

2009 Injury Report

Australian Football League

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1 Summary

The AFL has conducted and published an annual injury survey every season since 1992¹⁻³. This is the longest-running sports injury surveillance system in Australia. It is also the longest-running survey in professional sport which is publicly released on an annual basis. This 18th annual AFL Injury Report is updated with injury data from the 2009 season and reveals:

- Overall a higher injury incidence and prevalence in season 2009 compared with season 2008. However, the rate of recurrent injuries dropped in season 2009.
- Continued low rates of knee posterior cruciate ligament (PCL) and head and neck injuries.
- The number one injury in the game remains the hamstring strain. Both incidence and prevalence rates of this injury remain high. Incidence of hamstring injuries increased in 2009.
- Other studies related to the injury survey have reported that interchange use, player speed and tackling have increased parallel to injuries in recent seasons. There appears to be an association between these factors however their likely contribution to the increase in injuries needs to be confirmed.
- The most severe common injury is still the knee anterior cruciate ligament (ACL) tear, with slightly lower rates in season 2009 compared to 2006-08.
- The 'average' status of a club list of 46 players in any given week includes eight players missing through injury. This is an increase from six in 2003-05 and seven in 2006-08.
- Analysis of injuries by age for the last five seasons showed that older players miss more time through hamstring and calf strains and knee cartilage injuries. Younger players miss more time through groin injuries (including osteitis pubis), shoulder instability and leg and foot stress fractures. Overall, older players (30+) miss more time through injury than younger players (<21).
- Recurrence rates for injuries were the lowest on record, with only 10% of injuries recurring from the time of return to the end of the season. This rate has steadily dropped from 20% in 1997. Recurrence rates may reflect more conservative medical decision making and improved treatment and rehabilitation.

2 Introduction

The Australian Football League (AFL, the highest level professional league of Australian football) has commissioned a continuous annual injury surveillance system since 1992. Injury surveillance is now considered to be an important obligation of professional football bodies³⁻⁷. The degree to which injury surveillance is successfully undertaken varies substantially amongst different sports. On a national and International level the AFL injury survey model is highly acclaimed, particularly for the annual public release and consistent methodology⁸.

The first public release of the annual report was following the 1996 injury survey², believed to be the first occasion that a professional sport openly tabled its injury data. The National Football League (NFL) in the USA has conducted an injury surveillance system since the 1980s but does not publicly release its data. Other bodies known to conduct regular injury surveillance (with various degrees of disclosure) include Cricket Australia, the National Rugby League (NRL), the National Collegiate Athletic Association (NCAA), Union of European Football Associations (UEFA) and the Rugby Football Union (RFU).

From 1997 onwards, the definition of an injury has been an “injury or medical condition which causes a player to miss a match”. Weekly player monitoring from 1997 to 2009 inclusive has meant that for this entire thirteen year period, all 16 AFL teams have provided injury details for 100% of cases where conditions have met this injury definition⁸. This level of compliance over such a long period is unmatched in the injury surveillance systems of professional sports worldwide. The consistent methodology has led to annually consistent results.

The AFL has shown a long-term investment in high quality and consistent injury surveillance along with other advanced research. The AFL has also demonstrated willingness to consider and implement rule changes to improve player safety, where necessary.

The injury survey has also had a pivotal position in guiding the AFL Research Board to commission and fund projects that further investigate injuries that are common, severe or increasing in incidence. As the AFL was also the first professional sporting body in Australia to implement a funded research board, it has distinguished itself as the most progressive professional sport in this country with respect to injury research.

It is an ongoing aim of the AFL and the AFL Medical Officers Association (AFLMOA) to achieve the ‘gold’ standard of injury surveillance in Australia and to at least match the best other surveillance systems worldwide.

3 Methods

The methods of the injury survey are now well established and have been previously described in detail^{3,9}, although minor changes to injury category codes are made on an annual basis. Player movement monitoring essentially requires that all clubs define the status of each player each round to be either: (1) playing AFL football (2) playing football at a lower level (3) not playing football due to injury or (4) not playing football for another reason. The injury survey coordinator can cross-check the data provided by each club after the conclusion of the season with the player movement monitoring done in 'real time' during the season, in order to maximise compliance with the injury survey definition. Individual player injury details are not revealed in any report of the injury survey. Player movement monitoring has allowed the injury survey to achieve '100% compliance' for all instances of missed player games in the home and away season since 1997^{3,8}. In 2001 this was extended to include rookie listed players and finals matches.

The definition of an injury for the survey is "any injury or other medical condition that prevents a player from participating in a regular season (home and away) or finals match". All 16 teams provide a record of player status (for all contracted players) for each match (playing, at either AFL or lower level; not playing due to injury; not playing for other reasons). The details for injuries which result in a status of being unable to participate in a match due to injury are then passed on to the injury surveillance coordinator at the end of the season for recording and analysis. These details include diagnosis, which is subsequently coded¹⁰⁻¹¹ and onset of injury. This definition and methodology has been chosen to promote consistency across the sixteen AFL clubs and from season to season⁸. This definition has allowed the injury survey to achieve '100% compliance' for all instances of missed player games since 1997³. It has been suggested that this definition excludes valid injuries which do not cause a player to miss a match¹². However, for a longitudinal study such as the current analysis, if a broader definition was used there may be a concern about changing thresholds for reporting an injury by team medical staff over time⁸.

