Journal of Science and Medicine in Sport 19 (2016) 18–23

Contents lists available at ScienceDirect

Journal of Science and Medicine in Sport

journal homepage: www.elsevier.com/locate/jsams

Original research

Shorter time to first injury in first year professional football players: A cross-club comparison in the Australian Football League

Lauren V. Fortington[a], Jason Berry[b], David Buttifant[c], Shahid Ullah[d], Kathy Diamantopoulou[e], Caroline F. Finch[a,*]

[a] Australian Centre for Research into Injury in Sport and its Prevention (ACRISP), Federation University Australia, Australia
[b] Institute of Sport, Exercise & Active Living (ISEAL), Victoria University, Australia
[c] Carlton Football Club, Australia
[d] Flinders Centre for Epidemiology and Biostatistics, Flinders University, Australia
[e] Monash Injury Research Institute (MIRI), Monash University, Australia

ARTICLE INFO

Article history:
Received 1 July 2014
Received in revised form
19 November 2014
Accepted 13 December 2014
Available online 27 December 2014

Keywords:
Sports injury
Australian football
Injury risk
Game/training load
Survival analysis

ABSTRACT

Objectives: Australian Football League (AFL) players have a high risk of injury. Anecdotally, this injury risk is greater in emerging players (i.e. those in their first year), compared with established players (with 3+ years of experience). This study aimed to conduct the first comparison of injury risk and playing experience in these two player groups across a large number of AFL clubs.
Design: Prospective, cohort.
Methods: Injuries, game participation and training participation were collected weekly by 8 AFL clubs for 61 emerging and 64 established players. Injury incidence rates (IIR) and Cox proportional hazard models for time to first injury, separately for games and training, were computed.
Results: The game IIR was significantly higher for emerging than established players: 45.6 (95% CI: 35.7, 57.6) versus 18.3 (95% CI: 13.1, 24.9) per 1000 game-hours. Emerging players also had a higher training IIR than did the established players: 9.6 (95% CI: 7.6, 11.9) versus 8.9 (95% CI: 7.0, 11.1) per 1000 training-hours. Emerging players were significantly less likely to remain injury free in games than established players (HR = 3.46, 95% CI: 1.27, 9.45). A similar outcome was seen in training sessions, although to a lesser degree (HR = 1.41, 95% CI: 1.19, 1.69).
Conclusions: Despite efforts to modify the playing/training program of emerging players, this group remain at greater risk of injury in games and training sessions, compared with established players. Continued efforts should be made toward understanding reasons for this increased risk to better prevent injury during the early years of a professional football career.

Professional Australian Football League (AFL) players have a high injury risk owing to the fast paced nature of the game, frequent jumping/landing actions, sudden changes in direction and heavy physical contact between players.[1,2] The transition from junior- or sub-elite leagues to the top professional level of AFL involves a substantial increase in training load and physicality in game play.[3] Concern from the AFL Sport Science Association (AFLSSA), with supporting data from the annual AFL injury survey, suggests that new players entering professional club football (<21 years) have a higher rate of injuries compared to more experienced players, particularly over the most recent seven years.[4]

Most players are aged 18–19 years when they are drafted to the AFL. In this age bracket, players may not yet have developed the physical maturity required for professional training and games.[5] A study comparing body composition (including lean body mass, body fat, bone mineral content and bone mineral density) between elite junior (non-professional), young-elite players (professional AFL, 18–20 years) and older-elite players (professional AFL, 21+ years) found little difference between the elite junior and young elite, but significant differences between elite junior and older-elite professionals.[6] The change in physicality is reflected in improved performance outcomes for more senior players, including faster peak running speed,[7] greater upper body strength[8] and higher performance ranking scores.[9] Differences in recovery ability between

* Corresponding author.
E-mail addresses: l.fortington@federation.edu.au (L.V. Fortington), c.finch@federation.edu.au (C.F. Finch).

http://dx.doi.org/10.1016/j.jsams.2014.12.008
1440-2440/

emerging and established players have also been reported recently, through measurement of physiological markers (specifically, creatine kinase plasma levels as a marker of muscle damage).[10] In other words, it appears that during the initial professional elite years, substantial physical adaptation takes place and players develop a greater ability to cope with the demands of a full time professional football program.

