

## ORAL PRESENTATIONS

1

System wide approach to Hay Fever identification and management in elite athletes

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Hay fever is a prevalent disorder in athletic populations and is present in approximately 50% of elite endurance athletes. Symptoms can impact breathing, sleep quality and recovery. 80% of athletes with hay fever report an impact on their sport performance, with 12.5% of athletes not able to exercise at all when symptomatic. Under-recognition and treatment in an athlete population is common, with 54% of athletes fearing medication side effects and 21% concerned about anti-doping rule violations. We developed a systemic approach, initiated in Spring 2023, towards supporting UK athletes preparing for the 2024 Olympic and Paralympic Games. The initiative involved accurately identifying athletes with symptoms suggestive of hay fever via the AAA and AQUA self-reported scoring questionnaires, with subsequent allergen testing if indicated. We supported clinicians with an expert led and evidence based best practice management guideline, including criteria for onward referral for Immunotherapy, and predictive pollen mapping for the UK and France across the Games periods. Alongside this, both an athlete facing promotional campaign and clinician targeted learning and development material were developed and delivered. Subsequently there was a 65% increase in the year-on-year number of new diagnoses of Hay Fever recorded on the UKSI electronic medical records system (PDMS) between 2022 (25) and 2023 (73), suggesting considerably raised awareness and proactive management.

The priority should always be the safety and health of the athlete” – A current practices and needs assessment survey of competitive snow sports stakeholders related to injury and illness prevention

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Despite the International Ski and Snowboard Federation (FIS) efforts to decrease injury risks in competitive snow sports, injury rates and severity are still high. Therefore, to improve athletes' health protection, this study explored and described stakeholders' practices, beliefs, and needs related to injury and illness prevention in competitive snow sports. We conducted an exploratory cross-sectional study with an online survey on athletes, coaches, team staff, ski racing suppliers and FIS representatives from FIS competitive snow sports and all competition levels. Of the 436 responses from stakeholders across 23 nations, they believed that injury and illness prevention is important in their context, as they perform prevention “everywhere” to avoid injuries and minimise their time out of the snow. Participants highlighted knee, head and face injuries and concussion as their main concerns but also as their primary targets to improve their knowledge of prevention. While their targets mainly focused on respiratory and cardiovascular illnesses, they expected to have more information on respiratory, cardiovascular, endocrinological, and thermoregulatory illnesses. Despite differences across snow sports, roles and competition levels, they emphasised their practices and needs on, athlete-, equipment-, snow/environment-, and course-related areas. Moreover, respondents highlighted mental health and training as their top priority on needs. Their preferred communication channels were diverse in formats, ranging from websites and podcasts to e-books, webinars, and social media. Our study provided insight into the current practices, beliefs, and needs of competitive snow sports stakeholders and information and methods on injury and illness prevention within their contexts. This survey substantiated that stakeholders' perceptions differ between snow sports, roles, and competition levels, eventually becoming a pivotal move towards the development and further effective implementation of any tailored and context-driven preventive measure. Identifying stakeholders' communication preferences may assist in disseminating knowledge to effectively safeguard athletes' health and safety in competitive snow sports.

## Unveiling Injury Patterns in Sixes Lacrosse: Insights from the British National Men's Sixes Lacrosse Team

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World Lacrosse Sixes (sixes) is a variant of lacrosse set to debut in the 2028 Summer Olympics, yet there remains a paucity of injury surveillance data concerning sixes. Players often engage in multiple lacrosse formats, including sixes, field, and box lacrosse, which may add further injury risk and exposure. This study aimed to assess the incidence, severity, nature, and causes of injuries sustained by the British national men's sixes lacrosse team over a three-year period. Injury data for all players (n=45) featured in the national squad within this timeframe were collected, regardless of the need for medical attention or time loss, and analysed using international consensus statement methods. A total of 156 injuries were reported. Training injury incidence was 21.8/1000 player-hours in the 2021/22 training years and increased to 71.7/1000 player-hours in the 2023/24 training years. The highest tournament injury incidence recorded 285.9/1000 player-hours. The majority of time-loss injuries occurred during the 2023/24 training years (23.9/1000 player-hours), with the highest time-loss incidence from a tournament being 45.6/1000 player-hours. Sixes, compared to other forms of lacrosse, constituted 61% (n=95/156) of all injury complaints. Field lacrosse caused the highest proportion of time-loss injuries (41%, n=13/32), with the most common severity leading to 8-28 days of time-loss (39%, n=5/13). Lower leg muscle injuries were most frequent (10%, 16/156), followed by tendinopathy (6%, 10/156), knee tendinopathy (6%, 10/156), thigh muscle injury (6%, 10/156), and ankle sprain (5%, 8/156). These findings underscore the diverse range of injuries experienced by lacrosse athletes across various playing contexts, emphasizing the need for tailored injury prevention strategies to enhance player safety. This study highlights the urgency of comprehensive injury surveillance in international lacrosse squads, particularly for athletes playing multiple formats of lacrosse, to inform risk mitigation strategies in the interest of athlete health.

## Keep your head up and stick down: Video-analysis of in-game head contacts and suspected-concussions in male and female Canadian youth Box lacrosse

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Lacrosse (Canada's National summer-sport) hosts >80,000 registrants annually. Despite this, concussion prevention efforts are lacking, and female players are underrepresented. Moreover, examining in-game head contacts (HCs) and video-suspected concussions in youth lacrosse gameplay is important to inform future prevention avenues. Therefore, our objective was to examine HC and video-suspected concussion incidence rates (IRs) in elite division-A Box lacrosse tournament play across male age-groups (ages 9-16) and between male and female leagues (ages 13-14). Our cross-sectional video-analysis study included video-footage of elite tournament games (n=30 games, 6 per group) within male U11 (ages 9-10), U13 (ages 11-12), U15 (ages 13-14), U17 (ages 15-16), and female U15 (ages 13-14) Box lacrosse levels. Videos were analyzed for HCs and video-suspected concussions using previously validated criteria and Dartfish video-analysis software. Poisson regression analyses (adjusted for cluster by game and offset by playing time) were used to compare the IRs (per 100 game-minutes) using incidence rate ratios (IRR) for HCs and video-suspected concussions. The results showed that when comparing the HC IRs with U13 (reference; IR=26.72 HCs/100 game-minutes), U11 had a 3.81-fold higher IR (IRR=3.81; 95%CI:2.38-6.11) and U17 a 3.40-fold higher IR (IRR=3.40; 95%CI:2.21-5.23), but U15 did not differ (IRR=0.95; 95%CI:0.53-1.71). The IR of HCs in male U15 (IR=25.38 HCs/100 game-minutes) was 5.10-fold higher than female U15 (IR=4.98 HCs/100 game-minutes) (IRR=5.10; 95%CI:2.62-9.93). Five video-suspected concussions were identified (male: nU11=2, nU15=1; female: nU15=2) resulting in the highest IR for male U11 (IR=1.04 concussions/100 game-minutes), followed by U15 female (IR=0.77 concussions/100 game-minutes) and U15 male (IR=0.40 concussions/100 game-minutes). In summary, the high IR of HCs are concerning, especially in male U11 and U17 levels. Video-suspected concussions are also highest in the U11 (youngest) male age group which supports a need for further exploration of HC and concussion prevention strategies to improve player safety.

## Comparing injury incidence and risk across hockey5s, indoor hockey and field hockey using video analysis

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Field Hockey is played in three formats: outdoor (11 players), indoor (six players) and the new hockey5s. The first Hockey 5s World Cup occurred in January 2024. No published research investigated injuries in hockey5s and there is limited research in indoor. This retrospective video analysis study compared the injury incidence and match events between formats. Publicly available, adult international hockey match footage was randomly selected and coded for injuries and match events. Four games per format were coded (two male, two female). Across 12 matches there were 16 injuries: 7 in outdoor hockey, 4 in indoor and 5 in hockey5s. The most common injury was a contusion ( $n=11$ , 69%). The most common injury site was the trunk at ( $n=4$ , 25%) and the most common inciting event for injuries was shots ( $n=5$ , 31%) with 44% of injuries a result from ball contact. There were no significant differences in the pooled injury rates between formats, however the pooled rate was higher for hockey5s compared to outdoor hockey [Incidence Rate Ratio (IRR) 1.56 (95% CI: 0.39-5.70)] and indoor hockey [(IRR: 1.82 (95% CI: 0.39-9.16)]. Considering playing situations, the number of shots per 100 minutes was highest in hockey5s; (Male: 252, Female: 157), followed by indoor hockey (Male: 76, Female: 44), and outdoor hockey (Male: 23, Female: 33). Although not significant, indoor hockey had more injuries from shots per 100 shots than hockey5s for both males [(IRR: 2.07 (95% CI: 0.15-28.5)] and males and females pooled [(IRR: 2.29 (95% CI: 0.17-31.62)]. Given the high shot rate and the rapidly evolving format of Hockey5s, combined with ongoing public discussions around the concept of danger in the sport, further research is needed to expand on the exploration of the injury incidence of Hockey5s compared to the other formats.

## Attitudes and Behaviours Towards Injury Prevention Strategies Among Youth Female Rugby Players in England

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Rugby Union (rugby) is a contact sport, which consequently has a high risk of injury and concussion. Rugby utilises various injury prevention strategies; however, current research is limited regarding youth female rugby players' attitudes and behaviours towards those injury prevention strategies. To investigate the attitudes and behaviours of youth female rugby players in England towards injury prevention strategies. Cross-sectional online survey. Two hundred and thirty female rugby players (ages 14-19) participating in school/college (n = 71), community club (n = 222), developmental player pathway (n = 180) or centre of excellence (n = 19) programmes. Main outcome measures: attitudes and intended behaviours towards injury prevention (both 7-point Likert-scale question; 1: not serious – 7: very serious). Independent variables included age, playing experience and player position. Of those surveyed (n = 230), 78% of players 'agreed' (n = 128; 55%) or 'strongly agreed' (n = 53; 23%) that some rugby injuries are preventable. Two hundred and fourteen players (92%) reported training strategies (e.g. warm-up and tackle training) as the most effective way to prevent rugby injuries. Likewise, 108 players, (47%) reported training strategies as the most effective way to prevent rugby concussions. Eighty percent (n= 184) 'agreed' or 'strongly agreed' that regular tackle training could prevent injuries. When asked how often tackling is practiced outside of matches, 50% (n = 114) stated 'weekly'. Seventy-one percent (n = 163) 'agreed' or 'slightly agreed' that a neuromuscular training warm-up could prevent rugby injuries and 68% (n=157) 'agreed' or 'strongly agreed' to wanting their team to complete a rugby-specific warm-up programme before every rugby session. Players consider training strategies (e.g. warm-ups and tackle training) to be the most effective prevention strategies. In turn, developing an understanding of players' attitudes and behaviours towards injury prevention strategies may aid with the implementation of injury prevention strategies.

