feasible and appropriate concussion prevention strategies to evaluate in the Scottish youth sport context is needed.

Objective: To identify key research priorities for concussion prevention strategies in Scottish youth sport.

Design: Modified Delphi study.

Setting: Scottish youth club and school sport.

Participants: Individuals who are a member of/work with (1) a Scottish sport governing body, (2) a school sport, (3) a government sport policy group, or (4) are a concussion prevention researcher.

Methods: Three rounds of questionnaires will be distributed to develop consensus on research priorities. The first questionnaire will assess perceptions of concussion and its prevention and if there is a need for recommendations on research priorities for concussion prevention in Scottish youth sport. The second questionnaire will refine a list of specific prevention strategies to consider for research priorities. The necessity and feasibility for each strategy in Scottish youth sport will be considered. The third questionnaire will present research priorities for concussion prevention in Scottish youth sport that met consensus in the previous rounds to be considered.

Results: The three rounds of questionnaires are being distributed March to May 2025. Results from the first and second questionnaires will be presented.

Conclusion: This study will provide consensus on what are needed and feasible concussion prevention research priorities within Scottish youth sport. The results prioritise the needs of key Scottish governing bodies to ensure they are gaining useful evidence when considering Scottish youth sport concussion guidelines and policy.

Return-to-sport and recurrent concussions in adolescent sport participants: Does physician assessment matter?

Sick, Stacy

Co-authors: Scott Ramsay, Kathryn J Schneider, Jeffrey G Caron, Carolyn A Emery

Institutions: Sport Injury Prevention Research Centre, Faculty of Kinesiology, University of Calgary, Calgary, Canada; Alberta Children's Hospital Research Institute, University of Calgary, Calgary, Canada; O'Brien Institute for Public Health, University of Calgary, Calgary, Canada; Hotchkiss Brain Institute, University of Calgary, Calgary, Canada; Sport Medicine Centre, Faculty of Kinesiology, University of Calgary, Calgary, Canada; BC Children's Hospital Research Institute, University of British Columbia, Vancouver, Canada; School of Nursing, Faculty of Applied Science, University of British Columbia, Vancouver, Canada; School of Kinesiology and Physical Activity Sciences, Université de Montréal, Montréal, Canada; Centre for Interdisciplinary Research in Rehabilitation of Greater Montréal, Montréal, Canada; Department of Community Health Sciences, Cumming School of Medicine, University of Calgary, Calgary, Canada; Department of Pediatrics, Cumming School of Medicine, University of Calgary, Calgary, Canada

Abstract

Background: The Amsterdam consensus statement on concussion in sport recommends follow-up with a physician or qualified healthcare provider following a concussion. However, adolescent sport participants often navigate return-to-sport (RTS) without medical supervision, which may have implications on recovery (i.e., time-to-RTS) and recurrent concussions.

Objective: To evaluate the difference in (1) time to RTS and (2) time to recurrent concussion between adolescents with a physician-diagnosed concussion and those with no physician assessment following a suspected-concussion.

Study Design: Prospective cohort; Sub-study within SHRed Concussions (Surveillance in High school and community sport to REDuce the risk of Concussion and their consequences; 2019-2026), a multisite cohort examining the incidence of concussion and injuries in adolescent sport participants.

Participants: Adolescents (aged 13-19 years) participating on sport teams with a high-risk for concussion (e.g., football, rugby) and sustained a suspected-concussion.

Assessment-of-risk-factors: Accelerated failure-rate-time models will be used to assess time to RTS and recurrent concussion by physician diagnosis (Physician-diagnosed concussion / No physician assessment). Additional covariates, from annual baseline questionnaires and clinician validated injury report forms, will include concussion history (yes/no), sport (e.g., football, rugby), age (years), sex (male/female), continued participation at time-of-injury (yes/no), concussion signs (present/absent), time-to-RTS of index concussion (days), and self-reported injury severity scores (5-point Likert scale; 1=Unable to perform activities-of-daily-living; 5=Able to participate as if there was no injury).

Outcomes: (1) Time to RTS (days); (2) Time to recurrent concussion (days from RTS of index concussion).

Conclusion: While many sporting organizations have concussion policies in place, some adolescents do not seek medical attention after a suspected-concussion. This may result in participants returning to sport with ongoing impairments evident on a multifaceted clinical exam, leading to a potential increased risk for recurrent concussions. Establishing modifiable factors that elevate the risk for recurrent concussions will help inform current recommendations and secondary prevention strategies.

Cross cultural investigation of athlete mental health support resources, knowledge, and prevention initiatives, for safeguarding athlete health across five continents

Simpson, Kait

Co-authors: Debbie Palmer, Alex Lopes, Jess Bartley, Margo Mountjoy, Jung Woo Lee, Carole Akinyi, Hiwot Zelalem, Claudio Castilho

Institutions: University of Edinburgh, UK Collaborating Centre for Illness and Injury Prevention in Sport, UK; Northeastern University, USA; McMaster University, Canada; Brazillian Athletics Confederation; National Olympic Committee, Kenya; Ethiopian Olympic Committee

Abstract

Aim: The overarching aim of this proposed project is to investigate opportunities for implementing standardised, digital mental health (MH) resources that are a) focused on prevention, education, and safeguarding and b) can be culturally adapted and implemented across various sports and contexts (e.g. high vs low resources countries).