3.1 Injury Definition

The injury survey has defined an injury as a condition "causing a player to miss a match". This includes illnesses and injuries caused outside football, although these injuries are considered in separate categories when grouped by diagnosis. An injury recurrence is a condition to the same body part on the same side which causes a later bout of missed matches in the season after return to play. The injury definition has been made with the aim of assuring maximum compliance to the survey and has enabled the capture of 100% of defined injury episodes since 1997. As a result the AFL injury survey is one of the few sports injury surveillance systems in use that is highly reliable^{3,8}. Other football codes have defined injuries more broadly^{5-6,12} although none of those injury surveillance systems using broader definitions has been able to demonstrate 100% compliance.

3.2 Injury Categories

Injury categories are amended slightly on an annual basis depending on which specific diagnoses (using OSICS codes version 9¹¹) are included within each category. Where changes have been made they have been made retrospectively for all previous survey years. Therefore, some of the category data presented in this report for previous years varies slightly from what is apparently the same data that has been published before in the previous reports.

3.3 Injury Rates

The major measurement of the number of injuries occurring is seasonal injury incidence measured in a unit of new injuries per club per season (where a club is defined as 40 players and a season is defined as 22 rounds).

The major measurement of the amount of playing time missed through injury is injury prevalence measured in a unit of missed games per club per season, or alternatively percentage of players unavailable through injury.

The recurrence rate is the number of recurrent injuries expressed as a percentage of the number of new injuries. A recurrent injury is an injury in the same injury category occurring on the same side of the body in a player during the same season. Therefore, by this definition, an injury of one type that recurred the following season was defined as a new injury in that next season.

All injury rates are adjusted to account for differing player list sizes and number of matches per club in each season, so that the injury rates reported each season represent a hypothetical club with 40 listed players participating in 22 matches. The actual number of injuries per club is slightly higher than the averages listed in the various tables, as there are generally slightly over 40 players per club list and, with finals included, the average club plays slightly more than 22 matches per season.

4 Results

Key indicators for the past twelve years are shown in Table 1. The injury incidence (number of new injuries per club per season) for 2009 was the highest (37.6 new injuries per team per season) it has been since the year 2000. Injury prevalence was the highest it has been since 1997 and continued the upward trend since 2003. Despite these increases, the rate of recurrent injuries (3.6 per team per season or 10%) was the lowest reported in the 18 years of the injury survey.

Other related studies have found that the increases in injury incidence each year since 2006 and injury prevalence each year since 2005 have paralleled significant increases in the use of the interchange and subsequent increases in the average speed of players and tackling during this period. There appears to be an association between these factors however their likely contribution to the increase in injuries needs to be confirmed

Table 1 – Key indicators for all injuries over the past thirteen seasons

All injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Incidence (new injuries per club per season)	41.9	40.3	36.9	37.4	35.8	34.4	34.1	34.8	35.3	34.1	34.7	36.9	37.6
Incidence (recurrent)	8.4	7.6	5.2	5.9	5.5	4.4	4.6	3.7	4.8	4.1	5.6	5.4	3.6
Incidence (total)	50.3	47.9	42.1	43.3	41.3	38.7	38.7	38.5	40.1	38.2	40.4	42.3	41.2
Prevalence (missed games per club per season)	159.2	141.9	135.9	131.8	136.4	134.7	118.7	131.0	129.2	139.5	147.5	147.0	151.1
Average injury severity (number of missed games)	3.8	3.5	3.7	3.5	3.8	3.9	3.5	3.8	3.7	4.1	4.2	4.0	4.0
Recurrence rate	20%	19%	14%	16%	15%	13%	14%	11%	14%	12%	16%	13%	10%

4.1 Injury Incidence

Table 2 (on the following page) details the incidence of the major injury categories. From 1997, the compliance of the survey has been 100% for those conditions causing players to miss games. Notable findings to report for injury incidence in 2009 include a continuation of the high rates for hamstring and quadriceps strains. Shoulder injuries and ACL injuries fell from 2008 to 2009.

Table 2 – Injury Incidence (new injuries per club per season)