## Preliminary Effectiveness of COACH, an Evidence-based Intervention for Improved Head Impact Safety in Youth Football Developed Using a Community-Engaged Approach

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The study aimed to develop and evaluate an evidence-based intervention and implementation plan to reduce head acceleration events (HAEs) during youth football practices, using a community-engaged approach. A community stakeholder team (n=12) participated in monthly meetings (n=5) to co-design the intervention, COACH (COMMUNITIES Aligned to reduce Concussion and Head impact exposure) and implementation plan. COACH sought to: (1) improve knowledge and skills of youth football coaches in effective practice planning and use of safe drills, and (2) change attitudes and beliefs toward contact in practice. The implementation plan includes use of practice plans, a booklet aligned with state guidelines for contact in practice, a pre-season coaches' clinic, and peer mentorship during season. One 12U ( $\leq$  age 12) and two 13U ( $\leq$  age 13) level football teams were in the control arm. Two teams (12U, 13U) pilot tested the intervention. Athletes on each team were instrumented with mouthpieces measuring HAEs to evaluate effectiveness of COACH. HAEs were collected from n=35 control athletes and n=25 intervention athletes. When the teams followed COACH, coaches spent less time on "live" (i.e., full speed) drills (12U: 14.1 [5.1, 23.8]; 13U 28.9 [18.6, 39.1] minutes) and athletes averaged 0.6-3.0 HAEs per player per practice. Control teams averaged 50.3 [45.1, 55.5] minutes spent on live drills, resulting in 5.2 [4.8, 5.6] HAEs per athlete per practice. The 12U head coach left the organization after five weeks and the team stopped following COACH; time spent on live drills (60 [48.3, 71.6] minutes) and the number of HAEs per player per practice (4.4 [3.7, 5.2]) increased. This team had four concussions (2 prior to, 2 after stopping COACH). Preliminary data suggests COACH was effective at reducing HAEs. Organizational capacity influenced implementation outcomes. Future work will include a large-scale pragmatic trial to fully assess the effectiveness and implementation success of COACH.

The impact of relative age effects and biological maturity on professional football academies in Scotland.

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This study investigated to what extent the influence of relative age effects (RAEs) and biological maturity status had on selection biases and talent development pathways within professional football academies in Scotland. Furthermore, the process of maturation has been associated with increased risk factor, with both maturity status (pre-, circa-, post-peak height velocity [PHV]) and timing (early, late, on-time) associated with injury risk. The regular monitoring of maturity in this setting is therefore required to help reduce selection bias, maximise potential talent available and help improve and facilitate the design of maturity matched programmes to mitigate growth related injuries in youth football. The players assessed were from professional football clubs within Club Academy Scotland (CAS) (n=1010). A relative age effect existed in age groups from U10 to U18 apart from the U15 age group. Whereas maturity biases emerged from the U13 age group, increasing in magnitude with successive age groups. A total of 40% of players were early maturing, 45% were on-time and 14% were late maturing. We therefore encourage professional football clubs to critically reflect on their talent identification processes as the current systems discourage the chances of later developing players to be recruited or retained within academies.



## Scottish women's rugby – Current injury trends and prevention research

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Women's rugby is one of the fastest growing sports globally; with 24% of the worldwide playing population female and an annual growth of 28%. This growth however is not supported by current research, with female rugby underrepresented in the literature. Research into a cohort of Scottish amateur female rugby players was conducted using online and paper exposure and injury report forms over 2 seasons (2022/23 and 2023/24). The aim, to understand current injury trends in amateur female rugby players in Scotland. In keeping with previous literature, injury incidence in matches is higher than training. Incidence rates were similar from 2022/23 to 2023/24 in both training and matches (2022/23: 0.36/1000 player training hours, 95% CI 0.1 to 0.92, 13.61/1000 player match hours, 95% CI 9.43 to 19.03; 2023/24: 0.22/1000 player training hours, 95% CI 0.03 to 0.80, 20.86/1000 player match hours, 95% CI 14.94 to 28.44), as was median match severity (2022/23: 22 days lost, 2023/24: 22.5). Resulting in a match burden of 585.08 days lost/1000 player match hours (2022/23) and 972.49 days lost/1000 player match hours (2023/24). Across both seasons, in matches, the head was the most commonly injury site, ligament tears/sprains in 2022/23 and fractures in 2023/24 were the most common injury type and concussion was the most common injury diagnosis across both seasons. The future of this research will be pivotal for amateur women's rugby in Scotland. So far, an understanding of the current injury trends in amateur Scottish rugby have been seen. Future research aims to assess the efficacy of the Activate programme in the female setting and to collect and analyse feedback from both coaches and players on the programme itself, giving a clear evaluation of the intervention.

Making the Game Safer – Scottish community rugby tackle height law change video analysis study.

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Amateur rugby union produces the highest rate of sport related concussions when compared to other contact sports such as American football and ice hockey. Attempts to reduce this have included neuromuscular training programs, equipment mandates and education programs aimed at improving coaching and tackle techniques. While these interventions have displayed positive effects, the quantity of tackle related injuries remains elevated. To address this, World Rugby recommended a major law change reducing the height of the tackle to below the sternum for the 2023/24 community rugby season. To understand the impact of the law change, World Rugby launched a global tackle height video analysis study. Within the Scottish Rugby Union we will analyse 40,000+ tackles across male, female, and youth rugby cohorts assessing key variables such as tackle type, direction of contact, tackle height, head contact, and head proximity as well as game metrics, establishing the wider impact the rule change may have had on game play. The early indicators from a 5,000-tackle sample size within the men's premiership in Scotland demonstrate a positive shift in player behaviour regarding tackle characteristics and playing styles. The overall aim of the study is to provide key insights into the impact the law change has had on rugby within Scotland and on a global scale, with the intention of improving player safety and welfare.

## POSTER PRESENTATIONS

1

The Epidemiology of Musculoskeletal Injury in Professional and Amateur Golfers: A Systematic Review and Meta-analysis

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To determine the prevalence and incidence of musculoskeletal injury in amateur and professional golfers, and to identify common injury sites and factors associated with increased injury frequency. Systematic Epidemiological Review & Meta-analysis. Data Sources: PubMed (Medline), Embase, the Cochrane Library and SPORTDiscus were searched in September 2023. Eligibility Criteria: Studies published in the English language reporting the incidence or prevalence of musculoskeletal injuries in golfers at all anatomical sites. 20 studies (9221 golfers, 71.9% male, 28.1% female) were included, with mean age 46.8 years. Lifetime injury prevalence was significantly greater in professional golfers (73.5% [95% CI: 47.3 – 93.0]) than amateur golfers (56.6% [95% CI: 47.4 – 65.5]); RR = 1.50,  $p < 0.001$ ). Professional golfers had a significantly greater lifetime prevalence of hand and wrist (RR = 3.33,  $p < 0.001$ ) and lower back injury (RR = 3.05,  $p < 0.001$ ). Soft tissue injuries were most common, and diagnoses were typically non-specific. Injury frequency was not associated with age or sex. Two studies reported a greater injury risk in amateur golfers playing more than three and four rounds per week. Over half of golfers are at risk of sustaining a musculoskeletal injury during their lifetime. Risks and patterns of injury differ between professional and amateur golfers, with professionals significantly more likely to develop lower back, and hand and wrist injuries. A recent international consensus statement on the reporting of injury and illness in golf should aid consistency in future research assessing the epidemiology of specific diagnoses, informing golf injury prevention and management strategies.

Can risk of harm in sport and physical activity ever be ethically acceptable? A Canadian perspective.

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Our understanding of the important role of risk-taking behaviour—especially in childhood development—has increased substantially in recent decades. The Canadian Paediatric Society's (CPS) recent consensus statement on risky play exemplifies this global shift in medical opinion. Significantly, however, the CPS stresses the need for a dual emphasis on risk taking and safety, concepts that can seem incompatible. Thus, determining how to strike the right balance between risk of harm and safety is a central challenge for sport and physical activity practice organizers. Furthermore, it is critical that participants as well as care givers (e.g. physicians, physiotherapists, parents etc.) have a clear shared conception of what constitutes ethically acceptable and unacceptable risk of harm when considering/facilitating/recommending sport and physical activity participation. This presentation addresses this gap by proposing a novel cyclical-iterative modal for assessing the ethical (un)acceptability of risk of harm in sport and physical activity.

A global survey exploring tackle training knowledge, attitudes and practices of women's rugby union coaches

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The coaching and performance context in women's rugby is not well understood, despite growing popularity worldwide. The aim of this study was to describe the knowledge, attitudes and tackle training practices of women's rugby coaches in relation to tackle safety and performance. A globally distributed online survey exploring coaches' knowledge, attitudes and practices towards tackling in women's rugby was completed by 357 coaches (mean age  $41 \pm 0.6$  years) from 58 countries. The cross-sectional survey was distributed from March 2023 to June 2023. Survey development was guided by the Health Action Process Approach and informed by coaching experts, research evidence synthesis, and guidelines of international tackle safety programmes. Coaches believed that the risk of tackle injury in women's rugby is high, and that proper tackle technique for safety is very important. More than 75% of coaches had never completed a tackle specific training course, with only 39% aware of the availability of such courses. Time spent on controlled-contact and full contact activities varied from 0-40+ minutes per week, averaging 10-20 minutes for both types of training. Barriers to the effectiveness of tackle training related to sociocultural factors, coach knowledge gaps, training environments, and player training considerations. Coach education, improved infrastructures, and physical development were ranked the highest priorities for improving tackle safety and performance. These findings inform future implementation strategies for tackle safety and performance in the context of women's rugby, highlighting the need to involve coaches in providing practical solutions, and the role of education and institutional/organisational support in facilitating such improvements.