Settings and participants: A team of researchers, practitioners, and stakeholders representing different contexts will be formed to facilitate disseminating the study to elite athletes in their respective locales. The current countries involved in the proposal are: Brazil, Canada, Ethiopia, Kenya, South Africa, South Korea, United Kingdom, and United States.

Methods: The first phase of the project will seek to understand what a 'culturally-informed MH initiative' means for elite athletes and their entourage (medical practitioners, coaches, national governing bodies), with a focus on the Global South where there is scarce literature available, and countries are generally less well resouced. Participants in in each of the case study countries will be recruited. Using survey and delphi methods, we will assess MH literacy, current sources of support, and perspectives on the barriers and opportunities for implementing MH educational and prevention initiative. Attention will be given to male and female health provision differences.

The second phase of the project will be informed by the first, and seek to implement digital mental health resources in each context using case study methods. The utility of the most current International Olympic Committee MH resources and tools (e.g. SMHAT-1) for helping athletes learn about their wellbeing will be evaluated. We will seek to better our understanding of how to implement the SMHAT to improve awareness and literacy in a culturally and contextually appropriate way. It is possible that adaptations to these resources will need to be made for certain contexts depending on the findings in phase 1.

Effectiveness of the Youth Handball Injury Prevention Program #Utviklingsklar: A Cluster Randomized Trial

Sjølie, Emilie Scholten

Co-authors: Christian Moen, Solveig Hausken-Sutter, Martin Hägglund, Carly McKay, Grethe Myklebust, Roald Bahr, Merete Møller, Christian Thue Bjørndal, Hege Grindem

Institution: Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway

Abstract

Background: Injury prevention in youth sports is crucial for player well-being and long-term participation, yet implementation remains a challenge. This study examines the effectiveness of #Utviklingsklar, a theory-based, interdisciplinary injury prevention program developed in close collaboration with sports federations and end users.

Objective: To compare the effectiveness of #Utviklingsklar against usual practice in Norwegian youth handball (ages 13-17). The primary objective is to assess its impact on player injuries over one season through bi-weekly injury tracking using OSTRC-H2. A secondary objective is to evaluate changes in handball coaches' determinants of injury-preventive behavior using the Sports Injury Preventive Behavior Questionnaire.

Design: A parallel, two-armed, pragmatic, superiority cluster-randomized controlled trial.

Setting: Youth handball clubs in Norway.

Participants: Thirty clubs are participating. From each club, one club leader, coaches from two to six youth teams (ages 13-17, both male and female), and players from the respective teams are participating.

Intervention: #Utviklingsklar is an interdisciplinary injury prevention program consisting of e-learning and a pre-season workshop, followed by a mid-season club meeting. Topics covered include youth player development, pain and injury management strategies, and injury prevention training. During the workshop, coaches develop a team-specific injury prevention plan, which they implement throughout the season. The control group continues with usual training and competition routines.

Main Outcome Measures: The primary outcome is the players' average weekly injury severity score. Secondary player outcomes include injury type, risk, burden, location, and duration until return to full sports participation. Secondary outcomes also include changes in coaches' determinants of injury-preventive behavior.

Results: Data collection is ongoing and is expected to conclude in April/May 2025.

Development of a Periodic Health Evaluation for Para athletes: A Delphi consensus study

Snyders, Carolette

Co-authors: Wayne Derman, Bryce Dyer, Hilde Moseby Berge, Kristina Fagher, Jan Lexell, Raul Smith Plaza, Marcelo Patricio, Ruan Mocke, Abdulla Alrahoomi, Martin Schwellnus

Institutions: Sport, Exercise Medicine and Lifestyle Institute, Faculty of Health Sciences, University of Pretoria, Pretoria, South Africa; [l]nstitute of Sport and Exercise Medicine, Department of Exercise, Sport and Lifestyle Medicine, Faculty of Medicine and Health Sciences, Stellenbosch University, Stellenbosch, South Africa; Department of Design & Engineering, Faculty of Science & Technology, Bournemouth University, Bournemouth, United Kingdom, Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway; Rehabilitation Medicine Research Group, Department of Health Sciences, Lund University, Lund, Sweden; Faculty of Medicine, Clínica Alemana, Universidad del Desarrollo, Chile; Operations General Coordination, Brazilian Doping Control Authority, Ministry of Sport, Brazil; Physical Rehabilitation Department, University of Namibia, Windhoek, Namibia; College of Medicine & Health Sciences, United Arab Emirates University, Al Ain, United Arab Emirates; IOC Research Centre of South Africa, South Africa

Abstract

Background: Para athletes have higher rates of illness and injuries compared to their non-disabled counterparts, and their health status might fluctuate due to underlying medical conditions, or the impairment itself. However, no standardized Periodic Health Evaluation (PHE) is available to assess the specific medical needs, or baseline health of Para athletes.

Objective: To develop a PHE through consensus, with specific parameters for Para athletes within three disability categories: vision, physical (neurological and musculoskeletal) and intellectual impairments.

Study Design: Delphi consensus study conducted in a systematic manner over multiple rounds of questionnaires.

