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The incidence, prevalence, severity, mechanism and body region of injury in elite junior Australian football players: A prospective cohort study over one season

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ABSTRACT

Objectives: To describe the incidence, prevalence, severity, mechanism and body region of injuries in elite junior Australian football (AF) players over one competitive season in order to help inform injury prevention interventions.
Design: Prospective cohort, data collected during the 2014 playing season.
Methods: Player and staff-reported injuries sustained by 562 players from an under-18 state league were entered into an online sports injury surveillance system. An injury was recorded if it led to a missed training session or match. Injury incidence was calculated as the number of injuries per 1000 h of training and competition. Injury severity was defined by the number of days players missed training or competition. Injury mechanism was identified as either contact, non-contact or overuse.
Results: There were 1192 football-related injuries sustained during the season; the majority (n = 1041, 87.3%) were new, occurred during competition (n = 954, 86%) and led to 4–7 missed days in severity (n = 429, 46%). Injury incidence was 37.2 injuries per 1000 h of exposure. Over half of injuries were contact in mechanism (n = 355, 51%). Most injuries were to the lower limb (n = 720, 60%), with the thigh representing the highest proportion of these.
Conclusions: This study provides key information as to the aetiology of injury in this level of competition and provides a stronger foundation from which injury prevention studies could be carried out. Future research is well-placed to develop an understanding of the injury risk factors in the elite junior cohort, whilst also reducing injury risk once players transition to the AFL.

1. Introduction

In order to transition successfully to the Australian Football League (AFL), elite junior Australian football (AF) players need to develop certain physiological characteristics including high jumping ability, running endurance, acceleration and speed[1] and desirable anthropometric characteristics, including optimal power to body weight ratios.[2] Further, players need to be able to win contested possessions and frequently and accurately deliver the ball inside the attacking 50 m zone.[3] Optimal training loads in the absence of injury are required to develop these characteristics and help bridge the gap between elite junior and elite senior (AFL) competitions.[4] Appropriate loading strategies are needed to both develop suitable physical characteristics for performance and to protect against the risk of injury.[5–7] For example, aerobic-running fitness and overall greater body mass are factors that are likely to have a protective effect against injury incidence and severity in AFL players[6] as well as elite junior AF players.[8]

Talent-identified junior AF players are selected into an elite under-16 development program (state academy), from which they then progress to the elite under-18 level.[9] These talent academies were initially established to focus on skill progression and the development of key physical traits,[10] in order to facilitate a pathway to becoming an elite senior (AFL) player. Despite these formalised development structures, young aspiring athletes often play across multiple levels of competition, are involved in other sports and carry out their own self-administered strength and conditioning activities.[11] These extra commitments can add substantially to

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the overall load placed on elite junior AF players[12]; consequently, increasing their risk of negative events such as impaired wellness and injury.[13] Further, players sustaining injuries at the junior level have been identified as being six times more likely to sustain subsequent injuries throughout their career, than players who do not sustain injuries at this level.[14]

The AFL has a standardised injury data collection protocol that has been in place since 1992 in its elite senior players.[15] At the elite junior level of AF, there is no comparable standardised injury data collection protocol and only a small number of studies have reported injury epidemiology.[2,14,16] Across these studies, injury incidence has ranged from 17.1 new injuries per club[17] (14.3 per 1000 h) to 24.3 new injuries per club[8] (20.2 per 1000 h) and 26.2 injuries per 1000 player hours.[18] Appendix A.1 in Supplementary material details the injury incidence across previous elite junior AF studies. In this latter study, match injury incidence (76.6 injuries per 1000 h) was reported as much higher than training injury incidence (3.8 injuries per 1000 h).[18] Injury severity was reported as 3.3 matches missed per injury (95% CI 3.1–3.6).[17] Body contact (67.3% of all injuries)[18] and 'collision with another player' (29.3% of all injuries)[17] were the predominant mechanisms of injury mechanism, with between 67.7%[8] and 72.2%.[17] A previous review highlighted inconsistencies with data reporting across these studies, which partly explains the range in incidence, severity, and mechanism information.[19]

According to the Translating Research into Injury Prevention Practice (TRIPP) framework,[20] there are six stage stages that have been outlined as leading to real-world injury prevention gains. At present, injury prevention efforts have focused on stages 1 (injury surveillance) to 4 (scientific of injury prevention methods/'real world' evidence). In a 2013 review, Chalmers et al.[19] identified five prospective cohort studies on injury surveillance and 12 studies of varying methodological quality that investigate the aetiology and mechanisms of injury and five implementing injury prevention strategies in this level of play. This study highlighted inconsistences with data across the 17 included studies.[19] A number of the key recommendations, specifically related to methodological discrepancies and inconsistencies in data in TRIPP stage 1 studies, still apply five years later.