## Return to Golf Following Hip Arthroscopy: A Retrospective Cohort Study

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Musculoskeletal injuries are widely recognised to limit participation in Golf. Arthroscopy is an increasingly utilised strategy for the surgical management of many of these injuries. Return to wider sporting participation following hip arthroscopy has been reported in a small number of studies, but little is known about return to golf and the factors associated with this. A retrospective cohort study was conducted of a consecutive series of patients undergoing hip arthroscopy between 2018 and 2020 at the Royal Infirmary of Edinburgh. Patient demographics, surgical details, complications and revision surgery or conversion to total hip replacement were recorded. Patients were sent questionnaires exploring golfing participation before and after surgery, in addition to assessing their hip specific functional outcomes (iHot-12 and FJS-12). Rates of return to golf and factors influencing sporting return were explored. We identified 405 hip arthroscopies performed during the study period, of which 322 met the inclusion criteria. 126 (39%) patients responded to the postal survey with 21 (17%) patients identifying as golfers. The rate of return to golf among those who golfed prior to surgery was 62.5% (n=10) at a median of 6.5 months (IQR: 7). There were no significant differences in return to sport and hip specific function or health related quality life between those that returned to golf following hip arthroscopy compared to those who participated other sports. In addition, younger age at operation and male sex were associated with improved patient reported outcomes (iHOT-12 and EQ-5D) but there were no associations between sport participation and outcomes. This cohort study demonstrated no clinically significant difference in surgical outcomes in return to golf relative to those not returning following hip arthroscopy, and therefore factors beyond hip function may have a critical role in determining sporting return.

“Tell me what you want, what you really, really want”: Rugby Union coach preferences for education and support in injury prevention

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Copious time is being directed into developing strategies to mitigate the risk of injury in Rugby Union. One such measure is injury prevention programmes, or ‘structured warmups’ which require a delivery agent, typically a coach, to optimize their potential effects ensuring athletes receive adequate exposure to them. Prior research has illustrated their significant effect on musculoskeletal and concussion injury, but optimal adherence appears challenging. The aim of this research was to establish the preferences of Rugby Union coaches for education and support to enhance their adherence to these programmes with their respective teams. Twelve coaches of youth Rugby Union players participated in five small focus groups. Participants were community coaches of amateur male and/or female players aged between 8 and 19 years. Conventional content analysis was used to determine themes and categories from transcripts. Three themes were identified and could be characterized by themes already existing in coaching literature: 1. ‘formal/non-formal learning’ [229 references], 2. ‘informal learning’ [11 references], and 3. ‘intrapersonal considerations’ [23 references]. In keeping with existing practices, coaches prefer structured group workshops that occur during the pre-season period. In addition to addressing the purpose of the programme, coaches would like educational content to facilitate the development of implicit knowledge of these programmes to empower them to adapt them to their own coaching context. To aid this, coaches would also like resources that assist them in planning the delivery of these programmes, given the variety of exercises that is often afforded to coaches to mitigate player boredom. Coaches also preferred facilitation of peer learning and ‘learning by doing’ (theme 2); and opportunities to further develop their skillset in an environment that permits an opt-in approach to physical components (theme 3).

## Hybrid Implementation of the Sport Mental Health Assessment Tool 1: Screening for Mental Health Symptoms in a UK-Sport context

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In sport settings, researchers have recommended best practice to be implementing a hybrid model of mental healthcare for athletes that combines the use of digital technologies for prevention and early intervention with traditional face-face-approaches. This study explored the feasibility of hybrid delivery of the International Olympic Committee (IOC) Sport Mental Health (MH) Assessment Tool (SMHAT-1) for detection of MH symptoms. Participants (n=408) included performance sport student-athletes (PS SAs), sport coaches and support staff, and a student comparison group from a large British University. The hybrid SMHAT-1 was administered at the start of the academic year (pre-competition season) to all participants. The SMHAT-1 was digitalised and PS SAs were given time to complete it during a strength and conditioning session with the researcher and team mental health professional present or could choose to complete it in their own time. 67% of PS SAs chose to complete the digital SMHAT in-person in their sport setting, while 33% chose to complete it in their own time and location. 90% of PS SAs met the SMHAT-1 criteria for requiring further clinical follow-up due to their symptom levels being above the screening threshold. During pre-competition season, mental health symptoms in the performance sport students were generally less prevalent and elevated compared to the student body. Areas for future improvement of the SMHAT-1 tool were identified. The results offer a UK-context roadmap for implementing a hybrid delivery of SMHAT in a multi-sport university setting. Questions around links to care, resource, capacity of practitioners, and where to house SA MH data require attention. Overall, this study highlighted a dire need for MH to be an integrated part of sport medicine provision and injury prevention practices.



## Reducing Lower Back Injury in Golf: Cross-sectional Assessment of Novel Swing Technique

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Lower back pain (LBP) in golf has been associated with repeated swing performance and high-speed spinal loads/rotations. While different swing techniques exist, no studies have examined the “traditional” or modern swing with the lower body swing. The lower body swing, a novel technique, is believed to reduce the risk of LBP, as it does not require extensive lateral axis tilt of the upper body as rotations are achieved through increased motion at the knees and hips. The purpose was to analyze, the modern and lower body swing with respect to the risk of developing LBP. Nine athletes performed the modern swing (Age 48.0+/-13.6 y, Height 176.8+/4.4 cm, Mass 82.1+/5.3 kg) and seven lower body swing (Age 53.9+/12.1 y, Height 182.9+/6.1 cm, Mass 92.5+/14.8 kg), all free from LBP. Whole-body kinematics were recorded using a motion analysis system and a continuous t-test (point by point) was performed to identify differences in examined kinematic measures associated with LBP (high crunch factor and thorax to pelvis abduction velocity and acceleration, flexion velocity, thorax rotational velocity and acceleration). Cohen’s d was calculated to determine the magnitude of effects. The results showed significant differences with strong effects ( $p < .05$ ;  $d > .80$ ) were observed for: thorax to pelvis abduction acceleration (lower=358+/334°/s<sup>2</sup>, modern=1024+/464°/s<sup>2</sup>), thorax to pelvis abduction velocity (lower=53+/25°/s, modern 107+/24°/s), thorax to pelvis flexion velocity (lower=-38+/60°/s, modern -113+/42°/s), thorax rotation velocity (lower=428+/63°/s, modern 550+/68°/s) and thorax rotation acceleration (lower=2432+/535°/s<sup>2</sup>, modern=3681±712°/s<sup>2</sup>). The lower body swing displayed favourable kinematics in comparison to the modern swing in relation to LBP risk in healthy golfers. Future work should include larger sample sizes and prospective or intervention-based approaches to explore injury prevention efficacy of this novel swing technique.

## Multi-ligament knee injuries: Functional outcomes after reconstructive surgery

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Multiligament knee injuries (MLKI) are associated with significant morbidity, including reduced function, complications, and a risk of further surgery. The aim was to evaluate the clinical and patient-reported outcomes measures (PROMs) after reconstructive surgery for MLKI. This retrospective cohort study examined all patients requiring surgical management for MLKI between 2014 and 2018 in a single large-volume trauma centre. Electronic patient records were reviewed for demographic data, details of surgery and complications, and patients were interviewed to collect PROMs including: EuroQuol EQ-5D-5L; Lysholm Knee Scoring Scale (LKSS); UCLA Activity and Sport, and satisfaction. There were 35 patients with a mean age of 31 years (range 16-66), and 71% were male. The most common mechanism of injury was sports-related (71%). Obesity was present in eight (23%) patients. At the time of injury 3/35 (9%) patients had documented evidence of nerve injury; there were no vascular injuries. Postoperatively 5/35 (14%) patients had recurrent instability and 3/35 (9%) underwent further surgery (one revision ligamentous reconstruction, one meniscectomy, and one conversion to a hinged knee arthroplasty). PROMs were available for 22/35 patients (63%) with a median follow up of five years: median EQ-5D-5L was 0.84 (IQR 0.25) and median LKSS was 86 (IQR 14), which indicate 'good' outcomes on global quality of life and knee-specific functional scales. Grade of MLKI was not associated with significantly poorer scores in the LKSS ( $p=0.22$ ). Only 32% returned to their pre-injury activity level. There were 15/22 (68%) patients who failed to return to their pre-injury activity level. All patients were satisfied with their treatment. Following surgical reconstruction for MLKI the majority of patients did not return to their pre-morbid level of activity, but nevertheless reported good health-related quality of life, functional outcomes and satisfaction scores.

Establishing and evaluating a national outpatient needle arthroscopy service for patients with knee complaints: strategic planning analysis, economic impact assessment, and early patient outcomes

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Delay to diagnosis and treatment of knee complaints is associated with unfavourable outcomes. Needle arthroscopy (NA) can be delivered under local anaesthetic in outpatient settings and can facilitate timely diagnosis, often without magnetic resonance imaging, and treat a number of common pathologies. The aims of this multi-staged study were: 1) assess the feasibility of a national outpatient NA service; 2) establish the first national NA service; 3) evaluate the cost and efficiency of NA versus conventional arthroscopy (CA), and 4) evaluate early patient outcomes. A strategic planning analysis was conducted using a strengths, weaknesses, opportunities, and threats (SWOT) framework, and implementation strategies. An outpatient NA clinical pathway was established, and lessons are described. The i) cost; ii) efficiency, and iii) waste associated with the pathway as evaluated. An assessment of early clinical and patient-reported outcomes was performed. Strengths/opportunities include the high-volume unit, local innovation expertise, existing referral network, and demand for improving efficiency. Weaknesses/threats include the novelty of NA and limited evidence base. Thirty patients (mean age 56 years) used the service. One patient did not tolerate the procedure; there were no other complications. NA informed treatment plans, replaced the need for CA in all but one patient, and mean satisfaction with the service was 87% (50-100%); detailed outcomes are reported herein. The cost of the NA pathway was £1555/patient, compared to £2351/patient for CA. Time to NA management was quicker, required fewer attendances and resources, and produced less waste than CA, and released additional capacity for obligate inpatient procedures. PROMs were positive and are reported herein. A national outpatient needle arthroscopy service for patients with knee complaints is technically feasible and practical. NA offers multiple opportunities to improve time to treatment, patient experience, hospital resource capacity, economic cost, and waste production, and can do so in a safe fashion.