Body area	Injury type	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	10yrA
Head/ neck	Concussion	0.6	0.7	0.7	0.3	0.3	0.7	0.3	0.3	0.4	0.5	0.5
	Facial fractures	0.7	0.4	0.4	0.6	0.8	0.6	0.3	0.4	0.2	0.5	0.5
	Neck sprains	0.2	0.1	0.0	0.0	0.1	0.2	0.3	0.1	0.2	0.1	0.1
	Other head/neck injuries	0.1	0.3	0.2	0.3	0.2	0.1	0.2	0.2	0.1	0.1	0.2
Shoulder/ arm/ elbow	Shoulder sprains and dislocations	0.7	1.1	0.9	1.3	1.0	1.4	1.6	1.0	1.8	1.3	1.2
	A/C joint injuries	1.3	0.9	1.1	0.3	1.1	0.8	1.2	0.8	0.7	0.5	0.9
	Fractured clavicles	0.5	0.3	0.3	0.2	0.6	0.3	0.3	0.3	0.1	0.2	0.3
	Elbow sprains or joint injuries	0.1	0.2	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.2	0.1
	Other shoulder/ arm/elbow injuries	0.5	0.5	0.8	0.5	0.4	0.6	0.3	0.2	0.3	0.1	0.4
Forearm/ wrist/ hand	Forearm/wrist/hand fractures	1.4	0.8	1.1	0.8	1.1	1.3	1.1	0.9	1.2	1.1	1.1
	Other hand/wrist/ forearm injuries	0.5	0.3	0.4	0.7	0.4	0.3	0.3	0.6	0.4	0.4	0.4
Trunk/ back	Rib and chest wall injuries	0.8	0.4	0.9	0.8	0.7	0.4	1.0	0.4	0.7	0.3	0.7
	Lumbar and thoracic spine injuries	2.2	1.4	0.9	0.8	1.6	2.1	1.5	1.3	1.5	1.4	1.5
	Other buttock/back/ trunk injuries	0.8	0.5	0.4	0.5	0.6	0.4	0.6	0.5	0.7	0.5	0.6
Hip/ groin/ thigh	Groin strains/osteitis pubis	3.0	3.5	3.8	2.9	3.1	2.9	3.3	4.1	3.2	3.2	3.3
	Hamstring strains	5.6	6.0	4.4	5.7	6.3	5.2	6.4	6.7	6.6	7.1	6.0
	Quadriceps strains	2.0	1.6	1.7	2.0	1.9	1.9	1.7	1.8	1.8	2.2	1.9
	Thigh and hip haematomas	1.1	0.6	1.0	0.3	1.1	1.0	1.1	0.6	0.5	1.0	0.8
	Other hip/groin/thigh injuries, including hip joint	0.3	0.3	0.3	0.4	0.3	0.2	0.3	0.8	0.8	1.0	0.5
Knee	Knee ACL	0.5	0.9	0.8	0.6	0.5	0.6	1.0	0.7	0.9	0.6	0.7
	Knee MCL	0.9	1.2	0.9	1.0	0.7	1.0	0.8	1.4	1.3	0.7	1.0
	Knee PCL	0.5	1.0	0.4	0.5	0.7	0.4	0.3	0.2	0.3	0.3	0.4
	Knee cartilage	1.2	1.9	1.3	1.7	1.2	1.3	1.0	1.2	1.7	1.9	1.4
	Patella injuries	0.2	0.2	0.4	0.1	0.1	0.3	0.3	0.3	0.2	0.2	0.2
	Knee tendon injuries	0.7	0.5	0.8	0.7	0.4	0.7	0.4	0.3	0.3	0.5	0.5
	Other knee injuries	1.3	0.8	0.5	0.7	0.7	0.9	0.2	0.8	1.0	1.0	0.8
Shin/ ankle/ foot	Ankle joint sprains, including syndesmosis sprains	2.7	2.0	2.5	2.6	2.5	2.5	2.1	2.2	2.5	2.6	2.4
	Calf strains	1.9	1.6	2.2	1.6	0.9	1.9	1.6	1.2	2.0	1.3	1.6
	Achilles tendon injuries	0.4	0.2	0.4	0.4	0.2	0.3	0.3	0.4	0.6	0.6	0.4
	Leg and foot fractures	0.6	1.0	0.8	0.5	0.5	0.4	0.7	0.5	0.5	1.0	0.7
	Leg and foot stress fractures	0.5	0.9	0.7	0.9	0.9	0.9	1.1	1.1	0.9	0.9	0.9
	Other leg/foot/ankle injuries	1.3	1.7	0.8	1.5	1.7	1.3	1.5	1.3	1.1	1.5	1.4
Medical	Medical illnesses	1.9	1.8	2.3	2.4	2.0	2.2	0.7	1.9	2.1	2.9	2.0
Non-football injuries		0.2	0.2	0.3	0.4	0.1	0.1	0.2	0.2	0.3	0.1	0.2
NEW INJURIES / CLUB / SEASON		37.4	35.8	34.4	34.1	34.8	35.3	34.1	34.7	36.9	37.6	35.5