Participants: 17 Global respondents (14 medical doctors, 3 physiotherapists) experienced in the Para athlete medical care, including 2 previous Paralympians.

Methods: Questionnaires were compiled on Qualtrics^{XM} (USA) and distributed to respondents via a link embedded in personally addressed emails. Reminder emails were circulated if needed. An approach of 'quasi-anonymity' was followed. Round 1 collected qualitative data on medical history, physical examination, special investigations, adaptive equipment and mental health topics deemed important for the inclusion in the PHE. Comments in round 1 were anonymously incorporated into questions for quantitative data collection in round 2. Round 2 also included questions for the current IOC PHE and literature on medical concerns in specific impairment categories. Each question was assessed on a 5-point Likert scale including a 'Do not feel qualified to answer' option. If a statement reached consensus (≥70% of respondents 'Agree' or 'Strongly Agree'), the question was removed from subsequent rounds to decrease workload. If respondents suggested changes to a question, or consensus was not reached, the statement was recirculated in subsequent rounds.

Main Outcome Measures: Questions reaching consensus were included in the proposed PHE.

Preliminary Results: Data collection in progress. Round 2 completed and included 238 statements reached consensus, 20 did not reach consensus and 48 changes were suggested.

Exploring female-specific factors in concussion prevention and management in rugby players

Soligon, Clara

Co-authors: Patricia Doyle-Baker, Chantel Debert, Carolyn Emery, Jon Patricios, Kathryn Schneider

Institution: Sport Injury Prevention Research Centre, University of Calgary; University of the Witwatersrand

Abstract

Background: Concussions are common in rugby, but recovery may differ by sex due to biopsychosocial factors. Some studies suggest females take longer to recover, though findings are inconclusive. Female-specific factors may influence outcomes, as concussions may disrupt the hypothalamic-pituitary axis. Understanding sex-specific factors is critical for improving prevention and management strategies.

Objective: Investigate clinical factors associated with time to return to contact (RTC) following concussion in professional rugby players, focusing on sex differences. Examine the association between concussion history and self-reported menstrual irregularities in female rugby players.

Design: 1) A two-year prospective cohort study evaluated male and female professional rugby players across four competitions. Baseline multisystem assessments and evaluations during the return-to-play (RTP) protocol were conducted. Risk factors included sex, demographic, concussion history, psychological/cognitive history, and clinical outcomes (symptom severity, balance, cervical spine, oculomotor, and cognitive testing). The main outcome was time to RTC (days from injury to medical clearance).
2) A cross-sectional study analyzed data from two multicenter cohort studies (ALL Rugby, SHRed), including adolescent, varsity, and professional female rugby players across countries.

Results: Preliminary results suggest that:

RTC did not differ by sex, however males over 25 and those with prior concussions had longer recovery times (Time Ratio (TR) = 1.042; 95% CI: 1.024–1.062, $p < 0.001$), while females with greater symptom severity (TR = 1.037, 95% CI: 1.007–1.067, $p = 0.015$), psychological history, and balance deficits had prolonged RTC.

Female players prior concussions had 1.58x greater odds of reporting irregular menses (95% CI: 1.02–2.44), increasing with two or more concussions (OR: 2.52, 95% CI: 1.27–4.86).

Conclusion: Female-specific factors may influence concussion recovery. Males and females show distinct RTC predictors, and concussion history may impact menstrual cycles. Further research is needed to understand underlying mechanisms to inform tailored concussion management strategies in female athletes.

A randomized controlled trial (RCT), adding inspiratory muscle training to standard treatment for exercise-induced laryngeal obstruction (EILO)

Solli, Petrine V

Co-authors: Praveen Muralitharen, Sivert H. Veseth, Haakon K. Kvidaland, Petter H. Carlsen, Merete S. Engeset, Ola D. Røksund, Thomas Halvorsen, Maria Vollsæter, Astrid Sandnes, Hege Clemm

Institutions: Department of Paediatrics, Haukeland University Hospital, Bergen, Norway; Department of health and social sciences, Western Norway University of Applied Science, Bergen Norway; National Institute of Health, Oslo, Norway; Oslo university hospital, Oslo Norway, [5]University of Bergen, Norway

Abstract

Background: EILO is paradoxical laryngeal adduction during physical activity. Treatment is based on limited evidence, but data suggest that different subtypes require tailored approaches. Our standard treatment for EILO is information, breathing advice, biofeedback (IBAB) followed by self-training. We aimed to test if adding inspiratory muscle training (IMT) yielded better results.

Method: This is a part of an RCT on treatment of EILO at Haukeland University Hospital, Bergen, Norway. The RCT consist of four different conservative treatment options for EILO. This abstract is exploring if adding IMT to IBAB improved outcome, assessed using maximum cardiopulmonary exercise tests with continuous visualization of the larynx (CLE), performed before vs. after treatment. Obstruction was graded at glottic and supraglottic levels according to a validated scale, from no (0) to full obstruction (3). IBAB was provided per in-house standards, followed by self-training. IMT was individually adapted by a physiotherapist, with follow-up via three video consultations over six-weeks.