A wide range of factors have been investigated in relation to injury risk in AFL players,[11] but knowledge about the relationship between player experience, training/game load and injury risk in AFL is limited. One study reported that first year players missed significantly more games due to injury than did the 3+ year players.[12] In contrast, recent studies have found no higher risk of injury in emerging AFL players from one club,[13,14] or in first year professional soccer players.[15] Given these conflicting findings, and the limited research to date, further investigation of the relationship between playing experience, game/training load and injury risk is required to better identify potential areas for injury prevention in these different groups of players. Therefore, the aim of this study was to compare the probability of remaining injury free across training weeks and in games between a matched number of football players who were playing in their first year of AFL (emerging players) with those who had 3+ years of experience (established players), across a number of AFL clubs.

1. Methods

All 17 AFL clubs from the 2011 season were invited to participate in the study, with 8 clubs agreeing to participate and provide data relating to players' injuries, game participation and training times. The clubs provided data on all 61 emerging players (i.e. 100% of the 8 clubs' emerging players, ranging from 6 to 12 players per club). Clubs also provided data on a corresponding number of established players who had at least 3+ years listed in the AFL and a minimum of 50 games experience ($n = 64$). Established players were listed in term of games experience by each club, and the players who were closest to 50 games were included. In this way, the most experienced, and potentially more resilient, players were avoided to minimize bias.

Data were collected on-site by sports science staff at participating AFL clubs using a protocol developed by the AFLSSA and a standardized data collection Excel spreadsheet. Data reporting was limited to the 2011 regular playing season (i.e. excluded finals rounds) in which each team had two rounds where no game was played (byes), resulting in 22 games over 24 consecutive weeks. Data were recorded by each participating AFL club, linked within players, de-identified and then provided to the independent data analysts for compilation across clubs and analysis.

The SportSafe Australia definition of injury was used which includes all types of damage to the body occurring in competition, training and/or participating in a physical activity.[16] Weeks missed immediately following the injury was used to determine the duration of each injury. There was no information provided on injury recurrence. For this reason, on an individual player basis, if an injury was reported to the same body region in consecutive weeks, it was assumed that this corresponded to the same injury (e.g. the same type of injury reported in weeks 2, 3 and 4 was taken to be one injury of 3 weeks duration). When injuries were separated by more than one week, it was assumed that these were two different injuries irrespective of the type of injury (e.g. if the same injury was reported in weeks 2 and 3 and then again in week 6, this was taken as two injuries – one of 2 weeks duration, the other of 1 week). Computation of injury duration was undertaken manually by the data analyst.

Weekly training hours and game time played across each week were recorded by a club staff member. Exposure was calculated as the product of the total recorded hours, number of players and the number of rounds played:

- Game injury exposure (GIE) = hours of play × number of players × number of rounds played
- Training injury exposure (TIE) = hours of training × number of players × number of rounds played

Game and training injury incidence rates per 1000 h of exposure were calculated as:

- Game injury incidence rate = (number of injuries during games/GIE) × 1000.
- Training injury incidence rate = (number of injuries during training/TIE) × 1000.

Emerging and established players' mean weekly training and game load were compared with Wald chi-square tests generated though general estimating equations with an identity link function, Gaussian residual variation and independent work correlation matrix. Kaplan–Meier (K–M) survival curves were used to illustrate the probability of remaining injury free during games and weekly training hours. A log-rank test was used to compare the survival curves of the two player groups. There was no censoring due to missing data and all time intervals for the survival analysis either terminated at the time of first injury (for injured players) or the end of the game or training session (for non-injured players). Following confirmation of the proportional hazards (PH) assumption, Cox PH models of the time to first injury were used to compare the hazard ratios (and 95% confidence intervals (95% CI)) of injury in emerging and established players. Two sided tests were performed for all analyses and the level of significance set at $P < 0.05$. A 95% confidence interval was reported for the hazard ratios. Statistical analyses were performed using IBM SPSS Statistics Version 20. The Monash University Human Research Ethics Committee approved this study.

2. Results

The 8 participating clubs collectively provided data for a total game and training exposure of 20,874 h. Table 1 shows the number of injured players, number of injuries and injury incidence rates. The overall game injury incidence rate was higher for emerging players than for established players. The overall amount of training time missed through injury was also slightly higher for emerging players than established players.

Figs. 1 and 2 show the probability of remaining injury free in games and training sessions for emerging and established player groups. In the first 40 min of a game, the risk of injury to emerging and established players was similar. However, after 40 min game duration, the curves show that emerging players were increasingly likely to sustain an injury than established players (Fig. 1). Over a full 115 min of game time, the risk of injury was three and a half times higher for emerging players than for established players (HR = 3.46, 95% CI: 1.27, 9.45).

Similarly, after 3 h of accumulated weekly training, emerging players were more likely to be injured than established players (Fig. 2). Overall, the risk of injury in a training week was significantly higher in emerging players than established players (HR = 1.41, 95% CI: 1.19, 1.69).