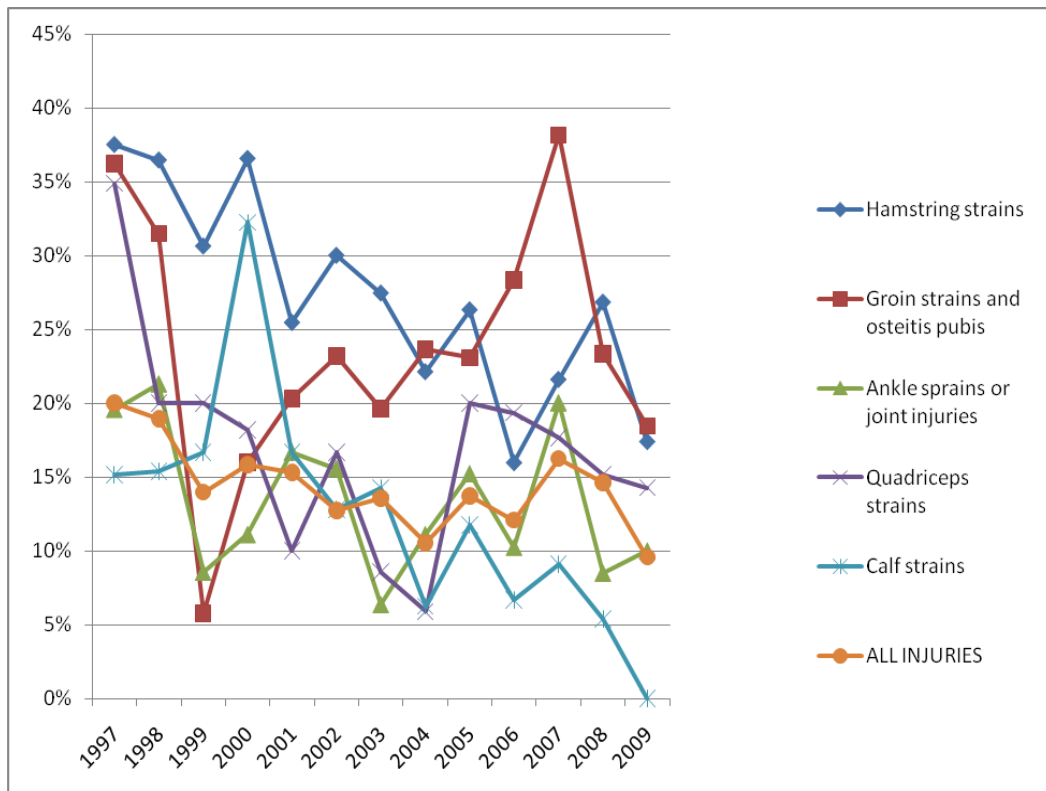
4.2 Injury Recurrence

Table 3 and Figure 1 show the rate of recurrence of some of the common injury types, particularly muscle strains which have a comparatively high recurrence rate. Most contact-mechanism injuries, such as fractures, concussions and ‘cork’ injuries have a low recurrence rate. The rate of injury recurrence has been showing a fairly steady decline over the last 10 years, with all of the common muscle strains showing a steady decline in recurrence rate¹³. Across the board there has been a trend for team medical staff to be more conservative with injury management (slower return to play and fewer recurrences).

Table 3 – Recurrence rates (recurrent injuries as a percentage of new injuries)

Recurrence rates	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Hamstring strains	38%	36%	31%	37%	25%	30%	27%	22%	26%	16%	22%	25%	17%
Groin strains and osteitis pubis	36%	31%	6%	16%	20%	23%	20%	24%	23%	28%	38%	20%	19%
Ankle sprains or joint injuries	20%	21%	9%	11%	17%	16%	6%	11%	15%	10%	20%	9%	10%
Quadriceps strains	35%	20%	20%	18%	10%	17%	9%	6%	20%	19%	18%	15%	14%
Calf strains	15%	15%	17%	32%	17%	13%	14%	6%	12%	7%	9%	5%	0%
All injuries	20%	19%	14%	16%	15%	13%	14%	11%	14%	12%	16%	13%	10%

Figure 1 – Recurrence rates (recurrent injuries as a percentage of new injuries)



4.3 Weekly player status and injury prevalence

Table 4 details player status on a weekly basis over the past ten seasons. The 'average' status of a club list of 46 players in any given week for 2009 was:

- 35 players playing football per week, 22 in the AFL;
- 8 missing through injury; and
- 3 missing through other reasons (such as suspension, being used as a travelling emergency, team bye in a lower grade, etc).

The increased injury prevalence over the past three years appears to be mainly related to increased injury severity (number of weeks that players miss per injury) rather than an increase in injury incidence.

Table 4 – Average weekly player status by season

All injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Playing AFL	21.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Playing lower grade football	11.8	11.4	11.4	11.3	12.9	12.1	12.0	11.9	12.2	11.8	11.9	11.7	12.8
<i>TOTAL playing</i>	32.8	33.4	33.4	33.3	34.9	34.1	34.0	33.9	34.2	33.8	33.9	33.7	34.8
Not playing because of injury	7.7	6.7	6.4	6.2	6.7	6.6	5.7	6.4	6.4	7.0	7.4	7.4	7.9
Not playing for other reasons	1.9	1.6	1.8	1.8	1.8	2.3	2.5	2.5	2.8	3.1	2.9	3.4	3.4
<i>TOTAL not playing</i>	9.6	8.3	8.3	8.0	8.5	8.9	8.2	8.9	9.1	10.1	10.4	10.8	11.4
<i>Players in injury survey (per club)</i>	42.3	41.7	41.7	41.4	43.4	43.0	42.2	42.8	43.3	43.9	44.2	44.6	46.1
<i>Injury prevalence (%)</i>	18.1%	16.1%	15.4%	15.0%	15.5%	15.3%	13.5%	14.9%	14.7%	15.9%	16.8%	16.7%	17.2%

Table 5 (on the following page) details the amount of missed playing time attributed to each injury category. Hamstring injuries remain the number one injury in the game with respect to missed playing time, surpassing both groin injuries and knee anterior cruciate ligament (ACL) injuries. Based on injury prevalence (missed playing time), these three categories are consistently the highest categories for injury prevalence. However, the prevalence of all three of these injury categories was slightly below the long-term average in 2009.

Shoulder injuries showed a decrease in the amount of lost playing time in 2009 compared to 2008, although this was still above the long-term average. There was a higher than usual prevalence of leg and foot stress fractures in 2009.