Results: 152 participants were randomized, 76 receiving IBAB and 76 receiving IBAB+IMT; 138 successfully completed all CLE-tests. In both groups, CLE scores improved significantly after treatment, fully explained by better glottic scores at peak exercise. The two groups did not differ in treatment response, i.e., adding IMT with professional follow-up to IBAB with self-training provided no average benefit. However, findings varied, including seven patients where supraglottic scores worsened after IMT.

Conclusion: Both IBAB and IBAB + IMT were effective for EILO; however, adding IMT provided no clear benefit on the overall CLE-score. The varied response suggests that IMT may not be suitable for all EILO subtypes, highlighting the need for careful patient selection.

Exploring physical profiling and monitoring in elite women's cricket: a qualitative phenomenological study of clinician's and player's perspectives (in progress)

Kommentert [NS1]: Skal dette med?

Stanislas, Catherine

Co-authors: Angela George, Thamindu Wedatilake, Sean Williams, Keith Stokes, Carly McKay

Institutions: Centre for Health and Injury & Illness Prevention in Sport (CHi2PS), University of Bath, Bath, UK; UK Collaborating Centre for Injury and Illness in Sport (UKCCIIS), Edinburgh & Bath, UK; Science and Medicine, England and Wales Cricket Board, Loughborough, UK

Abstract

Background: Physical profiling and daily monitoring are widely used in elite cricket to evaluate athletes' capacities and readiness, respectively. Guidance, however, on implementation and communication, remains limited.

Objective: To investigate the implementation and utilisation of physical profiling and daily monitoring in elite women's cricket, and to explore the athletes' experience, with a focus on engagement and the impact of practitioner communication.

Study Design: A cross-sectional, qualitative, phenomenological design.

Methods: Twelve semi-structured interviews were conducted with professional players (mean age 22.5 ± 3.8 years). Focus groups with practitioners (strength and conditioning coaches, physiotherapists, and sports physicians) from Tier One county cricket teams are ongoing. An inductive thematic analysis will be employed to explore participants' experiences. Player interviews are supplemented with a questionnaire using Likert scales (1-5) to explore clarity of practitioner language and influence on self-perception.

Results (Athletes only): Preliminary analysis indicates that career progression shapes athletes' perceptions. Younger players often view profiling as stress-inducing, whereas senior athletes embrace it as a valuable developmental tool. Social pressures in competitive group settings heighten stress, while the general shift from ranking systems to individualised, position-specific feedback has been positively received. Engagement with daily monitoring is hindered by inconsistent enforcement, uncertain feedback processes, and overly data-driven approaches. Post-interview questionnaire findings demonstrate that clarity and self-perception ratings are closely aligned. Common, well-understood terms such as '*injury prevention*' and '*monitoring*' received high ratings for clarity and positive influence on self-perception, whereas ambiguous or technical terms like '*athletic profiling*' and '*injury risk profiling*' scored poorly on both.

Conclusion: Findings reveal the ongoing evolution of athletes' perceptions of profiling and monitoring processes. Career stage, competition pressures, and communication practices profoundly influence athlete engagement and experience. Improving consistency in enforcement, optimising feedback delivery, and refining practitioner language may foster greater athlete buy-in, alleviate stress, and ultimately improve data quality.

Influence of the Menstrual Cycle and Associated Symptoms on Neuromuscular Capacities in Female Athletes

Stitelmann, Anna

Co-authors: Anne-Violette Bruyneel, Carina Enea, Tscholl Philippe, Streuli Isabelle, Vincent Martin, Nathalie Boisseau

Institutions: Orthopedic and Sports Trauma Unit, Department of Orthopedic Surgery and Traumatology, Geneva University Hospitals, Geneva, Switzerland; Department of Physiotherapy, School of Health Sciences, HES-SO University of Applied Sciences and Arts Western Switzerland, Switzerland; MOVE Laboratory, Faculty of Sports Sciences, University of Poitiers, Poitiers, France; AME2P Laboratory, Clermont Auvergne University, Clermont-Ferrand, France

Abstract

Background: EILO is paradoxical laryngeal adduction during physical activity. Treatment is based on limited evidence, but data suggest that different subtypes require tailored approaches. Our standard treatment for EILO is information, breathing advice, biofeedback (IBAB) followed by self-training. We aimed to test if adding inspiratory muscle training (IMT) yielded better results.

Method: This is a part of an RCT on treatment of EILO at Haukeland University Hospital, Bergen, Norway. The RCT consist of four different conservative treatment options for EILO. This abstract is exploring if adding IMT to IBAB improved outcome, assessed using maximum cardiopulmonary exercise tests with continuous visualization of the larynx (CLE), performed before vs. after treatment. Obstruction was graded at glottic and supraglottic levels according to a validated scale, from no (0) to full obstruction (3). IBAB was provided per in-house standards, followed by self-training. IMT was individually adapted by a physiotherapist, with follow-up via three video consultations over six-weeks.

Results: 152 participants were randomized, 76 receiving IBAB and 76 receiving IBAB+IMT; 138 successfully completed all CLE-tests. In both groups, CLE scores improved significantly after treatment, fully explained by better glottic scores at peak exercise. The two groups did not differ in treatment response, i.e., adding IMT with professional follow-up to IBAB with self-training provided no average benefit. However, findings varied, including seven patients where supraglottic scores worsened after IMT.