Establishing standardised injury collection protocols at the elite junior AF level can help to identify the characteristics of players at risk of injuries, and help identify injury risk factors such as previous injury, low cardiovascular fitness and hence increased levels of fatigue later in the game as well as poor jumping technique,[8,14,16] that predispose players to injury. Injury surveillance systems have previously been implemented in some places, e.g. in the South Australian elite junior AF competition,[17] and across different junior age groups in Victoria and New South Wales.[18] Surveillance systems have also been implemented in community AF[21] and, recently, an effort has been made to summarise current data collection, injury definition and reporting practices across professional football codes, including the AFL.[22]

At present, there remain key discrepancies and inconsistencies in establishing the epidemiology of injuries in elite junior AF players.[19] Previous injury surveillance studies in elite junior AF have either used injury definitions that are described as "too broad"[18,23] or "too narrow".[17] The "too broad" definition includes any injury resulting in medical attention, whereas the "too narrow" definition (used by the AFL) only incudes missed matches. Studies using a 'too-broad' definition may involve players reporting their injuries. This may lead to a large amount of data, however, may not have the precision or detail of specific staff-reported injury information.[18] As injury surveillance is a fundamental component of injury prevention research,[20] it is important that these methodological issues are overcome.

Currently there is a major gap in the literature because "too-broad" approach used in most elite junior AF studies does not include minor injuries and so underestimates the number of injuries affecting players at this level, in turn, not providing an accurate picture of the overall injury problem. This may then affect the ability of elite junior aspiring AFL players to develop the physical characteristics identified by other studies[3,9] as required at the more senior level. Previous studies have also not collected clear training exposure data that includes the volumes and intensities – and hence, loads – of training. For these reasons, additional injury surveillance and aetiology (defined as TRIPP stage 1 and 2[20]) research of high power (i.e. large sample size), that captures injury incidence, prevalence, severity, body region and mechanism, is warranted.

The aim of this study was to describe the incidence, prevalence, severity, mechanism and body region of injuries in elite junior Australian football (AF) players over one competitive season in order to help inform injury prevention interventions.

2. Methods

All 12 clubs participating in the 2014 Transport Accident Commission (TAC) Cup, the elite junior AF competition in Victoria, season were invited to participate in the study and nine did so (75% club response). Before participation, informed written consent was obtained from AFL Victoria, team managers from each club, and the players from each participating club. The study was approved by Monash University's Human Research Ethics committee and carried out according to the Declaration of Helsinki protocol.

In order to facilitate maximal capture of the player injury data, injuries were reported by both players themselves and medical staff (club doctors, physiotherapists, accredited exercise physiologists and sports trainers) at their respective clubs. Players from the nine clubs (n = 562, age: 17.7 ± 0.3, range 16–18 years; height: 188.4 ± 7.1, range 176.7–202.7 cm) were invited to use an online monitoring tool of their club's choice to report their injuries (Athletic Logic©, Google Forms©, DropBox©, or club-designed). The season lasted from March until August 2014, with a total in-season duration (not including finals) of 24 weeks. Players were requested to enter information including the date of injury, type of injury, whether this was a new or recurrent injury and severity as measured by the number of days away from training or competition due to injury. These data were crosschecked with the medical and support staff data using Microsoft Excel to check all raw data and formulas for consistency and accuracy.

Physical therapy staff from seven of the nine participating clubs reported player injuries using Sports Medicine Australia's (SMA) Sports Injury Tracker (SIT). The two clubs that did not use SMA's SIT used an injury tracking system that they had previously developed, which integrated with their player monitoring tools. Education was provided to medical (physiotherapy and club doctor) staff at each club using SIT and technical support for its use was provided by SMA Victoria.

Most injuries were entered by club staff members (n = 759, 64%) using SMA's SIT, whereas players entered fewer injuries (n = 433, 36%) with 34 (3%) of injury records identified as duplicated; that is, having complete data for number of injuries, injury severity, mechanism and body region, by both staff and players. Of the 562 players who participated in this study, most (n = 420, 55%) used the project designed system (Google Forms©), followed by a pre-existing cost-based system (Athletic Logic©) (n = 175, 23%).

Definitions of injury type used in this study are consistent with those in previous studies.[24,25] An injury was recorded if the injury event led the player to miss a full training session or match. The number of days that players missed training or competition due

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