Table 5 – Injury Prevalence (missed games per club per season)

Body area	Injury type	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	10yrA
Head/ neck	Concussion	0.7	1.3	2.0	0.6	0.3	0.9	0.3	0.3	0.5	0.7	0.8
	Facial fractures	2.0	1.3	1.4	1.0	2.2	1.4	0.8	0.7	0.5	1.1	1.2
	Neck sprains	0.3	0.2	0.0	0.0	0.6	0.3	0.3	1.1	1.1	0.1	0.4
	Other head/neck injuries	0.8	1.5	0.2	0.7	0.2	0.2	1.1	1.6	0.1	0.3	0.7
Shoulder/ arm/ elbow	Shoulder sprains and dislocations	4.0	5.4	5.9	5.7	5.9	7.7	10.8	6.4	10.2	7.7	7.0
	A/C joint injuries	3.1	2.1	2.4	0.7	2.5	1.9	2.7	1.4	1.5	1.2	1.9
	Fractured clavicles	3.0	1.6	2.0	1.0	3.5	1.3	1.7	1.8	1.1	0.6	1.8
	Elbow sprains or joint injuries	0.1	0.4	0.3	0.4	0.7	0.4	0.7	0.8	0.5	1.5	0.6
	Other shoulder/ arm/elbow injuries	1.3	1.3	3.4	1.6	1.6	2.4	1.7	0.7	0.7	1.0	1.6
Forearm/ wrist/ hand	Forearm/wrist/hand fractures	5.6	2.7	3.1	2.5	3.9	3.8	4.3	2.3	3.2	4.8	3.6
	Other hand/wrist/ forearm injuries	1.4	0.3	2.2	2.9	1.2	1.2	0.5	3.1	1.4	0.8	1.5
Trunk/ back	Rib and chest wall injuries	1.3	0.7	1.5	1.7	1.3	0.6	2.2	1.9	1.3	0.6	1.3
	Lumbar and thoracic spine injuries	8.4	5.6	5.8	2.1	5.4	6.4	5.4	2.8	5.0	4.6	5.1
	Other buttock/back/ trunk injuries	2.6	1.5	1.6	1.6	2.3	0.7	1.3	1.7	1.3	1.2	1.6
Hip/ groin/ thigh	Groin strains/osteitis pubis	7.5	13.6	15.7	13.7	13.3	11.2	14.0	18.0	12.4	11.6	13.1
	Hamstring strains	22.4	21.3	15.6	18.6	21.6	18.6	21.8	24.3	25.8	22.0	21.2
	Quadriceps strains	5.6	3.8	4.3	6.0	4.2	6.4	5.5	5.6	6.5	8.6	5.7
	Thigh and hip haematomas	1.8	0.6	1.9	0.5	1.7	1.6	1.4	1.0	0.6	1.2	1.2
	Other hip/groin/thigh injuries, including hip joint	1.4	1.7	1.2	1.5	2.6	1.0	2.3	4.5	3.4	6.9	2.6
Knee	Knee ACL	4.8	13.6	15.3	10.8	10.1	9.3	15.3	15.9	15.3	11.1	12.2
	Knee MCL	3.5	4.8	2.8	2.9	2.9	3.0	1.7	4.7	4.0	2.3	3.3
	Knee PCL	2.3	5.9	2.3	2.0	6.5	2.7	1.8	1.6	2.2	1.2	2.8
	Knee cartilage	8.6	12.5	6.0	7.0	6.1	7.8	5.7	9.1	8.9	10.7	8.2
	Patella injuries	1.8	0.8	2.5	0.6	0.1	0.8	1.2	2.7	1.0	1.8	1.3
	Knee tendon injuries	3.9	2.5	3.7	2.9	0.9	2.6	1.8	0.7	1.1	0.8	2.1
	Other knee injuries	3.6	2.5	1.0	2.4	1.3	3.8	0.2	2.6	2.7	2.6	2.3
Shin/ ankle/ foot	Ankle joint sprains, including syndesmosis sprains	6.8	4.3	5.9	5.3	6.4	9.2	8.1	7.1	7.0	8.9	6.9
	Calf strains	5.7	3.4	4.4	3.8	1.7	4.5	3.4	3.1	4.3	3.0	3.7
	Achilles tendon injuries	1.6	0.7	0.9	1.5	0.8	1.9	2.1	2.2	4.1	2.2	1.8
	Leg and foot fractures	4.6	7.0	7.9	2.9	3.7	2.7	5.7	2.7	3.2	7.5	4.8
	Leg and foot stress fractures	3.8	4.4	3.9	5.3	6.3	5.1	8.2	6.8	7.3	11.0	6.2
	Other leg/foot/ankle injuries	3.9	4.2	2.3	3.7	4.3	4.2	4.1	4.2	4.6	6.8	4.2
Medical	Medical illnesses	2.8	2.6	2.9	3.8	4.2	3.6	0.7	3.1	3.5	3.7	3.1
Non-football injuries		0.6	0.3	2.4	1.0	0.4	0.1	0.5	1.0	0.7	0.9	0.8
MISSSED GAMES / CLUB / SEASON		131.8	136.4	134.7	118.7	131.0	129.2	139.5	147.5	147.0	151.1	136.7

4.4 Analysis and discussion for significant injury categories

(a) Hamstring injuries

Hamstring injuries are the most common injury in the AFL and are responsible for the highest number of matches missed through injury³. 2009 recorded the highest incidence on record and a furthering of the upward trend in incidence since 2005.