Conclusion: Both IBAB and IBAB + IMT were effective for EILO; however, adding IMT provided no clear benefit on the overall CLE-score. The varied response suggests that IMT may not be suitable for all EILO subtypes, highlighting the need for careful patient selection.

Sedentary time and risk of obesity in adults: systematic review and meta-analysis of prospective studies

Tarp, Jakob

Co-authors: Miguel Adriano Sanchez-Lastra, Ulf Ekelund

Institution: Norwegian School of Sports Sciences

Abstract

Background: Sedentary time may increase the risk of obesity and weight gain but evidence from prospective studies have not been quantitatively summarized in a meta-analysis.

Objective: To determine the dose-response association between sedentary time and obesity and weight gain and identify moderating factors.

Design: Systematic review and meta-analysis of prospective studies with at least two years of follow-up and sedentary time measured prior to assessment of the outcome (temporality).

Participants: Adults aged 18-65 years from the general population.

Assessment of Risk factor(s): All forms of sedentary time or sitting, such as, total sedentary time, leisure sedentary time, leisure-sitting, occupational sitting, total sitting, and TV-viewing.

Main Outcome: Incident obesity (body mass index ≥30 kg/m^2). Secondary outcomes include any measurement of weight change, weight maintenance, adiposity, or body composition.

Results: A total of 29,925 records were identified from 3 electronic databases. Title/abstract screening was done using AI-assisted software (ASReview), with 7014 records (23%) screened by one or two humans and 22,911 records (77%) excluded by software. A total of 566 articles on sedentary time or physical activity were evaluated in full-text screening, leading to inclusion of ≈ 40 unique papers on sedentary time and obesity or weight gain. Data extraction and meta-analysis of results will be performed in April and May and presented as work in progress at the conference.

Conclusion: The results of this systematic review and meta-analysis have the potential to provide the first-ever quantitative recommendations on amount of sedentary time to prevent obesity and weight gain in adults.

Secular trends in adherence to physical activity guidelines among Norwegian adults

Teinung, Elisabeth

Co-authors: Jostein Steene-Johannessen, Bjørge Herman Hansen, Elin Kolle, Knut Eirik Dalene, Ulf Ekelund, Sigmund Alfred Anderssen

Institutions: Oslo Center for Physical Activity and Population Health, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway; Norwegian Institute of Public Health; University of Agder

Abstract

Background: The World Health Organization (WHO) has set a global goal to reduce inactivity by 15 % by 2030, defining inactivity as not meeting the 2020 WHO physical activity (PA) guidelines. We have the unique opportunity to evaluate trends in adherence to PA guidelines using data from The Norwegian National Physical Activity Survey (NNPAS) samples.

Objective: To investigate secular trends in adherence to PA guidelines among Norwegian adults.

Study Design: Repeated cross-sectional design

Methods: Three nationally representative samples of adults aged 18-97 were surveyed in 2008-09, 2014-15 and 2020-22 (NNPAS 1-3). Participants were drawn from the National Population Register. A total of 14,906 agreed to participate (37 % of the invited), and PA was assessed using ActiGraph accelerometers (GT1M, GT3X+ and GT3X+ BT). Data were analysed according to the 2020 WHO PA guidelines.

Results: Of the participants, 13,511 (55.4% women) provided ≥2 valid days of accelerometer data and anthropometrics. The prevalence of adults meeting the PA guidelines increased significantly from 2008 to 2022, from 68% in NNPAS 1 to 72% and 74% in NNPAS 2 and 3, respectively ($p < .002$). Fewer women than men met the PA guidelines at all three time points ($p<0.013$), but the increase in PA guideline adherence from NPASS 1 to NPASS 3 was greater in women than men (8.4 vs 3.1 percentage points, $p<0.05$).

Conclusions: Between 2008 and 2022, the prevalence of adherence to PA guidelines increased significantly by eight and three percentage points among Norwegian women and men respectively, indicating a positive trend. These findings should be interpreted with caution due to potential healthy volunteer selection bias prevalent in such studies.

Groin injuries in women's football

Thorarinsdottir, Solveig

Co-authors: Roar Amundsen, Roald Bahr, Thor Einar Andersen, Lena Kristin Bache-Mathiesen, Arne Larmo, Roar Pedersen, Stian Isaksen Johansen, Tobias Ruud Askim Elvestad, Merete Møller

Institution: Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway

Abstract

*Objective***:** To describe the prevalence, incidence and burden of all health problems in women's football, with special focus on groin injuries and their clinical and imaging characteristics. Additionally, to compare the effectiveness of high- and low-volume Adductor Strengthening Program protocols in increasing hip adductor strength in females.

Methods: We conducted a two-season prospective cohort study in the Norwegian women's premier league. Players (n=294; 22±4 years) reported all health problems weekly, using the Oslo Sports Trauma Research Centre Questionnaire on Health Problems (OSTRC-H2). We calculated their average weekly prevalence, incidence and burden. Team physiotherapists classified all groin injuries reported using the Doha classification system and referred groin injuries fulfilling certain criteria to magnetic resonance imaging (MRI). In a randomized trial, 52 female players performed either a high- or low-volume 8-week protocol of the Adductor Strengthening Progrramme. Hip adductor torque was measured at 0° and 15° hip abduction using the ForceFrame.

