Injury Report 2008

Australian Football League

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Authors: **Assoc Prof John Orchard**
Adjunct Associate Professor, University of Sydney

Dr Hugh Seward
Executive Officer, AFL Medical Officers Association

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1 Summary

The AFL has conducted and published an annual injury survey every season since 1992 [1-3]. This is the longest-running sports injury surveillance system in Australia and is believed to be the longest-running survey in professional sport which is publicly released on an annual basis. This 17th annual AFL Injury Report is updated with injury data from the 2008 season and reveals:

- Overall a similar injury prevalence in season 2008 compared with season 2007 (147.0 missed games per club per season in 2008 versus 147.5 missed games per club per season in 2007). Total injury incidence was slightly higher in 2008 (41.5 injuries per club per season compared to 40.4), but recurrence rate was lower (13% compared to 16%).

- Lowest rate of head & neck injuries on record in terms of both incidence (0.8 injuries per club per season) and prevalence (2.2 missed games per club per season).

- Continued low rates of knee posterior cruciate ligament (PCL) injuries since the introduction of the centre circle rule. There were only five reported PCL injuries in season 2008, and although two of these did occur at centre bounce ruck duels, these two were the first reported from this mechanism since 2005.

- Slightly lower rates of groin injuries in 2008 compared with 2007.

- Slightly higher rates of shoulder injuries in 2008 compared with 2007.

- The number one injury in the game remains the hamstring strain. Both incidence and prevalence rates of this injury remain high.

- The most severe common injury is still the knee anterior cruciate ligament (ACL) tear, with similar rates in 2008 to 2007.

- There is an ongoing trend for teams to be more conservative with injury, leading to greater severity (missed playing time) per injury but lower recurrence rates.

2 Introduction

The Australian Football League (AFL) has commissioned a continuous annual injury surveillance system since 1992. Injury surveillance is now considered to be an important obligation of professional football bodies [3-7]. However, the degree to which it is successfully undertaken varies substantially amongst different sports. On a National and International level the AFL injury survey model is admired particularly for the annual public release and consistent methodology[8]. The first public release of the annual report was following the 1996 injury survey[2], believed to be the first time in the world that a professional sport openly tabled its injury data.

From 1997 onwards, the definition of an injury has been an "injury or medical condition which causes a player to miss a match". Contemporaneous weekly player monitoring from 1997 to 2008 inclusive has meant that for this entire twelve year period, all 16 AFL teams have provided injury details for 100% of cases where conditions have met this injury definition[8]. 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, with hamstring strains, groin injuries and knee anterior cruciate ligament (ACL) injuries accounting for the highest amount of missed playing time on an annual basis.

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.

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.

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 10] although none of the injury surveillance systems using broader definitions has been able to demonstrate 100% compliance.

3.2 Injury categories

Injury categories are minimally changed annually based on which specific diagnoses (using OSICS codes version 9 [11]) 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.

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 2008 was slightly higher (36.6 new injuries per team per season) than the low rates seen in recent years. Injury prevalence was similar to the rates of season 2007. Recurrence rate (13%) fell from the level of 2007 (16%) and has generally shown a decline over the last twelve years. Average injury severity has been creeping up slightly over the same time period, with the inference that team medical staff have become more conservative over the past decade (keeping players out for longer and achieving a lower recurrence rate because of this).

Table 1 - Key indicators for all injuries over the past eleven seasons

All injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
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	36.6
Incidence (recurrent)	8.4	7.6	5.2	5.9	5.5	4.4	4.6	3.7	4.8	4.1	5.6	4.9
Incidence (total)	50.3	47.9	42.1	43.3	41.3	38.7	38.7	38.5	40.1	38.2	40.4	41.5
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
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
Recurrence rate	20%	19%	14%	16%	15%	13%	14%	11%	14%	12%	16%	13%

4.1 Injury incidence

Table 2 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 2008 include that the rates of concussion and facial fractures were very low and continue to demonstrate a long-term decline. The rate of shoulder sprains/dislocations was higher than usual. The injury incidence for the majority of other categories was similar to the long-term averages.

Table 2 - Injury incidence (new injuries per club per season)