## The role of artificial intelligence in lower limb non-contact injury prediction: a two-year pattern recognition analysis within Rugby Union

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Lower limb musculoskeletal injuries, notably lateral ankle sprains, consistently emerge as predominant injuries in injury surveillance studies within Rugby Union. The cause of sport injuries is multifactorial and requires sophisticated statistical approaches to accurately identify risk factors predisposing athletes to injury. Pattern recognition analyses may be useful in injury risk prediction due to their ability to account for repeated measures, non-linear interactions, and imbalanced datasets, but there are limited examples of their use in injury risk prediction. Senior Regional Academy Rugby Union players were monitored over two consecutive seasons which included 1740 individual weekly data points including training load, performance testing, musculoskeletal screening, and injury history parameters. Predictive models (injured vs. non-injured) were generated for non-contact ankle and severe lower limb non-contact injuries using Bayesian pattern recognition from a pool of 36 Senior Academy Rugby Union athletes. Compared to non-injured players, lower dorsiflexion angle measures were predictive of non-contact ankle injuries ( $32.5 \pm 11^\circ$ ), along with slower sprint times over 10m ( $1.80 \pm 0.2s$ ) and 40m ( $5.43 \pm 0.4s$ ), greater body mass ( $105.7 \pm 15.2kg$ ), previous concussion, and previous ankle injury (Area Under ROC = 0.76). Predictors of severe non-contact lower limb injuries included greater changes in mean weekly training load ( $2022.4 \pm 397.4AU$ ), slower 10m ( $1.76 \pm 0.1s$ ) and 40m sprint time ( $5.44 \pm 0.34s$ ), reduction in hamstring ( $-4.83 \pm 15.5mmHg$ ) and adductor strength ( $-8.4 \pm 15.7mmHg$ ), reduction in dorsiflexion angle ( $-1.13 \pm 5.4^\circ$ ), greater increases in perceived muscle soreness ( $+0.76 \pm 1.24$ ), and playing as a forward (Area Under ROC = 0.72). These findings provide evidence supporting targeted prospective injury risk analysis from routine monitoring of athletes, enabling coaches and medical practitioners to have actionable thresholds to tailor training regimes and injury prevention protocols for non-contact ankle and lower limb non-contact injuries.

Respiratory conditions in elite swimmers: prevalence, diagnosis, management & athlete support. A cross-sectional study from a national performance programme.

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Respiratory conditions are common in athletes. The prevalence of asthma is higher among swimmers than athletes of other sports. In addition to asthma, there are other respiratory disorders that can affect swimmers, and accurate diagnosis is vital because each have different best-practice management. Therapeutic strategies must also align with athletes' health, performance, and anti-doping requirements. The primary aim was to quantify the prevalence of respiratory conditions in a national swimming programme. Secondary aims were to assess: i) diagnostic methods; ii) treatment strategies, and iii) athletes' knowledge and support. A cross-sectional study was carried out using an online survey distributed to Scottish Swimming performance athletes. Quantitative and qualitative data were collected regarding demographics, symptoms, diagnostic and therapeutic approaches, and perceptions of support. 122 of 141 (87%) athletes responded (mean age 17.4 years (range 13-31)). 28 athletes (23%) reported a respiratory condition including: asthma (57%); exercise-induced asthma or exercise-induced bronchoconstriction (39%), and dysfunctional breathing (4%). 17/28 athletes (61%) who reported a respiratory condition had been diagnosed in primary care based on clinical assessment and peak expiratory flow rate measurement. Specialist respiratory assessment involving spirometry, hyperventilation- or exercise-based provocation accounted for 10/28 (36%) diagnoses. 21/28 (75%) of athletes felt well-informed and 16/28 (57%) felt well-supported in the management of their condition. In conclusion, almost a quarter of swimmers reported a respiratory condition, majority being asthma. Diagnostic methodology was inconsistent and typically involved basic clinical assessment only. No athlete underwent gold-standard bronchoprovocation testing. There are no public sector Sport and Exercise Medicine specialists in Scotland, therefore, Scottish athletes who rely on public health services may receive inadequate medical support. This may be detrimental to their performance and health and put athletes at risk of unintentional anti-doping violations. These findings may drive practice to improve management of respiratory conditions in swimming and other endurance sports.

## The maturational profile of players in Scottish Football Academies

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Maturation is considered a risk factor for youth football injuries, with both maturation status (pre-, circa-, or post-peak height velocity [PHV]) and timing (early, on-time, late) associated with injury risk. Furthermore, previous research has identified maturity associated biases favouring early over late maturing players in professional football academies. The maturational profile of players within Club Academy Scotland (CAS) is currently unknown. This study investigated the influence of biological maturity status upon player selection in players across 12 CAS academies. Players (n=840) had their biological maturation recorded using the Khamis-Roche method of percentage of predicted adult height at the time of observation. The growth spurt was defined as 88-92% of predicted adult height. A total of 18%-64% of players within CAS were early maturing; only 1% of u16 and 0% of u18 players were late maturing ( $p < 0.01$ ). The u15 age group had the largest proportion of players in their growth spurt (74%), followed by the u14 (70%) and u16 (23%) age groups. These results demonstrate that a selection bias towards early maturing players exists in CAS, and that the u14 and u15 age groups have the largest proportion of players experiencing the adolescent growth spurt. The regular monitoring of maturity in this setting is therefore required to help reduce this selection bias, maximise potential talent available from a relatively small (Scottish) population, and help improve and facilitate the design of maturity matched (i.e., bio-banded) programmes to mitigate growth related injuries in youth football players.

High Tackle Headache: Can referees agree on what constitutes a high tackle in a controlled environment?

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Rugby union is a popular sport; however, its high risk of injury necessitates targeted injury prevention strategies. Recent research highlights the potential benefits of lowering tackle height in reducing head injuries, although concerns persist among stakeholders regarding implementation challenges. This study aimed to understand whether Rugby referees can agree on tackle height in an independent controlled environment (i.e., video). Seventy-nine referees, who had refereed at least one Rugby match in the current or previous season, completed a content validated (by a gold-standard referee) questionnaire based on World Rugby's high tackle decision-making framework while watching 18 tackles (including three pairs of repeating tackles), pre-coded by an experienced analyst. There were 801 coded tackles. For those coded "high" by participants (n=413), 23% stated that they would not consider the same sanction according to the previous community Rugby guidelines. Mean intra-rater reliability on tackle height was substantial (Cohen's Kappa: 0.79; percent agreement: 91%). The percent agreement between responses on tackle height was 78% between participants, 63% between participants and the experienced analyst, and 74% between participants and the gold standard referee. For high tackles, 83% of participants agreed on the degree of danger. Contact location (on tackler) agreement was 57% amongst participants and 48% with the gold standard referee. Participant agreement on mitigating factors was 71%, compared to 43% with the gold standard referee, with the most common factors being ball carrier height drop (11%) and reactionary tackle (7%). Regarding penalty level (No penalty= 9%, Penalty only= 62%, Penalty and Yellow card= 23%, Penalty and Red card= 6%), participant agreement was 62%, with an overall agreement of 61% with the gold standard referee. Inter-rater agreement among participants and the gold standard referee was moderate for all items except degree of danger and tackle height, which showed strong agreement when compared with their respective Cohen's Kappa. These results demonstrate disagreement between referees in making decisions around tackle height in 22% of cases. Ensuring consistent education and resources is imperative to successful implementation of tackle height law modifications.

“How is your current mood?”, introduction of a novel daily mental health monitoring question in a Category One English Football Academy

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Mental health disorders are prevalent among athletes, yet barriers often hinder them from raising concerns. Screening can detect these disorders, but intervals between screenings may mean presentations are missed and they may not detect subtle variations. This project, conducted at a Category One Football Academy in England, aimed to enhance mental health monitoring by introducing a new question in the daily wellness survey for 33 male full-time athletes aged 16-21. A focus group revealed dissatisfaction with existing question's ability to capture mental well-being changes. A new question, "How is your current mood?" using a Likert scale with prompts of "very bad" at 0 and "very good," at 10 was devised using wording from validated questionnaires and was endorsed during a focus group. Before the trial period, athletes were screened using the SMHAT-1 and were all negative. At three months, compliance, correlation with other wellness questions and psychology clinical impressions was assessed. Compliance reached 37%, equal to other questions, with a mean score of 7.39 (SD 0.79). Linear regression showed no correlation with other wellness questions. The difference between individual three month means and last month mean was expressed as a proportion of three-month SD. Athletes were stratified into low, normal, or high cohorts based on their score within the cohort normal distribution. A 44% agreement was observed between scores and clinical impression. Reasons for low scores were apparent in 80% of cases and included selection, injury, or social factors. Clinical follow-ups were planned for the 20% of unexplained discrepancies. In summary, this question was acceptable to athletes, provided novel information and some correlation with clinical impressions. Data led to additional targeted contacts with psychology staff. No mental health presentations occurred during this period, warranting further study to assess its screening utility and enhance reliability with a longer period of surveillance.