*Results***:** Response rate to the OSTRC-H2 was 79%. The average weekly prevalence for all health problems was 32% (95% CI: 31% to 33%), 22% (95% CI: 22- 23) for substantial health problems and 3.9% (95% CI: 3.4–4.4%) for groin injuries. Groin injury incidence was 1.6/1000h and their burden 11days lost/1000h. The physiotherapists examined 67 of 124 player-reported groin injuries, with adductor-related injury being most common (55%). Of the 42 injuries with MRI, 32 (76%) showed nonacute findings. We found no between-group difference in hip adductor strength over the 8-week training period (0°: -0.01 [95% CI: -0.11-0.01] Nm/kg; 15°: 0.10 [95% CI: -0.09-0.29] Nm/kg).

Conclusions: One in five players had a health problem negatively affecting their training volume or performance. Groin injuries had a high incidence and burden, with adductor-related injuries being most common. The 8-week high-volume protocol was not more effective in increasing hip adductor strength in female players.

Return to Sport and to Work after Mulitligament Knee Injury.

Trøan, Ingrid

Co-authors: Gilbert Moatshe, Tone Bere, Inger Holm, Lars Engebretsen

Institutions: Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway; Oslo University Hospital, Department of Orthopedics, Oslo, Norway

Abstract

*Background***:** Multiligament knee injuries (MLKIs) are complex and often associated with significant functional impairments. Data on return to sport (RTS) and return to work (RTW) remain limited, particularly for recreational athletes and the general population.

Purpose: To evaluate RTS, RTW, and physical activity levels after surgical treatment of MLKIs.

Study Design: Cross-sectional cohort study; Level of evidence IV.

Methods: Patients surgically treated for MLKI at a single Level 1 Trauma center from 2013 to 2020 were included. Patient-reported outcomes included the Tegner score and work status before and after injury. Physical activity was assessed using the activity questionnaire from the Nord-Trøndelag Health Study (HUNT 1). Health-related quality of life was measured with EQ-5D.

*Results***:** Of 191 eligible patients, 124 (65%) participated (mean age 37 ± 13.7 years, range 17–70). RTS: 77% (n=84) returned to some level of sport, 37% (n=31) returned to their pre-injury sport at any level, and only seven of 28 (25%) resumed high-level pivoting sports. The mean Tegner score declined from 5.2 to 3 ($p < 0.001$). RTW: 90% (n=112) returned to work, but 15% required task modifications or became disabled. Work participation significantly declined (2.1 to 1.9, $p < 0.04$). Patients with single cruciate injuries had better outcomes, including higher Tegner (3.6 vs. 3, $p = 0.043$) and EQ-5D scores (0.931 vs. 0.893, $p = 0.012$) than those with bicruciate injuries.

*Conclusion***:** A significant number of patients with a MLKI were unable to return to their former sports activities, with only 37% returning to the same level as before the injury. Although most patients were able to return to their pre-injury work levels, 15% had to adapt to less demanding tasks or became disabled due to the injury. Despite significant reductions in activity levels, most patients reported good health-related quality of life.

The other side of the ACL injury story: a nationwide, prospective cohort of non-operated patients and their outcomes

Tveiten, Caroline Kooy

Co-authors: Rune Bruhn Jakobsen, Anne Marie Fenstad, Andreas Persson, Lars Engebretsen, Håvard Moksnes, Guri Ranum Ekås.

Institutions: Oslo Sports Trauma Research Center, Department of Sports Medicine, Norwegian School of Sport Sciences, Oslo, Norway; Department of Orthopedic Surgery, Akershus University Hospital, Oslo, Norway; Department of Arthroscopy and Sports medicine, Oslo University Hospital Aker, Oslo, Norway; Faculty of Medicine, University of Oslo, Oslo, Norway; Norwegian Knee Ligament Register, Department of Orthopaedic Surgery, Haukeland University Hospital, Bergen

Abstract

Objectives: To describe the nationwide population of anterior cruciate ligament (ACL) injured patients initially managed non-surgically, quantify the proportion undergoing delayed ACL reconstruction (ACLR) and describe both surgical findings and patient-reported outcomes.

Methods: Primary ACL injuries treated non-surgically were prospectively registered in the Norwegian Knee Ligament Register (2017-2023). We collected baseline characteristics, injury details, surgical details if delayed ACLR was performed, and patient-reported outcomes (Knee injury and Osteoarthritis Outcome Score, KOOS). Treatment survival was analyzed with Kaplan-Meier curves, and factors associated with ACLR with cox regression.

Results: Of 485 patients included (mean age (SD) 35 (12), 25% < 25 year), 93% (n=452) were physically active in sports pre-injury. At two years, 63% remained non-surgically treated. Of the delayed ACLR patients (n=178), 56% underwent a concurrent meniscal repair, and instability was the main reason for ACLR (85%). Younger patients, those active in pivoting sports preinjury, and those with meniscal injuries at baseline, were more likely to undergo delayed ACLR (HR 1.95, 1.54, and 1.63, respectively). There were no statistically significant differences in KOOS scores between the non-surgical and ACLR patients at two- and five-year follow-up.

