

Background Sleep is important to elite athletes as it plays a key role in repair of cellular damage. In recent years, there has been increasing interest in the role of sleep in athletes.

Objectives The aim of this study is to give a systematic overview of what is known about the impact of sleep on sport injuries and injury recovery. The following questions will be addressed: 1. What is the prevalence of sleep disturbances in athletes? 2. What is the impact of sleep on injury risk? 3. What is the relationship between sleep and recovery after training and/or injury? 4. What is the influence of sleep and nutrition on recovery?

Design Systematic review

Methods Screening of PubMed, Web of Science, Cinahl and Cochrane Library on the keywords 'athletic injuries', 'football', 'soccer', 'sleep deprivation', 'fatigue', 'circadian rhythm', 'insomnia', 'rehabilitation', 'recovery', 'prevention' between January 1, 2002 and November 14, 2020; systematic review after assessment for methodological quality.

Results There is strong evidence that athletes in general are at high risk for a poor sleep duration and quality. In contrast to the expectations, most athletes (>85%) are mid-range to morning types and tend to pursue and excel in sports that match their chronotype.

Reduced sleep (<8h) is related with 1.7 more risk of having an injury and a negative effect on recovery after training. There is an increased proinflammatory state, which affects a person's resistance to a simple infectious disease, and may affect an athlete's training capacity and potential.

Sleep is also associated with recovery from injuries. Studies found that sleep affected concussion recovery time and an increased risk of a re-injury during rehabilitation.

Conclusion The importance of sleep remains a main issue in competitive sporters. Training and competition schedules should take sleep into account in order to avoid injuries and prolonged rehabilitation after injury.

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THE ASSOCIATION BETWEEN COVID-19 AND MUSCLE STRAIN INJURY OCCURRENCE IN ELITE SOCCER PLAYERS: A PROSPECTIVE STUDY

¹Evi Wezenbeek, ¹Sander Denolf, ¹Dries Pieters, ^{1,2}Jan Bourgois, ³Renaat Philippaerts, ⁴Bram De Winne, ¹Joke Schuermans, ¹Steven Verstockt, ¹Erik Witvrouw. ¹Ghent University, Ghent, Belgium; ²KAA Ghent, Ghent, Belgium; ³Royal Standard de Liège, Liège, Belgium; ⁴Zulte Waregem, Waregem, Belgium

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Background Because of the high injury rate currently seen in soccer players and the exceptional pandemic circumstances, the question arises to what extent this reported increase in injury incidence is associated with COVID-19.

Objectives The aim of this study was to investigate the association between COVID-19 and muscle strain injury occurrence in elite athletes.

Design A prospective cohort study

Setting During the first half of the 2020–2021 season, injury data was collected by using the UEFA injury card. Assessment of SARS-CoV-2 infection was performed by means of a polymerase chain reaction (PCR) test before each official game.

Patients (or Participants) Three Belgian professional male soccer teams (84 players in total) participated.

Interventions (or Assessment of Risk Factors) Regression analysis was performed to identify the risk of developing a muscle strain injury after SARS-CoV-2 infection.

Main Outcome Measurements Muscle strain injury, COVID-19 diagnosis, quarantine duration.

Results Eighteen players developed a muscle strain injury during the study period (June 2020–January 2021), of which 11 players were diagnosed with COVID-19. Regression analysis showed a significant association between SARS-CoV-2 infection and the development of muscle strain injuries ($p=0.010$). The athletes that developed a muscle strain injury after COVID-19 diagnosis were all injured within the first month (15.71 ± 11.74 days) after sports resumption and showed a longer quarantine duration (14.57 ± 6.50 days) compared to the SARS-CoV-2 infected players that did not develop a muscle strain injury (11.18 ± 5.25 days).

Conclusion This study demonstrated a five-time higher risk to develop a muscle strain injury after a SARS-CoV-2 infection in elite soccer players. Although this should be examined further, it seems possible that short-term detraining effects due to quarantine are associated with a higher risk of muscle strain injury and could possibly be related to lower physical readiness and higher rates of fatigue.

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SAFETY AND RISK AWARENESS FOR HEALTH AND WELLBEING EVALUATION IN ELITE RUGBY: A QUANTITATIVE SURVEY DEVELOPMENT

¹Yanbing Chen, ²Conor Buggy, ¹Seamus Kelly. ¹Institute of Sport and Health, School of Public Health, Physiotherapy and Sports Science, University College Dublin, Dublin, Ireland; ²Centre for Safety and Health at Work, School of Public Health, Physiotherapy and Sports Science, University College Dublin, Dublin, Ireland

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Background Despite the physical, competitive nature of elite athletes and unique features of sport culture, no Occupational Safety and Health (OSH) related measurement instruments exist in sport.

Objective As a part of a wider project focusing on health and safety awareness in elite sport, the purpose of this study was to develop a survey instrument for the evaluation of risk and safety awareness among elite rugby players.

Design Based on an established conceptual framework incorporating OSH theories, the survey was developed by adopting questions from existing validated questionnaires through an iterative process, with the feedback from a multidisciplinary team of experts and pilot test.

Setting Elite division rugby (union) team in Ireland

Participants Players from an elite rugby team in Ireland ($n=50$) participated the advanced pilot test.

Assessment of Risk Factors The key themes include current health outlook, tackle behaviour, awareness of risk acceptance, reasons for risk-taking, and safety consideration for other players.