## Attitudes and Reporting Behaviours Towards Musculoskeletal Injuries in Youth Female Rugby Players in England

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Rugby Union (rugby) is a contact sport, which consequently has a high risk of injury and concussion. Rugby utilises various injury prevention strategies; however, current research is limited regarding youth female rugby players' attitudes and behaviours towards those injury prevention strategies. To investigate the attitudes and behaviours of youth female rugby players in England towards injury prevention strategies. Cross-sectional online survey. Two hundred and thirty female rugby players (ages 14-19) participating in school/college (n = 71), community club (n = 222), developmental player pathway (n = 180) or centre of excellence (n = 19) programmes. Main outcome measures: attitudes and intended behaviours towards injury prevention (both 7-point Likert-scale question; 1: not serious – 7: very serious). Independent variables included age, playing experience and player position. Of those surveyed (n = 230), 78% of players 'agreed' (n = 128; 55%) or 'strongly agreed' (n = 53; 23%) that some rugby injuries are preventable. Two hundred and fourteen players (92%) reported training strategies (e.g. warm-up and tackle training) as the most effective way to prevent rugby injuries. Likewise, 108 players, (47%) reported training strategies as the most effective way to prevent rugby concussions. Eighty percent (n= 184) 'agreed' or 'strongly agreed' that regular tackle training could prevent injuries. When asked how often tackling is practiced outside of matches, 50% (n = 114) stated 'weekly'. Seventy-one percent (n = 163) 'agreed' or 'slightly agreed' that a neuromuscular training warm-up could prevent rugby injuries and 68% (n=157) 'agreed' or 'strongly agreed' to wanting their team to complete a rugby-specific warm-up programme before every rugby session. Players consider training strategies (e.g. warm-ups and tackle training) to be the most effective prevention strategies. In turn, developing an understanding of players' attitudes and behaviours towards injury prevention strategies may aid with the implementation of injury prevention strategies.

## The Prevalence of Symptoms of Common Mental Disorders among Professional Golfers

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Mental wellbeing holds equal importance to physical well-being among athletes, but receives far less research attention. In order to effectively manage and support athletes' mental health and wellbeing it is important to understand their needs. To date, there is a paucity of quantitative research on the mental wellbeing of elite golfers, therefore this study aims to: (i) assess the prevalence of symptoms of mental health disorders among a cohort of professional golfers, (ii) compare prevalence values with data from the general population and other elite athlete cohorts, and (iii) assess how players cope with mental health problems and players' opinions on the mental health support services available to them. Players competing on the European Challenge Tour (n=261) were sent a questionnaire which assessed symptoms of depression, distress, anxiety, sleep disturbance, and obsessive-compulsive disorder. Questions were also included to assess coping-behaviours and opinions on current support measures. The two-week symptom prevalence was 10.3% for depression, 51.7% for distress, 8.6% for anxiety, 10.3% for sleep disturbance, 13.8% for obsessive thoughts and 27.6% for compulsive behaviour. The prevalence of symptoms reported is comparable with those found among other elite athlete cohorts and symptoms of anxiety and distress were reported more frequently than in the general population. 67% of players who had experienced a mental health issue did not seek professional help at the time and 61% of players did not think sufficient support was available to them. Mental health problems are prevalent among elite golfers; however, this study demonstrates that the majority of players do not seek help from professionally accredited practitioners. Following discussion of this study, the European Tour Group now provide a 24/7 mental health crisis hotline for players and have educated staff-members on how to identify players with mental health issues and signpost them to the appropriate support.

## Athlete Health in Women's Football: A Scoping Review

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In 2019, a scoping review on women's football was undertaken to quantify existing research, as part of FIFA's research "agenda-setting" project to inform future research on women's football. This current review serves as an extension of the project, with a focus on illness as defined by the 2020 IOC Consensus Statement. The methodology of this review followed that of the initial 2019 scoping review and pre-registered ([osf.io/gp7fb](https://osf.io/gp7fb)). Results were combined with records identified as illness-related from the initial scoping review. Two reviewers (AW, BK) independently screened titles and abstracts, and extracted relevant data. Studies were also allocated to illness-related themes adapted from a similar follow-on study. A total of 14071 studies were scoped, and 72 studies included. The most common themes were epidemiology (n=39), risk factors (n=26), assessment (n=21), and management (n=15). Psychiatric/psychological illnesses were the most published (n=25), with genitourinary (n=10) and cardiovascular illness (n=10) following. Since 2019, there's been commendable international effort field of women's football athlete health. There is a paucity in aspects of our understanding of illnesses, such as assessment approaches, management methods, or prevention programmes. Future research endeavours may be directed towards these themes to aid sports medicine practitioners in their care for their athletes.

## Evaluating game play rule change as a mechanism to reduce invasion sport injury risk, lessons for rugby union: A scoping review

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Invasive contact sports such as rugby union has an injury rate of 29.2/1000 hours. Non-contact sports, such as swimming, results in 3.04/1000 hours. Sport related concussions (SRC) are common within contact sports due to the frequency of player-to-player contacts. Game rule changes are an effective means to reduce injury and SRC. Therefore, further evaluations to inform future injury prevention strategies are required. The objective of this scoping review was to understand the effectiveness of in-game rule changes aimed at reducing injury across invasive contact sports. Electronic databases (Medline, Cinahl, SportDiscus, Scopus, Web of Science) were searched. Terms included an extensive list of invasive contact sports followed by 'sport injury' or 'athletic injury' and 'law change', or 'policy change', or 'rule change'. Eligible articles comparing standard laws (control) to the intervention law changes and reporting injury outcomes were included. Exclusion criteria were interventions not evaluating game play rule-change, non-invasive sports, or no measurement of injury rates. Outcome measures compared control to the intervention incidence rates, incidence rate ratio, time lost, and any unintended consequences that increased or altered injury mechanisms. Out of 1598 studies screened, 38 met the inclusion criteria. 11(29%) studies assessed elite athletes, 26(68%) amateur and 1(3%) assessed all populations. Ice hockey was the most frequently studied sport 13 (38%). There were 21 studies reporting injury reduction outcomes using a rule change. 21 used rule changes to reduce SRC rates, of which 57% (12/21) were successful, while 9 found no reduction in SRC. This was mostly attributed to increased education regarding signs and symptoms in invasive contact sports. Injury burden was rarely reported due to limited medical personnel or inadequate injury surveillance data. If rules are enforced correctly, rule change interventions can be an effective method to reduce injury and SRC, although this method is often underutilized when compared to other injury prevention strategies. Future work evaluating rule change interventions should be done over multiple years to allow participants time to adapt, thus providing a greater understanding of the effects.

## Identification and Treatment of Relative Energy Deficiency (REDs) in Sport by Canadian Family Physicians

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REDs is a syndrome where insufficient energy intake relative to energy expenditure leads to impaired health and sport performance. Family physicians are first-line providers who can identify and treat REDs, but research shows they have low knowledge and confidence in managing it. No studies exist that assess the awareness and knowledge of REDs by Canadian family physicians, or how their management practices compare to current guidelines. To assess this, a cross-sectional study was conducted using a novel online survey disseminated to family physicians in Canada. Recruitment occurred via emails, newsletters, and social media by Canadian universities and family medicine provincial colleges between December 2023 and March 2024. Data were analyzed using descriptive statistics. Preliminary results include a sample size of 50. Of these, 75% correctly identified REDs signs and symptoms, while 37% had ever treated the condition. The most common investigations were basic bloodwork (71%) and eating disorder screening (70%), and least common were orthostatic vitals (14%) and bone density testing (26%). The most common management strategies were mental health counseling (53%) and vitamin D supplementation (48%), and least common were calcium supplementation (32%) and increased calorie intake recommendations (36%). Most (83%) participants would prescribe hormonal contraception to REDs patients, with 42% preferring oral contraceptives. Most (96%) participants agreed that more REDs education would be beneficial. These findings suggest that though family physicians exhibit knowledge of REDs, there is variation in how they manage it. The most common practices align with current guidelines, but several recommended investigations and treatments are underused. Some practitioners also prescribe oral contraceptives to patients with REDs, despite this being discouraged. Further education and resources on REDs management would likely be beneficial for family physicians.

## Injury Incidence Across the Menstrual Cycle in Elite Female Rugby

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The number of female rugby players competing at all levels of the game is increasing, but female specific research remains scarce. The Menstrual cycle has been theorized to influence injury risk in female athletes. This Study aimed to observe how menstrual cycle phase influenced the injury incidence in elite female rugby players. Injuries from two representation unions in New Zealand were collected over one full season. Injuries in eumenorrhic players were categorized into follicular, ovulatory, or luteal phase. Injury incidence rates (per 1000 player days) and injury incidence rate ratios were calculated for each phase for all injuries and stratified by type. 32 injuries from 25 players were eligible for inclusion. Injury incidence rate per 1000 player days were 5.5 (95% CI 2.9 to 10.2) in the follicular phase, 25 (95% CI 13.0 to 48.1) in the ovulatory, and 9.4 (95% CI 5.5 to 16.2) in the luteal. Injury rate ratios found players were nearly 5 times more likely to sustain an injury in the ovulatory phase than the follicular phase (95% CI 1.86 to 11.26,  $z=3.31$ ,  $p=0.00$ ) and nearly 3 times more likely to sustain an injury in the ovulatory phase than the luteal phase (95% CI 1.14 to 6.23,  $z=2.26$ ,  $p=0.02$ ). Ligament injuries were the most common injury sustained (25% of all injuries) and 75% occurred in the ovulatory phase, making ligament injuries over 30 times higher in the ovulatory phase than the follicular and 23 times higher than the luteal. This data suggests, injury risk in female rugby may be elevated in typically eumenorrhic women during ovulation. Specifically, risk of ligament injuries could be significantly higher in the ovulatory phase. Further female specific research in rugby is of paramount importance for female athlete wellbeing, and retention of females in rugby.