Conclusion: ACL injured patients treated non-surgically span all age groups and represent the active population. Two-thirds remain non-surgically treated at two years. Younger patients, those engaged in pivoting sports pre-injury, and those with baseline meniscal injuries had statistically significant higher risks of undergoing ACLR than their reference groups. KOOS scores were similar between non-surgical and delayed ACLR patients.

Beyond borders: unveiling and monitoring the mental health of elite athletes

Van der Hoven, Helene

Co-authors: Maaike Eken, Phoebe Runciman, Kristina Fagher, Wayne Derman, Soraya Seedat, Marelise Badenhorst, DW James Burger

Institutions: Institute of Sport and Exercise Medicine, Department of Exercise, Sport and Lifestyle Medicine, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa; South Africa IOC Research Centre; Rehabilitation Medicine Research Group, Lund University, Sweden; Department of Psychiatry, Stellenbosch University, Stellenbosch, South Africa; Sports Performance Research Institute New Zealand (SPRINZ), Auckland University of Technology, Auckland, New Zealand; Division of Neuropsychiatry, Department of Psychiatry and Mental Health, University of Cape Town

Abstract

Background: World-wide, there is a growing recognition of the importance of athlete mental health, including for athletes with disabilities. However, comprehensive data on the mental health symptoms and disorders in athletes, as well as how these may change over the course of an athletic year, remain limited. Furthermore, optimal mental health assessment in athletes, the psychometric properties of sport-specific mental health assessment tools like the Sports Mental Health Assessment tool 1 (SMHAT-1) and importantly athletes' perspectives on their own mental health and preferred interventions remain under investigated.

Objective: To 1) systematically review existing literature mental health assessment and monitoring tools and their measurement properties used in athletes, 2) longitudinally monitor mental health symptoms in athletes over a period of one year, 3 & 4) investigate test-retest the reliability and validity of the (SMHAT-1) to assess mental health symptoms in athletes, and 5) explore the mental health views and mental health interventional needs of athletes.

Methods: A series of five studies including 1) a systematic review (PROSPERO registration number CRD42023468178) using COSMIN-PRISMA guidelines to assess mental health assessment tools used in athletes, 2 & 3) a 12-month international cohort study tracking mental health in athletes with and without disability using online surveys every four months, assessing risk factors and SMHAT-1 reliability, 4) a cross-sectional study evaluating SMHAT-1's criterion validity by comparing it to the M.I.N.I. assessment, 5) a qualitative study using interviews and thematic analysis to explore athletes' mental health perspectives and intervention needs.

Conclusion: This research is urgently needed to enhance understanding of the mental health landscape in sports by providing both cross-sectional and longitudinal data. Using mixed methods the findings could help refine the sport-specific mental health assessment toolkit and in particular guide sustainable recommendations towards optimal assessment, early intervention, and protection of athlete mental health globally.

The Ecology of Injury Prevention and Management in Youth Sport

Venzel, Nicklas Stott

Co-authors: Merete Møller, Kristoffer Henriksen & Louise Kamuk Storm

Institution: Research unit of Psychology of Sport, Excellence and Health, Department of Sports Science and Clinical Biomechanics, University of Southern Denmark

Abstract

*Background***:** Adolescents commonly sustain injuries while engaging in sports, whereas most injuries occur during activities linked to the local club. Despite effective prevention strategies being available, these are rarely implemented in practice. As the injury process, from prevention to return-to-sport, is influenced by factors in the surroundings of the athlete (e.g., coaches' knowledge, the culture, facilities), this highlights the important role of the local club environment. However, our understanding of the key characteristics of how youth sport environments prevent, and handle injuries remains limited. To explore these characteristics of youth sport environments, this Ph.D. project adopts a holistic ecological approach to focus on the broader developmental context (i.e. the environment), in which the athlete is embedded.

*Objective***:** To explore what characterizes prevention and management of injuries in Danish youth sport environments.

*Study Design***:** Multiple case studies.

*Methods***:** Four Danish youth sport clubs - two football clubs and two handball clubs - will be selected as cases for this study. Selection criteria include that the club must have teams across all age groups in youth (e.g., U13-U19 in football) and the presence of both boys' and girls' teams. The study will focus on athletes aged 12-19 years old. Each case study will be based on three to four weeks of fieldwork consisting of interviews with key persons, observations of relevant activities, and analysis of documents related to the club and sport. The units of analysis will encompass interaction between key people in the environment, structural aspects at the micro-, meso-, exo-, and macro system and the cultural norms and values of the environment. A cross-case analysis will be conducted to identify common patterns, similarities and differences. The first case study is scheduled to begin in the spring 2025.