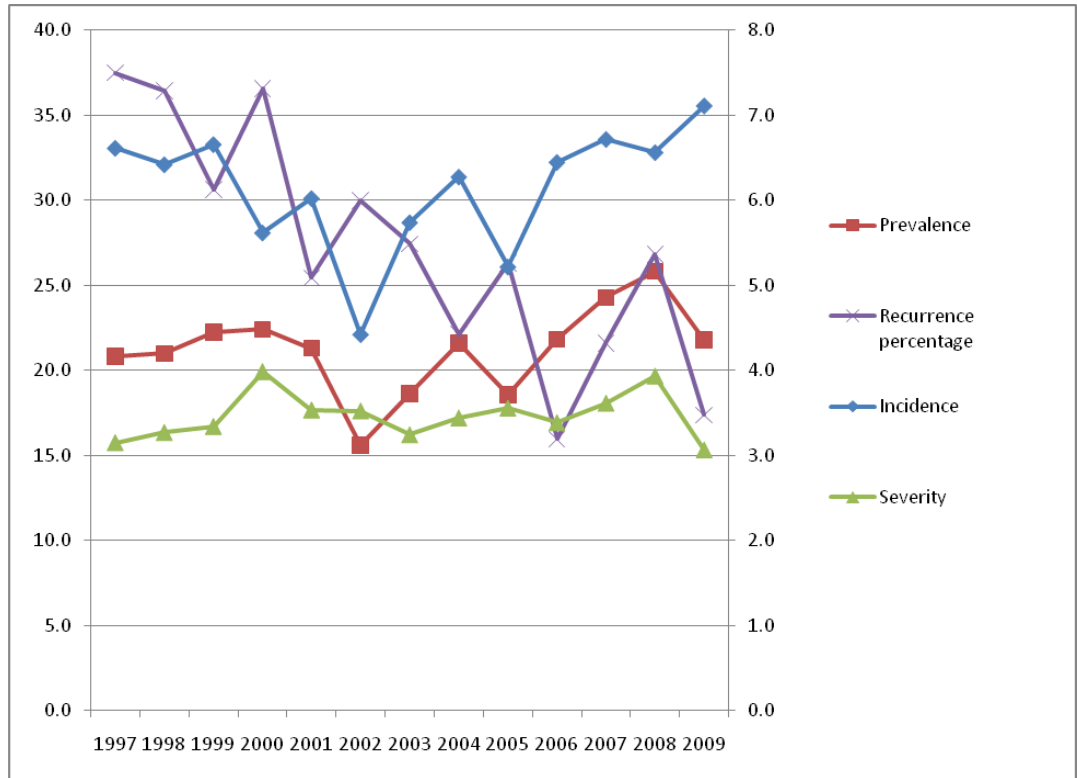
Hamstring injuries can occur acutely from a high intensity event (as per the 100m sprinter tearing the muscle after 40m of running) and also as a gradual onset ‘overuse’ injury with specific onset being difficult to isolate. The majority of hamstring injuries in Australian football occur in matches although some occur during training sessions or by other means. Known risk factors include player age, past history of hamstring injury, strength deficits, indigenous race and past history of other injury (including calf, knee, ankle and groin injuries)¹⁴⁻¹⁷.

Previous analysis of hamstring and other muscle strain data shows a high rate of recurrence^{13 15 17-22}. The current AFL data shows that management of these injuries has become more conservative over the last twelve years in the AFL, with recurrence tending to decrease but prevalence and severity tending to increase (Figure 2). This change in management strategy has possibly been led by research showing that recurrence rates remain high for many weeks after the initial injury¹⁸ and that performance of players is often decreased in the matches soon after return from hamstring strain²². Hamstring injuries are known to affect older players and those with a past history of injury more often^{13 15 17-22} than other players.

Table 6 – Key indicators for hamstring strains over the past thirteen seasons

Hamstring injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Incidence	6.6	6.4	6.7	5.6	6.0	4.4	5.7	6.3	5.2	6.4	6.7	6.6	7.1
Prevalence	20.9	21.0	22.3	22.4	21.3	15.6	18.6	21.6	18.6	21.8	24.3	25.8	22.0
Severity	3.2	3.3	3.3	4.0	3.5	3.5	3.2	3.4	3.6	3.4	3.6	3.9	3.1
Recurrence rate (%)	38	36	31	37	25	30	27	22	26	16	22	27	17

Figure 2 – Key indicators for hamstring strains over the past thirteen seasons



(b) Knee ligament injuries

The two major knee ligament injuries show continuing divergent trends, with posterior cruciate ligament (PCL) injury rates decreasing in recent years but anterior cruciate ligament (ACL) injury prevalence slightly increasing (Table 7). There was a continuation of the low rates of PCL injuries since the introduction of the centre circle rule. Table 7 shows that there were only six reported PCL injuries in season 2009, and although one of these did occur at centre bounce ruck duels, there have been few injuries from this reported mechanism since 2005. There has certainly been a long-term decline in the incidence and prevalence of PCL injuries.

Knee ACL injury incidence has been generally steady over the past few seasons (Table 7). However ACL injury prevalence (time missed due to these injuries) has increased over the past few seasons. This is in keeping with the trend observed with other injuries that players are being managed more conservatively (that is, staying out of the game for longer following their initial injury). Future injury reports and further study may be able to document the effect, if any, of newer ACL reconstruction techniques such as the LARS ligament.