Main Outcome Measurements The data were imported to SPSS for analysis of survey reliability and validity, such as the adoption of the Kaiser-Meyer-Olkin (KMO) measure.

Results Overall, the survey has a high internal consistency (Cronbach's $\alpha = 0.742$). Some sections require a further factor analysis, such as current health outlook, (KMO <0.823 , $p < 0.001$) and reasons for risk-taking (KMO <0.604 , $p = 0.003$). Some sections indicate the requirement for a larger sample size for further validation, such as safety consideration for other players (KMO <0.48 , $p < 0.001$). The participants' qualitative comments on the viability of customising OSH concepts to sports context was also considered to refine the survey. Most players indicated a better understanding of risks relating to themselves than risks relating to opposition players.

Conclusions Such a survey enables the measuring of athletes' safety and risk awareness level, which could possibly point the way forward for its application in a wider range of sport settings internationally for improving athletes' long-term health and wellbeing.

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KNOWLEDGE OF THE IMPORTANCE OF PROPER TACKLE CONTACT TECHNIQUES DOES NOT TRANSLATE TO PROPER TACKLE CONTACT TECHNIQUE FOR INJURY PREVENTION AND PERFORMANCE

¹Steve den Hollander, ¹Mike Lambert, ^{1,2,3}Ben Jones, ^{1,2}Sharief Hendricks. ¹Division of Exercise Science and Sports Medicine, Department of Human Biology, Faculty of Health Sciences, the University of Cape Town and the Sports Science Institute of South Africa, Cape Town, South Africa, Cape Town, South Africa; ²Institute for Sport, Physical Activity and Leisure, Leeds Beckett University, Leeds, UK, Leeds, UK; ³School of Science and Technology, University of New England, NSW, Australia, Armidale, Australia

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Background In rugby union and sevens, the tackle is the most frequently occurring contact event and carries the greatest risk of causing injury. Proper tackle technique has been shown to reduce the risk of injury during the tackle and increase likelihood of success. As such, national rugby injury prevention programmes aim to provide coaches, trainers and players with knowledge of proper tackle technique. This knowledge is intended to modify players behaviours towards safety in the tackle, and ultimately improve their tackle technique in training and matches.

Objectives To determine the association between knowledge of the importance of proper tackle contact techniques and actual proper tackle contact technique for injury prevention and performance.

Design Cross-sectional study design.

Participants Fifty-three (n=53) academy rugby players participated in this study, and a total of 211 tackles were analysed.

Assessment of Risk Factors Knowledge and attitudes of proper contact technique for injury prevention and performance for both the ball-carrier and tackler were determined using a questionnaire. In training, players performed four ball-carriers into contact and four tackles using a validated tackle drill. Thereafter, technical proficiency for the ball-carrier and tackler were scored using a standardised technical criteria.

Main Outcome Measurements Knowledge and attitude score for proper tackle contact technique for injury prevention and

performance, technical proficiency score for the ball-carrier and tackler.

Results No association was found between player knowledge of the importance of techniques and actual tackle contact technique in training for both injury prevention (tackler $r = -0.02$, $p = 0.90$; ball-carrier $r = -0.26$, $p = 0.06$) and performance (tackler $r = 0.02$, $p = 0.86$; ball-carrier $r = -0.13$, $p = 0.38$).

Conclusions This study reveals the gap between players' declarative knowledge of safe and effective techniques and their procedural knowledge of how to execute proper techniques. This gap supports the argument that injury prevention programmes should not be limited to educational strategies only, and should include practical coaching components.

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HITS IN RUGBY LEAGUE: BETTER NEVER THAN LATE

^{1,2}Declan Patton, ^{1,3}Colin Huber. ¹Center for Injury Research and Prevention, Children's Hospital of Philadelphia, Philadelphia, USA; ²Sport Injury Prevention Research Centre, University of Calgary, Calgary, Canada; ³Department of Bioengineering, University of Pennsylvania, Philadelphia, USA

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Background A late hit in rugby league is when a player is tackled after passing or kicking the ball and is deemed player misconduct by the National Rugby League (NRL). During the 2019 season, the NRL cracked down on late hits as the struck player is typically in a vulnerable position and/or unaware and unable to brace for the impact.

Objective To (1) identify body regions of contact for striking and struck players involved in late hits, (2) compare the anthropometrics of striking and struck players involved in late hits and (3) compare the rate of late hit penalties before and after the crackdown.

Design Descriptive observational study.

Setting NRL 2019 regular season.

Main Outcome Measurements Body regions of contact for striking and struck players as determined by two independent video reviewers and subsequent consensus. Height and weight of striking and struck players as per the NRL player profile. Late hit penalty rate calculated on a per game basis.

Results A total of 29 late hit penalties were identified, most of which involved the shoulder of the striking player (73%) impacting the back (52%) or side (28%) of the struck player. The majority of the striking players were forwards (93%) with a mean height and weight of 1.89 ± 0.05 m and 106.3 ± 5.8 kg, respectively, which were significantly greater ($p < 0.001$) than struck players (mean height, 1.82 ± 0.07 m; mean weight, 91.4 ± 8.4 kg) who were predominantly backs (79%). Before the crackdown, there were 0.12 late hit penalties per game, which increased to 0.18 per game after the crackdown.

Conclusions A typical late hit involved the shoulder of a larger player colliding with the back or side of a smaller player. The rate of late hit penalties increased after a crackdown by the NRL suggesting that referees were more vigilant in penalising late hits.