## Identifying global differences in concussion prevention and rehabilitation across all levels of women's and men's rugby union

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Rugby Union (Rugby) is a prevalent collision sport with a notable injury rate, particularly concerning concussion. Despite its significant burden in sport, the practical application of concussion prevention and rehabilitation strategies in men's and women's rugby union across different levels of play globally remains largely unreported. Our study aimed to investigate current coach and medic practices related to concussion prevention and rehabilitation processes in rugby union. Conducted as a cross-sectional study, a convenience sample of participants (medics and coaches) involved in male and/or female rugby union were recruited. A survey was collaboratively designed on REDcap by clinicians and researchers, aligned with prior Rugby studies, and internally validated and piloted. A total of 173 participants (100 medics, 73 coaches) with a completion rate of 94% provided valuable insights. Neck strength training was perceived as important by both medics and coaches (Medics Median: 6, IQR: 5-7; Coaches Median: 5, IQR: 5-7), while protective clothing was not prioritised (Medics and Coaches Median: 2, IQR: 1-4 respectively). Tackle height laws (80.7%) and tackle training (89%) were highly utilised, while additional protective clothing (2.9%) and biobanding (3.5%) were among the least utilised strategies. The presence of trained medical staff at games and educational programs were deemed highly important, with recognition and removal after head impact (88.3%) being the most utilised secondary prevention strategy. Utilisation of return-to-play processes (75.4%) and rehabilitation (65.5%) were prominent in tertiary prevention. Neck strength training emerged as the most important rehabilitation aspect (Median: 6, IQR: 5-6.25), while cervical manual therapy was considered less important (Median: 4, IQR: 2-5). This study underscores stakeholders' recognition of the importance of prevention strategies in rugby concussion management but highlights a gap in utilising rehabilitation strategies. It emphasises the necessity for educational interventions to reshape stakeholder attitudes and underscores the imperative for further exploration to optimise program implementation.

## Injury prevention programmes in male versus female rugby union – A scoping review

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Rugby union (rugby) injury rates are higher than most sports, with the tackle cited as the most injurious event. Accordingly, injury prevention programmes (IPP) must be designed for and tested in rugby players. To describe current rugby IPPs and their effectiveness to reduce injury in male and female rugby players and identify gaps for future injury prevention research. Electronic databases were systematically searched (e.g. PubMed, SportDiscus, Google Scholar, Science Direct). Search terms included 'rugby union' and 'prevention' with both male and female studies included. Exclusion criteria included youth players and non-rugby IPPs. Eligible articles investigated IPPs and their outcomes in adult rugby players. Of the 2738 articles screened, 11 met the inclusion criteria, with no studies on female players. There were 4 types of IPP: training (n=4; 36%); law change (n=4; 36%); education programmes (n=2; 18%); and a longitudinal multidisciplinary programme (n=1; 9%). The IPPs were studied at varying levels of male rugby: 5 studies on male professional players (46% of studies); 3 in national registered player databases (27%); and 1 each on male community, student, and academy players. Reductions in injury outcome measures were documented, including fewer concussions following training programmes and a lowered tackled height trial and reduced spinal cord injury rates following law change and coach education. However, there were some negative unintended consequences reported, including increases in shoulder injury incidence and burden following a training programme and increases in catastrophic injuries following a coach education programme. Existing literature shows that most injury outcome measures can be reduced, but there were some unintended consequences. It is currently unknown if the benefits seen in males can be seen in females. Future research should focus on injury prevention in female rugby players.



## Stirred not Shaken: A longitudinal pilot study of the head kinematics experienced by professional flat jockeys while training racehorses

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This longitudinal pilot study used inertial measurement units (IMUs) to quantify the head kinematics experienced by professional flat jockeys while training racehorses. At three time points during the year, data were collected from 4 mornings riding from 4 professional jockeys (2 male, 2 female). Jockeys wore IMUs attached behind the ear to allow their head kinematics to be measured. Peak resultant linear acceleration, rotational velocity and rotational acceleration were identified. Counts of linear and rotational acceleration peaks above a value of 3g or 400 rad/s<sup>2</sup>, which are values representative of those experienced in daily living in the literature, were made and reported as a value per hour. The results showed that peak resultant linear acceleration was on average 5.8±1.08 g across all rides and riders, while mean resultant linear acceleration was 1.02±0.01g. Resultant rotational velocity peak and mean were 10.37±3.23 rad/s and 0.85±0.15 rad/s, respectively. Resultant rotational acceleration peak and mean were 1495±532.75 rad/s<sup>2</sup> and 86.58±5.54 rad/s<sup>2</sup>, respectively. Jockey experienced 300 linear and 445 rotational accelerations above daily living values per hours riding. Linear and angular acceleration peaks were comparable to those measured in other non-contact sports. Large individual variation between the jockeys was noted, with female jockeys exhibiting higher rotational values. The length of exposure, as well as the peak metrics for linear and rotational acceleration, were higher at the beginning of the season (March) compared to late season (August), suggesting that seasonal variation is important to consider in future studies. Counts of linear and rotational acceleration peaks above 3g and 400 rad/s<sup>2</sup>, should be considered in line with any changes in cognitive function of riders. This pilot study demonstrated the feasibility of measuring head kinematics in jockeys and lays the foundation for future large-scale research to quantify head kinematics and investigate if these influence brain health.

## A multidisciplinary approach to optimising respiratory health in elite Scottish swimmers

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Elite swimmers often experience respiratory symptoms at rates higher than the general population and athletes in many other elite sports. These symptoms can vary widely, encompassing problems such as sinus and nasal issues, laryngeal dysfunction, exercise-induced bronchospasm (EIB), and asthma. Not only can these conditions be distressing and detrimental to performance, but they also pose a serious concern due to their potential for long-term adverse effects on health. It is important to dispel the misconception that advanced respiratory interventions are solely aimed at enhancing performance, as this overlooks their critical role in maintaining respiratory health. Persistent exposure to EIB may precipitate sustained inflammatory processes within the bronchial passages, culminating in pathological airway remodelling and a progressive decline in bronchial reactivity. This pathophysiological evolution can exacerbate respiratory symptoms and amplify the risk of developing or exacerbating bronchial asthma or the development of more fixed obstructive lung pathology. It can also be characterised by air entrapment during expiratory phases, resulting in a reduction of pulmonary ventilation capacity and gas exchange efficacy. Athletes with unrecognised EIB and sinonasal issues are at an increased risk for developing respiratory tract infections. The inflamed airways provide a fertile ground for opportunistic microbial colonisation and proliferation, thereby intensifying respiratory symptom. Moreover, the psychological impact of chronic respiratory problems on elite swimmers can be profound. Persistent breathing difficulties can lead to increased stress, a loss of confidence, sleep disturbance and a greater risk of anxiety and depression, especially if athletic performance suffers. In the context of the COVID-19 pandemic, concerns about respiratory health have become more acute, with swimmers facing added anxiety over possible viral infection and the prospect of enduring pulmonary damage. This underscores the essential need for comprehensive respiratory management and psychological support to help athletes maintain their performance focus and protect their health. In summary, prompt identification and treatment of respiratory problems are vital for minimising long-term health risks and ensuring the well-being and success of athletes. We propose a collaborative, multidisciplinary and structured approach to managing respiratory health in elite Scottish swimmers, including systematic screening, early intervention, and regular surveillance. By introducing EVH for the first time in Scotland, the model aims to enhance domestic care for swimmers and could be expanded to benefit high-performance athletes across various sports within Scotland.

## Female Athlete Health in Scottish Swimming

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This study investigates the health considerations affecting female athletes participating in Scottish Aquatics programs, with a specific focus on swimming and diving. It underscores the challenges posed by intense training regimens during the crucial developmental stages of puberty, compounded by the non-weightbearing nature of these sports, which may limit the bone-strengthening benefits observed in other sports. Additionally, the demands of training, academics, and social obligations during this period necessitate adequate energy intake to support physiological requirements. To address these concerns, this study aimed to assess factors which may impact female athlete health across Scottish Aquatics athletes. Anonymous questionnaires were distributed to all female athletes in national performance programs for swimming and diving in January 2018. Subsequently, an educational initiative was launched, incorporating workshops on female athlete health for both coaches and youth athletes. Athletes who were triaged to need review were offered this opportunity, with onwards signposting as needed. A follow-up data collection was conducted in July 2019 and July 2023. Notably, menstrual patterns were within normal age ranges, with higher rates of hormonal contraception usage observed among supported athletes in 2019, which was seen to reduce in 2023. Significant numbers of athletes in all cohorts at all time periods had symptoms that impacted performance. Amenorrhea rates were seen to reduce over the collection points. An increasing number of female athletes monitor their menstrual cycles using app-based technology. Concerns regarding weight, diet, and bone health were also addressed. A significant number of female swimmers expressed weight-related anxieties, with a greater emphasis on weight loss than weight gain across all athlete categories. However, the prevalence of reported eating disorders and bone health conditions remained low, providing some reassurance. Education earlier in the performance programme on these issues has been introduced. The study underscores the importance of continued education and collaboration across disciplines to support female athlete health. It recommends ongoing workshops, athlete messaging, and annual health reviews for supported athletes, alongside ensuring accessible medical education and support for all female athletes.



Injuries on artificial and natural grass pitches in English men's community rugby union matches.

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The use of artificial grass pitches has increased in recent years in English community rugby union. The injury incidence at the adult community is established but no studies have compared injury incidence on natural and artificial grass pitches in this population. Using a prospective cohort design over four seasons (2018-19 to 2022-23), English men's community rugby teams with an artificial grass home pitch provided data for team match exposure and match injuries causing absence of eight days or longer from training or match play. Comparisons were made between artificial (normally home matches) and natural grass (normally away matches) surfaces. Overall injury incidence was not significantly different on artificial (27/1000 player match hours, 95% CI:24-30) versus natural grass (23/1000 hours, 95% CI:21-26; rate ratio:1.15, 95% CI:0.99-1.33) surfaces. Injury severity was not different on artificial (mean: 48 days absence, 95% CI:44-53; median: 33 days, IQR:21-56) and natural grass pitches (mean: 41 days absence, 95% CI:37-47; median: 28 days, IQR:21-43; P=0.10). Injury burden was higher for artificial than natural grass for mean (artificial: 1278 days absence/1000 hours, 95% CI:1159-1409 vs grass: 956 days absence/1000 hours, 95% CI:855-1068; RR:1.34, 95% CI:1.15-1.55) and median (artificial: 885 days absence/1000 hours, 95% CI:803-976 vs grass: 655 days absence/1000 hours, 95% CI:586-733; RR:1.35, 95% CI:1.16-1.57). Injury incidence was not significantly different between surface types for the top five injury types, including concussions, ankle joint/ligaments, knee joint/ligaments, thigh muscle strains and shoulder joint/ligament injuries and only concussion burden was different with a lower total days absence on artificial pitches (98 day absence/1000 hours, 95% CI:64-181) than grass (165 days absence/1000 hours, 95% CI:128-212; RR:0.60, 95% CI:0.41-0.86). In conclusion, overall burden of injury in community rugby is higher on artificial compared with natural grass pitches but continued surveillance and analysis of injury mechanisms is required to understand the causes.