Lowering the maximum legal tackle height in Scottish community women's rugby: an injury surveillance and video analysis study across two seasons

Walton, Hannah

Co-authors: Hamish Gornall, Isla Shill, Anthony P Turner, Neil Graham, Lara Paul, Sharif Hendricks, Ross Tucker, Debbie Palmer

Institutions: Edinburgh Sports Medicine Research Network, Institute for Sport, PE and Health Sciences, University of Edinburgh, Edinburgh, United Kingdom; UK Collaborating Centre on Injury and Illness Prevention in Sport, University of Edinburgh, United Kingdom; Sport Injury Prevention Research Centre, Faculty of Kinesiology, University of Calgary, Canada; Scottish Rugby Union; Division of Physiological Sciences, Department of Human Biology, Faculty of Health Sciences, University of Cape Town, South Africa; Carnegie Applied Rugby Research (CARR) Centre, Carnegie School of Sport, Leeds Beckett University, UK; World Rugby Limited, Dublin, Ireland; Institute of Sport and Exercise Medicine, Department of Exercise, Sport and Lifestyle Medicine, Faculty of Medicine and Health Sciences, Stellenbosch University, Stellenbosch, South Africa

Abstract

*Background***:** The most concussive match event in rugby union is the tackle. Lowered maximum tackle height (LTH) law variations have been introduced in men's rugby to reduce this.

*Objective***:** Assess the effect of an LTH law variation, from the line of the shoulder to the base of the sternum, on 1) Player head-contact and head-proximity events (location on opposition body closest to the head (~30 cm)), 2) Concussion incidence, in Scottish community women's rugby.

*Design***:** Retrospective video analysis, with prospective injury surveillance.

*Participants***:** Two Scottish community women's rugby cohorts were used. Forty percent of teams, in each cohort, were Premiership standard, there were 2117 and 1915 match exposure hours in the pre-law and law variation trial seasons respectively.

*Outcome Variables***:** Video outcome measures were tackler and ball-carrier head-contact and head-proximity (/100 tackle actions), injury outcomes were >24 time-loss injury and concussion rates (/1000 payer match hours). Rate ratios with 95% CI were used to compare seasons.

*Results***:** Head-to-head and head-to-shoulder proximity to the tackler [head: RR:0.71 (95%CI 0.62-0.82), shoulder: RR:0.73 (95%CI 0.65-0.83)] and ball-carrier [head: RR:0.67 (95%CI 0.58-0.77), shoulder: RR:0.68 (95%CI 0.58-0.79)] reduced with the LTH. The rate of head-contact to the opponent's shoulder decreased for the tackler [RR:0.65 (95%CI 0.46-0.91)] and the ball-carrier [RR: 0.52 (95%CI 0.35-0.78)]. Tackler body position was lower [upright tackle: RR: 0.79 (95%CI 0.75-0.83), bent-at-waist tackle: RR:1.34 (95%CI 1.25-1.42)], resulting in fewer higher risk contacts [RR:0.81 (95%CI 0.76-0.85)]. There were no significant differences in match injury or concussion rates for the tackler or ball-carriers between the two seasons.

*Conclusion***:** The rate of head-to-head proximity and head-to-shoulder contact for the tackler and ball-carrier reduced with the LTH. This, in turn, reduced higher risk contacts (above the sternum). Future research should be undertaken to further assess the effects of injury prevention initiatives in community women's rugby union.

Epidemiology of injuries in academy and professional male cricketers and long-term health of former professional cricket players: A systematic review and meta-analysis

Williams Amy

Co-authors: Alex Mosey, Katie Stanislas, Nick Peirce, Keith Stokes, Carly McKay, Sean Williams

Institutions: Centre for Health and Injury & Illness Prevention in Sport (CHi2PS), University of Bath, Bath, UK; UK Collaborating Centre for Injury and Illness in Sport (UKCCIIS), Edinburgh & Bath, UK; Science and Medicine, England and Wales Cricket Board, Loughborough, UK

Abstract

Background: In 2016, an updated consensus statement for methods of injury surveillance in cricket was published, but no systematic review of studies implementing the updated definitions has been undertaken. There is also a growing interest in the long-term health outcomes of retired players.

Objectives: To synthesise injury epidemiology data in academy and professional male cricket and assess health outcomes in former professional male cricket players.

Design: Systematic review and meta-analysis.

Patients (or Participants): Current and former, academy and professional male cricket players.

Methods: Electronic databases were searched using the keywords 'cricket*' and 'injur*' or 'retire*'. Injury incidence and prevalence rate data were modelled using a mixed-effects Poisson regression model. Descriptive analysis was performed for the studies not included in a meta-analysis.

Results: Thirty-two studies were included: 28 on injury epidemiology and four on health outcomes in former cricketers. The overall match time-loss (TL) incidence rate was 167.8 (95% confidence interval [CI] 136.1-203.9) and 139.7 (95% CI 91.4-213.4) per 1,000 days of play for the match TL and general TL injury definitions, respectively. Shorter formats presented a higher risk of injury than multi-day cricket ($p < 0.001$). Mean match injury prevalence was 10.1% (95% CI 9.3-10.9%). The overall seasonal injury incidence was 59.1 (95% CI 56.6-61.7), 43.2 (95% CI 28.8-64.7) and 232.8 (95% CI 137.2-395.1) per 100 players per year for the match TL, general TL and medical attention injury definitions, respectively. Fast bowlers had the highest injury incidence and prevalence. The hand, lumbar spine, and thigh were the most common injury locations. Studies on retired players were limited and heterogeneous, precluding clear conclusions.

Conclusion: Shorter formats present a higher risk of injury than multi-day cricket. Prevention efforts should target fast bowlers and common injury sites (lumbar spine, thigh, hand). More high-quality research is needed to understand retired cricketers' long-term health.