Table 7 – Key indicators for major knee ligament injuries over the past thirteen seasons

Knee ligament injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
PCL incidence	0.6	0.3	0.7	0.5	1.0	0.4	0.5	0.7	0.4	0.3	0.2	0.3	0.3
PCL prevalence	1.9	2.2	5.2	2.3	5.9	2.3	2.0	6.5	2.7	1.8	1.6	2.2	1.2
PCL severity	3.3	7.4	7.2	4.8	5.9	5.9	4.4	9.0	7.0	6.8	9.7	8.2	3.8
Number of centre bounce PCL injuries (compared to total injuries)	0/10	2/5	3/12	4/8	4/18	3/7	2/8	5/13	1/7	0/5	0/3	2/5	1/6
ACL incidence	1.2	0.8	0.7	0.5	0.9	0.8	0.6	0.5	0.6	1.0	0.7	1.0	0.6
ACL prevalence	19.8	15.8	10.8	4.8	13.6	15.3	10.8	10.1	9.3	15.3	15.9	15.3	11.1
Number of graft ruptures (compared to total ACL injuries)	3/21	2/15	0/8	1/8	1/17	4/15	0/11	2/9	1/10	4/19	2/13	4/17	1/13

(c) Head and neck injuries

Table 8 shows consistently low incidence and prevalence for head and neck injuries (combined) over the past decade. Season 2008 reported both the lowest incidence and prevalence of head and neck injuries since the survey commenced, with the prevalence figures similar in 2009 to 2008. This suggests that reduced tolerance of head-high contact and stricter policing of dangerous tackles along with the introduction of rules to penalise a player who makes forceful contact to another player with his head over the ball has contributed to these positive trends. The reduced tolerance of head-high contact relates to the AFL Player Rules and Tribunal Guidelines regarding rough conduct which stipulate that players are liable for head high contact caused by a bump where the player laying the bump had a realistic alternative to either contest the ball or tackle.

Table 8 – Key indicators for head and neck injuries over the past thirteen seasons

Head & neck injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Incidence	1.8	1.6	1.6	1.6	1.5	1.2	1.2	1.4	1.6	1.0	0.9	0.9	1.1
Prevalence	4.1	3.5	4.6	3.8	4.2	3.7	2.2	3.3	2.7	2.5	3.7	2.2	2.2
Severity	2.3	2.2	3.0	2.3	2.9	3.0	1.8	2.4	1.7	2.6	4.0	2.6	1.9

(d) Shoulder injuries

Table 9 shows a slight but steady increase in the rates of shoulder injuries over the past thirteen years, with the exception of recurrence rates which are falling. It is possible that the increased number and ferocity of tackles during this period has contributed to the increased risk of shoulder injury. The increasing speed of the game may be a contributing factor and this relationship is currently being investigated with a project funded through the AFL Research Board.

However, the observed data are also consistent with the notion that perhaps players and some teams are electing in certain circumstances to end a player's season early to undertake shoulder reconstructive surgery. Unlike knee reconstructions, shoulder reconstructions can often be delayed until the end of the season. However, the recommended six month recovery time after a shoulder reconstruction would tend to lead to a delayed start for the following season. There is a possibility that there is a greater tendency for teams to end a player's season somewhat earlier which is impacting on the observed rates of shoulder injury.

Table 9 – Key indicators for shoulder injuries over the past thirteen seasons

Shoulder sprains & dislocations	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Incidence	1.0	0.9	0.7	0.7	1.1	0.9	1.3	1.0	1.4	1.6	1.0	1.8	1.3
Prevalence	5.3	5.9	5.6	4.0	5.4	5.9	5.7	5.9	7.7	10.8	6.4	10.2	7.7
Severity	5.3	6.5	8.5	5.6	4.9	6.7	4.4	5.9	5.6	6.7	6.3	5.8	5.7
Recurrence rate	12%	13%	27%	17%	10%	13%	9%	11%	20%	13%	16%	9%	12%

(e) Groin injuries

Groin injuries (including osteitis pubis) are consistently one of the three injury categories that cause the most missed playing time in the AFL. As a group, groin injuries represent a number of overlapping diagnoses, including adductor muscle strains, tendinopathy, osteitis pubis and sports hernias. In general these injuries have a high rate of recurrence and a high rate of becoming chronic. Incidence appears to be quite constant from season to season (3-4 new injuries per club per season) but prevalence (missed playing time) and recurrence rates vary from season to season.

Table 10 – Key indicators for groin injuries over the past thirteen seasons

Groin injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Incidence	4.1	3.2	3.1	3.0	3.5	3.8	2.9	3.1	2.9	3.3	4.1	3.2	3.2
Prevalence	17.4	13.6	9.4	7.5	13.6	15.7	13.7	13.3	11.2	14.0	18.0	12.4	11.6
Severity	4.3	4.2	3.0	2.5	3.9	4.1	4.8	4.4	3.9	4.3	4.4	3.9	3.6
Recurrence rate	36%	31%	6%	16%	20%	23%	20%	24%	23%	28%	38%	23%	19%

4.5 Analysis of injury prevalence by player age and experience

Previous studies have shown that hamstring and calf injuries are more common in older players in the AFL. Earlier study has suggested that groin injuries do not affect older or younger players more often, although there has been a perception in recent years that younger players are more susceptible to osteitis pubis.

Table 11 (on the following page) confirms that, over the last five seasons, the player age group most susceptible to missing time through injury has been the 30+ age group. The excess injury risk in older players is explained particularly by hamstring and calf strains, along with knee cartilage injuries. Younger players, particularly first year players, are in contrast susceptible to groin injuries (including osteitis pubis), stress fractures and shoulder injuries. Despite the increased risk due to these injuries, because of the lower risk of knee cartilage injuries and hamstring and calf strains, a younger player is still less prone to missing time through injury than an older player.