Match injuries in English women's community rugby union.

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Participation in women's rugby union has undergone significant growth in recent seasons across all levels of the game. Injury surveillance in the women's elite game is well established but there is less understanding regarding injuries at community levels. In a two-season (2021/22 – 2022/23) prospective cohort study, teams ranging from the second to sixth tier of women's rugby union in England volunteered to participate in the current study. Teams reported details for injuries causing an absence of eight days or longer and team match exposure over each season. A total of 163 injuries were reported over 247 matches resulting in an injury incidence of 33.0 per 1000 player match hours (95% CI: 28.3-38.5) with a mean severity of 62 days absence per injury (95% CI: 53-72). The head was the most commonly injured site, accounting for 36% of all injuries (11.7/1000 hours, 95% CI: 9.1-15.2), followed by the knee (14%; 4.7/1000 hours, 95% CI: 3.1-7.0), ankle (12%; 4.0/1000 hours, 95% CI: 2.6-6.3) and shoulder (10%; 3.2/1000 hours, 95% CI: 2.0-5.3). Knee injuries had the greatest mean severity (137 days absence per injury, 95% CI: 91-206) and the highest burden of any body site (637 days lost per 1000 player match hours, 95% CI: 423-959). The tackle was associated with 64% of all injuries (38% being tackled; 26% tackling). Concussion was the diagnosis with the highest incidence (7.5/1000, 95% CI: 5.4-10.3) with 68% and 11% associated with the tackle and ruck, respectively. Areas of future injury prevention research in the women's community game should be focused on injury mechanisms associated with the tackle and particularly for injuries to the knee and head. Continuing injury surveillance is required to assess injury outcomes in relation to the lowered tackle height introduced in season 2023/24.

## The prevalence, mechanism, and reporting behaviours of breast injury in international under-18 women's rugby union players

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During rugby, female breasts will be exposed to injury through direct blows. Whilst breast injury is prevalent in contact sports, they predominantly go unreported. Research has focused on senior players and therefore prevalence in adolescents is not well known. This study investigated the prevalence, mechanism, and reporting behaviours of breast injury in under-18 women's rugby union. A custom designed questionnaire was completed by 83 international female players, who were competing at the Under-18 Women's Six Nations Festival in North Wales. Players were aged between 16 and 18 years old. Retrospective data on breast injuries and prevention strategies were collected. Forty-four percent of players (n = 36) reported previously sustaining a breast injury whilst playing rugby, with 75% (n = 27) reporting > 1 injury in the past year. Sixty-one percent (n = 22) of players reported their most severe injury healed within 1-2 weeks. Contact with another athlete was the most reported contributing factor (84%, n = 32), followed by direct contact with the ground (51%, n = 1). Seventy-six percent (n = 25) of players did not report their most severe breast injury, with those who did informing either a parent (n = 7) or a teammate (n = 2). No injuries were reported to a coach or medical professional. Sixty percent (n = 49) of players considered themselves not to use any strategies to prevent breast injury with only 10% (n = 8) reporting wearing female specific protective armour. Breast injury is common in adolescent women's rugby, which highlights the need for more research into its effects on the developing breast. Adolescent players rarely report injuries to medical professionals. Increased awareness of breast injury and its potential impact may encourage reporting. Breast injury management and prevention strategies should be developed to reduce the occurrence in these athletes.

## The Athlete Care Project: Experiences and Perceptions of Care in elite and professional UK athletes

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What does care mean to an athlete, and how do they experience it? Much of the current literature and guidelines on care for elite and professional athletes internationally and within the UK is developed from the expert opinions of sport medicine physicians, physiologists, athlete support personnel and coaches. However, one expert group's experience and voice is largely missing from the conversation – the athletes themselves. The Athlete Care Project is a PhD research project investigating how elite and professional athletes in the UK experience care, and how they perceive the importance of various aspects of care (ranging from coach and governing body interactions, access to medical, physiological and psychological support, safety of their training environment and interactions, exposure to abuse and maltreatment, their mental health, and feeling 'cared' about as a person beyond sport). Data is currently being collected through a large-scale survey capturing both quantitative and qualitative data. The survey targets both current and retired elite and professional UK athletes, both male and female respondents, and elite disabled athletes. Additional care considerations are captured for female and disabled athletes. Preliminary data and trends will be presented and discussed.



Getting them through the door: Factors that increase the likelihood of attending a medical diagnosis and clearance assessment.

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Concussions are a global concern: in New Zealand (NZ) an estimated 10 per 1000 rugby players seek medical care for concussions at an average cost of NZ\$1700 per claim. In response, NZ Rugby (NZR) developed a community concussion initiative to operationalize best practice guidelines for managing concussions. This study aimed to describe demographic and/or contextual factors associated with players attending a medical diagnosis, clearance assessment and adherence to the recommended standdown period as part of NZR's concussion management pathway (CMP). Over the course of the 2020 and 2021 seasons, 4724 community rugby players from 59 clubs/schools in NZ participated in the study. The following factors were examined relative to compliance to each stage of the CMP: players' age, sex, ethnicity, presence of a team physiotherapist and completion of a pre-season baseline test. Multivariate logistic regression models explored associations between independent variables and CMP compliance steps. Over the two seasons, 383 suspected concussions were reported, with an average incidence rate of 16.4 suspected concussions per 1000 player match hours. Age, ethnicity, and sex did not influence compliance to the CMP steps. 62% of players attended a medical diagnosis assessment following their suspected concussion. The odds of a player attending a diagnosis assessment were increased by having a team physiotherapist (OR 3.12;  $p < 0.001$ ). The odds of a player obtaining medical clearance were significantly improved if their team had a physiotherapist (OR 2.02;  $p = 0.02$ ) and a pre-season baseline test (OR 2.48;  $p < 0.001$ ). The odds of a player adhering to the appropriate stand-down were significantly improved by having a baseline test (OR 2.94;  $p < 0.001$ ). Having a team physiotherapist and completing a pre-season baseline test were associated with improved compliance to the CMP. These contextual factors should be promoted by relevant governing bodies to improve player welfare following a rugby-related concussion in the community game.

## Women U18's Six Nations: Understanding rugby union player concussion knowledge attitude and behaviour intention

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Female rugby union players are more susceptible to concussion and have prolonged concussive symptoms compared to their male counterparts. To ensure prompt diagnosis and effective concussion management it is important that players report concussion or symptoms of concussion at occurrence of injury. The aim of the current study was to identify under-18-women players knowledge of concussion, as well as their intention to report. A modified version of the RoCKAS-ST was used to measure concussion knowledge and attitudes in 103 female rugby union players between the ages of 16-18 during the Women's U18's Six Nations Festival 2024. Thirty-seven percent of players (n=38) were found to have sustained at least one concussion whilst playing rugby, with 58% (n=22) of players sustaining their injury in the last year. Of those who reported their concussion (n=29), 65.5% (n=19) reported the concussion during the game/training, and 34.5% (n=10) reported after the game/training. Eighteen percent of players (n=7) did not report their injury. Seventy-six percent of players (n=29) who sustained a concussion followed return-to-play guidelines. Concussion knowledge CK was measured using 15 true/false questions and 3 scenarios, overall scores could range from 0-18. Analysis identified an overall CK score  $M=12.8$ , with Irish players demonstrating highest scores ( $M=13.35$ ) and Italian players the lowest ( $M=12.25$ ). Interestingly, Irish players had the high concussion rates (42%), and Italian players the lowest (17%) which may reflect better understanding of symptoms rather than actual injury. When directly asked "I intend to report symptoms of a concussion", seventy-four percent of players agreed (n= 76). Overall, players demonstrated positive knowledge and intention, but further research should identify factors which influence players intention to report. The findings from this study will also guide further research into understanding differences in concussion knowledge, attitudes and behaviour based on age, gender, and level of play.

### Exploring Athletes' Beliefs Surrounding Concussions in American Youth Football

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The objective of this study was to explore youth athletes' beliefs surrounding concussions in American football. Athletes on three teams (n=38) participated in the study. Each athlete completed a survey, focused on concussions and based on the Health Belief Model, at the end of their respective seasons. The survey gauged concussion knowledge, perceived susceptibility of experiencing a concussion, perceived severity of concussions, perceived benefits of reporting a concussion, perceived barriers to reporting a concussion, cues to action for concussion reporting, and symptom and concussion reporting intentions. All items were rated on a Likert scale from one to seven with one indicating disagreement or unwillingness and seven indicating agreement or willingness. Athletes had high perceived severity (5.8 [5.5, 6.1]), but low perceived susceptibility (3.7 [3.5, 3.9]) indicating that athletes believe concussions are serious but might not fully understand the prevalence of concussions. Athletes had moderate concussion knowledge (4.3 [4.2, 4.5]) and perceived benefits (4.0 [3.7, 4.4]), and low perceived barriers (2.6 [2.3, 2.8]); athletes might not be aware of the short- and long-term benefits of reporting concussions, but do not feel that there are many barriers to reporting. Athletes had high cues to action (5.7 [5.3, 6.0]) and concussion reporting intentions (5.6 [5.2, 5.9]), and moderate symptom reporting intentions (4.4 [4.0, 4.9]), indicating willingness to report concussions but being less willing to report symptoms. Fifteen athletes (39%) suspected having a concussion within the last year, with two athletes not reporting the suspected injury. Four athletes, all from the same team, had clinically diagnosed concussions during their football season. Athletes who reported experiencing their concussion(s), had higher composite scores for all survey sections except perceived barriers than athletes who did not experience a concussion. Future work will explore relationships between survey composite scores and athlete head kinematics.

## Predictors of Post-Concussion Musculoskeletal Injury Severity: An Integrated Data Analysis Approach

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There is a well-established ~2x elevated risk of musculoskeletal injury in the year following concussion; however, previous efforts to identify risk factors have largely been unsuccessful. We recently reported on an integrated data analysis successful approach to identify athletes at elevated risk; however, this analysis included all injury severities. The purpose of this study is to apply the risk algorithm to mild (<10 days' time loss), moderate (11 – 30 days' time loss) to severe (>30 days' time loss) musculoskeletal injuries. We tracked 211 collegiate student-athletes for one-year post-concussion and recorded musculoskeletal injuries. We recorded commonly used concussion assessments (balance, cognition, oculo-motor), demographics, and injury characteristics. Consistent with our prior reports, the model was created Weight of Evidence transformation followed by LASSO and ridge regularization, and Shapley Additive Explanations to develop a composite risk score (0 – 1) with a lower score reflecting a lower injury risk. The composite risk score was compared between groups with a one-way ANOVA. There was a significant main effect ( $p < 0.001$ ) and the severe injury group has a higher injury composite risk score ( $0.88 + 0.08$ ) than either the mild ( $0.58 + 0.14$ ,  $p < 0.001$ ) and the moderate ( $0.71 + 0.30$ ,  $p = 0.040$ ). The composite risk score was not different between the mild and moderate group's composite risk score ( $p = 0.592$ ). The results of this study expand prior findings and suggest the composite risk score can successfully identify those athletes at risk of severe musculoskeletal injury. While severe injuries are infrequent, they involve the most substantial consequences to sports time lost, economic burden to the individual and health systems, and potential elevated risk of later life orthopaedic pathology. As injury prevention resources are frequently limited in many sporting environments, these results could be used to target those athletes at highest risk of severe injury with established injury risk reduction programs.

## Managing Health Threats to Performance. The UKSI Approach

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Injuries and illnesses can have a significant impact upon the performance of athletes. Therefore, there is a real need in high-performance environments for performance teams (coaches and support staff) to effectively manage the threat to performance injuries and illness pose. There are several frameworks that have been proposed to prevent sports injuries. These frameworks, however, are not necessarily directly applicable within the context of Paralympic and Olympic sports. The UKSI Athlete Health team have developed a framework to support UK Sport world class programmes to develop and implement bespoke plans to manage the threat of injuries and illness on performance. This framework is a two-part, six step process that has been developed based on established risk management. The application of this framework is flexible and can be tailored to the needs of all UK Sport world class programmes based on their unique context. This presentation will outline the development of the framework and it has been utilized by the UKSI Athlete Health team to support UK Sport world class programmes manage health threats in the buildup to the Paris Paralympic and Olympic Games.

## Can elite athletes' psychological load affect their injury status?

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Psychological load is described as the total psychological demands, pressures, or stressors that an athlete is facing at a given time. Psychological load can be categorized into sport load (i.e., total psychological demands an athlete faces in their sport, which could include team selection or coach conflict) and life load (i.e., total psychological demands an athlete faces away from their sport, which could include family bereavement or financial worries). Although the link between physiological training load and sport injury has been thoroughly examined, less attention has been paid to the role of psychological load in injury status among athletes. Therefore, this study examined if psychological load was associated with injury status in elite sport. Using a cross-sectional design, 89 elite athletes (37 males; Mage = 25 ± 6 years) from various Olympic and Paralympic sports completed an online questionnaire assessing psychological load and injury status (i.e., injured yes or no). Binomial logistic regression analyses examined the relationships between psychological load (i.e., overall load, sport load, and life load) and injury status. Results revealed the odds of experiencing injury significantly increased by 7.4% ( $\beta = -0.30$ , SE = 0.14, W = 4.48,  $p = .029$ , 95% CI [0.56, 0.97]) for each unit increase in overall psychological load, and by 6.5% ( $\beta = -0.44$ , SE = 0.21, W = 4.21,  $p = .040$ , 95% CI [0.43, 0.98]) for each unit increase in sport load. Further, the odds of experiencing injury increased by 8.1% for life load ( $\beta = -0.21$ , SE = 0.18, W = 1.41,  $p = .235$ , 95% CI [0.58, 1.15]), although these results were not statistically significant. Overall, the results suggest that elite athletes experiencing greater psychological load, in particular sport load, may be more susceptible to injury. Therefore, practitioners should consider athlete psychological load monitoring within injury risk mitigation initiatives.

Performance backwards thinking creating performance focused criterion driven rehabilitation.

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Rehabilitation is regarded as training in the presence of injury, with training aiming to enhance physical qualities to maximize performance, whilst reducing the risk of future reinjury. If physical and mental requirements of performance can be defined it appears logical that the majority of outcomes sort during rehabilitation should align to these. Performance backwards thinking breaks down performance requirements into the specific physical qualities necessary to perform. Once these are established the athlete is assessed (within the constraints of injury) against these requirements, the gap between current status and those requirements then becomes the space progressive rehabilitation interventions will fill to return the athlete to performance. An important aspect of this approach is the separation of rehabilitation goals into those to develop physical qualities of the athlete and those to develop adaptation and so healing of the injured tissue. Often protection of healing tissue is believed to be juxtaposed to athletic development, but these can co-exist. By taking an approach of what can the athlete do (current status) and needs to do (performance goal), whilst simultaneously appreciating what the injured tissue can currently tolerate and eventually needs to tolerate, athletic development can occur whilst the optimal environment for injured tissue adaptation-healing occurs concurrently. This approach at tissue level is reliant on having a clear understanding of how any given task impacts on injured tissue and monitoring that impact for adverse effects, with the aim of gradually increasing the tissues load exposure. Athletic development is enhanced because of the ability to maximize physical quality development towards clearly defined often measurable goals, whilst being assured of its impact on injured tissue, this thorough approach to rehabilitation is also likely to be a key to tertiary prevention. The proposed presentation will demonstrate how this approach is used in the UK Sports Institute.

## Service evaluation of female athlete health and performance clinical service for Olympic and Paralympic athletes at UK Sports Institute

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The UK Sports Institute female athlete health and performance clinical service was developed to meet the recognized need to further understand and support female athletes with specific health concerns in relation to training and performance. The multidisciplinary weekly service provides gold standard clinical support and expertise to all world class funded female athletes with the aim of supporting optimal health and maximizing performance. The service covers a wide spectrum of issues including, but not limited to, menstrual related symptoms affecting training and performance (including relative deficiency in sport), bone health management, pelvic floor and breast health, pregnancy and post-partum, perimenopause/menopause, and psychosocial symptoms adversely affecting health and performance. The aim is to provide sports/athletes with individualized collaborative management approaches in a supportive environment. The weekly clinical service is led by a consultant in Sports and exercise medicine and provides both virtual and face to face appointments feeding into the wider female athlete health performance team as required. Clinical governance of the service has incorporated setting gold standard clinical measures, service evaluation and feedback from athletes, practitioners, and national governing bodies. From August 2023 to April 2024, the clinic has undertaken 141 consultations with 36 athletes from across 22 Olympic and Paralympic sports, totalling 8,500 minutes of consultation time. The most common diagnoses respectively were relative energy deficiency in sport (44%), pregnancy/post-partum care (14%), menorrhagia (11%), dysmenorrhoea (8%), premenstrual syndrome (5%). Athlete feedback demonstrated that 80% felt that their needs had been met and that the service had provided a positive impact on their training and performance.



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Seasonal allergic rhinitis (SAR) is a prevalent disorder in athletic populations, present in approximately 50% of elite endurance athletes. The symptoms arising from SAR impact breathing, sleep quality and recovery and can impair training and competition performance. In preparation for the 2024 Olympic and Paralympic Games, we developed a novel screening questionnaire tool (the Aeroallergy in Athletes [AAA] questionnaire), with the aim of enhancing detection of SAR and to quantify the impact of symptoms, with athlete specific focus. We present provisional data (n=23, 10 = female, age 22 ±5 years), elite athletes within the UK High Performance Sport system describing the development and application of this tool and validity when compared with other questionnaires (e.g. the allergy questionnaire for athletes [AQUA]) and assessment outcomes, as they were completed, contemporaneously, during the UK Sports Institute's systematic assessment of respiratory health in athlete programme (SARAH). The full data will be presented at the Conference, but findings indicate that the AAA questionnaire is a simple questionnaire that acts to detect SAR, but also quantifies the impact of these issues to provide an overall assessment to help shape treatment choice and potentially monitor outcomes.

## Twenty Year Analysis of Men's Rugby Union Knee Injuries from The English Premiership Shows High Rates and Burden

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Rugby Union is a popular collision team sport with high participation rates. Knee injuries have previously been reported as the highest burden injury. Consequently, the objective of this study was to report the rates, severity, and burden of specific knee injuries in professional male rugby union from the English Premiership. Injury and exposure data were captured over 20 seasons using a prospective cohort design. Knee injury incidence, resulting days' absence, and burden were recorded for each injury type, and by pitch surface type in both match and training. The rate of knee injury in matches was 9.8/1000 hours (95% Confidence Intervals (CI): 9.3-10.3). Mean days lost to knee injury was 50 (95%CI: 46-53) in matches and 51 (95%CI: 44-57) in training. In matches, MCL injuries were the most common, while ACL injuries had the highest mean severity and burden. There was no significant change in the incidence of knee injuries over time; however, average severity increased significantly [□: 2.18 days/season (95%CI: 1.60-2.77);  $p < 0.001$ ]. The incidence of match knee injury was 44% higher on artificial pitches than grass pitches [IRR: 1.44 (95%CI:1.21-1.69);  $p < 0.01$ ], with no significant difference in severity between surfaces. In matches, the tackle was the event most commonly associated with knee injuries for all diagnoses, except ACL injuries (running). In training, running was a more common injury event than the tackle. Knee injuries in matches are common and severe in English professional men's rugby union. Despite an increased focus on player conditioning and injury prevention throughout the study period, rates of knee injury remained stable, and days lost to injury increased. Prevention of knee injuries should be considered a priority, given their morbidity and association with post-traumatic osteoarthritis.