Table 11 – Injury prevalence (missed games per club per season) 2005-2009 by age

Body area	Injury type	First year players	Non-first year	Age <21	21-23	24-26	27-29	Age 30+
Head/neck	Concussion	0.9	0.5	0.6	0.6	0.6	0.2	0.4
	Facial fractures	0.8	0.9	1.1	0.8	0.5	1.6	0.0
	Neck sprains	0.1	0.7	0.2	0.0	1.3	0.5	3.2
	Other head/neck injuries	0.3	0.7	0.8	0.5	0.1	1.2	0.8
Shoulder/arm/elbow	Shoulder sprains and dislocations	13.7	7.6	11.8	9.9	4.7	2.5	5.3
	A/C joint injuries	0.8	1.9	1.6	2.5	1.9	0.8	0.2
	Fractured clavicles	3.0	1.0	1.8	1.1	0.6	0.1	3.2
	Elbow sprains or joint injuries	1.7	0.6	0.7	1.5	0.2	0.1	1.3
	Other shoulder/arm/elbow injuries	1.4	1.3	1.2	1.4	1.2	1.8	1.1
Forearm/wrist/hand	Forearm/wrist/hand fractures	4.6	3.5	4.6	3.7	3.0	1.1	5.0
	Other hand/wrist/ forearm injuries	1.2	1.4	0.9	1.7	1.3	1.9	2.9
Trunk/back	Rib and chest wall injuries	1.2	1.3	1.0	0.9	1.2	1.5	5.5
	Lumbar and thoracic spine injuries	7.8	4.2	5.6	4.6	3.3	4.7	5.9
	Other buttock/back/trunk injuries	0.7	1.3	1.1	1.1	1.7	1.1	1.7
Hip/groin/thigh	Groin strains/osteitis pubis	24.7	11.2	18.6	10.7	8.3	10.6	12.8
	Hamstring strains	18.6	23.3	20.0	23.2	22.5	25.4	31.3
	Quadriceps strains	10.2	5.8	9.5	5.6	3.3	6.0	2.3
	Thigh and hip haematomas	1.7	1.0	1.4	1.2	0.6	0.7	1.7
	Other hip/groin/thigh injuries, including hip joint	3.9	3.6	4.7	2.2	2.3	3.2	8.8
Knee	Knee ACL	8.5	14.4	10.3	14.8	20.0	10.7	11.6
	Knee MCL	1.6	3.4	2.7	4.1	2.8	3.5	2.3
	Knee PCL	0.3	2.2	1.2	1.6	2.6	2.6	3.6
	Knee cartilage	4.3	9.3	4.4	8.3	11.3	11.5	21.7
	Patella injuries	0.6	1.7	1.3	0.5	1.4	4.9	1.1
	Knee tendon injuries	1.2	1.4	1.3	0.9	0.9	3.3	1.9
	Other knee injuries	1.6	2.5	3.1	1.7	2.7	1.5	1.3
Shin/ankle/foot	Ankle joint sprains, including syndesmosis sprains	7.5	8.2	7.9	8.7	7.0	8.5	8.8
	Calf strains	1.7	4.0	1.6	3.0	4.3	6.5	13.5
	Achilles tendon injuries	1.1	2.7	0.5	1.4	4.4	5.6	7.8
	Leg and foot fractures	5.1	4.3	5.2	5.0	2.8	3.6	2.9
	Leg and foot stress fractures	10.5	7.2	9.2	7.8	7.5	4.8	3.6
	Other leg/foot/ankle injuries	4.3	4.9	4.5	5.0	3.1	9.4	2.3
Medical	Medical illnesses	3.2	2.8	3.4	2.7	2.5	3.2	1.7
MISSED GAMES / CLUB / SEASON		148.9	141.1	144.1	138.6	131.8	144.7	177.8

5 Conclusion

Head and neck injuries and knee PCL injuries have been reducing in incidence in recent years following the introduction of the centre circle rule, a reduced tolerance of head-high contact and stricter policing of dangerous tackles enacted through the Laws of Australian Football and the AFL Tribunal.

There have been increases since 2007 in the incidence and prevalence of the most significant non-contact soft tissue injuries such as hamstring and groin strains. These increases have paralleled significant increases in the use of the interchange and subsequent increases in the average speed of players during this period. The potential impact of increased rates of interchange on these injury rates is the subject of further investigation. There appears to be an association between these factors however their likely contribution to the increase in injuries needs to be confirmed

In terms of general injury statistics, there has been an increase in *incidence* (new injuries per club per season) and *prevalence* (missed games per club per season) in recent seasons. There has also been a gradual lowering of recurrence rates, with 2009 showing the lowest recurrence rates reported. This decrease in recurrence is likely due to a more conservative and skilled approach by clubs.

The AFL injury profile continues to be consistently defined and published in sports medicine scientific literature and in public media releases^{3,9,23-24}. The average playing list includes eight players unavailable through injury in any given week which has risen from previous years. Hamstring injuries, knee ACL injuries and groin injuries (including osteitis pubis) are consistently the most prevalent injuries in AFL players.

Historically, the AFL injury survey is the world's longest running publicly-released injury survey in sport, having run for 18 seasons and achieving 100% participation and compliance over the last 13 seasons. It defines an injury as a 'condition which causes a player to miss a game' striking a balance which has enabled comprehensive analysis without sacrificing compliance⁸. The survey has led directly and indirectly to dozens of published studies^{3,9,25-31} and interventions which have improved the safety of the AFL competition (e.g. ruck rule changes to decrease PCL injuries).

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