Body area	Injury type	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Head/ neck	Concussion	0.6	0.7	0.5	0.6	0.7	0.7	0.3	0.3	0.7	0.3	0.3	0.3
	Facial fractures	0.8	0.6	0.7	0.7	0.4	0.4	0.6	0.8	0.6	0.3	0.4	0.2
	Neck sprains	0.1	0.2	0.2	0.2	0.1	0.0	0.0	0.1	0.2	0.3	0.1	0.2
	Other head/neck injuries	0.2	0.2	0.2	0.1	0.3	0.2	0.3	0.2	0.1	0.2	0.2	0.1
Shoulder/ arm/ elbow	Shoulder sprains and dislocations	1.0	0.9	0.7	0.7	1.1	0.9	1.3	1.0	1.4	1.6	1.0	1.8
	A/C joint injuries	0.9	0.9	0.6	1.3	0.9	1.1	0.3	1.1	0.8	1.2	0.8	0.7
	Fractured clavicles	0.4	0.4	0.3	0.5	0.3	0.3	0.2	0.6	0.3	0.3	0.3	0.1
	Elbow sprains or joint injuries	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.3	0.1	0.1	0.1	0.1
	Other shoulder/ arm/elbow injuries	0.6	0.5	0.2	0.5	0.5	0.8	0.5	0.4	0.6	0.3	0.2	0.3
Forearm/ wrist/ hand	Forearm/wrist/hand fractures	1.1	1.7	1.7	1.4	0.8	1.1	0.8	1.1	1.3	1.1	0.9	1.2
	Other hand/wrist/ forearm injuries	0.4	0.4	0.4	0.5	0.3	0.4	0.7	0.4	0.3	0.3	0.6	0.4
Trunk/ back	Rib and chest wall injuries	1.2	0.6	1.0	0.8	0.4	0.9	0.8	0.7	0.4	1.0	0.4	0.7
	Lumbar and thoracic spine injuries	1.8	1.4	1.4	2.2	1.4	0.9	0.8	1.6	2.1	1.5	1.3	1.4
	Other buttock/back/ trunk injuries	1.2	1.0	1.1	0.8	0.5	0.4	0.5	0.6	0.4	0.6	0.5	0.7
Hip/ groin/ thigh	Groin strains/osteitis pubis	4.1	3.2	3.1	3.0	3.5	3.8	2.9	3.1	2.9	3.3	4.1	3.2
	Hamstring strains	6.6	6.4	6.7	5.6	6.0	4.4	5.7	6.3	5.2	6.4	6.7	6.6
	Quadriceps strains	2.5	3.0	2.4	2.0	1.6	1.7	2.0	1.9	1.9	1.7	1.8	1.8
	Thigh and hip haematomas	1.3	1.3	1.1	1.1	0.6	1.0	0.3	1.1	1.0	1.1	0.6	0.5
	Other hip/groin/thigh injuries	0.4	0.2	0.3	0.3	0.3	0.3	0.4	0.3	0.2	0.3	0.8	0.8
Knee	Knee ACL	1.2	0.8	0.7	0.5	0.9	0.8	0.6	0.5	0.6	1.0	0.7	0.9
	Knee MCL	0.7	1.3	1.2	0.9	1.2	0.9	1.0	0.7	1.0	0.8	1.4	1.3
	Knee PCL	0.6	0.3	0.7	0.5	1.0	0.4	0.5	0.7	0.4	0.3	0.2	0.3
	Knee cartilage	0.9	1.1	1.1	1.2	1.9	1.3	1.7	1.2	1.3	1.0	1.2	1.7
	Patella injuries	0.2	0.4	0.1	0.2	0.2	0.4	0.1	0.1	0.3	0.3	0.3	0.2
	Knee tendon injuries	0.5	0.6	0.7	0.7	0.5	0.8	0.7	0.4	0.7	0.4	0.3	0.3
	Other knee injuries	1.4	0.4	0.9	1.3	0.8	0.5	0.7	0.7	0.9	0.2	0.8	1.0
Shin/ ankle/ foot	Ankle sprains or joint injuries	2.7	2.8	2.1	2.7	2.0	2.5	2.6	2.5	2.5	2.1	2.2	2.5
	Calf strains	1.9	2.3	1.4	1.9	1.6	2.2	1.6	0.9	1.9	1.6	1.2	2.0
	Achilles tendon injuries	0.4	0.3	0.5	0.4	0.2	0.4	0.4	0.2	0.3	0.3	0.4	0.6
	Leg and foot fractures	0.5	0.8	1.1	0.6	1.0	0.8	0.5	0.5	0.4	0.7	0.5	0.5
	Leg and foot stress fractures	0.8	0.7	0.8	0.5	0.9	0.7	0.9	0.9	0.9	1.1	1.1	0.8
	Other leg/foot/ankle injuries	1.9	1.7	1.3	1.3	1.7	0.8	1.5	1.7	1.3	1.5	1.3	1.1
Medical	Medical illnesses	2.5	2.8	1.5	1.9	1.8	2.3	2.4	2.0	2.2	0.7	1.9	2.1
Non-football injuries		0.1	0.2	0.2	0.2	0.2	0.3	0.4	0.1	0.1	0.2	0.2	0.3
NEW INJURIES / CLUB / SEASON		**41.9**	**40.3**	**36.9**	**37.4**	**35.8**	**34.4**	**34.1**	**34.8**	**35.3**	**34.1**	**34.7**	**36.6**

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 rate[12]. Groin injuries do not seem to be following the long-term downward trend in recurrence rates, although the recurrence rate dropped from 2007 to 2008. Across the board there is certainly 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
Hamstring strains	38%	36%	31%	37%	25%	30%	27%	22%	26%	16%	22%	25%
Groin strains and osteitis pubis	36%	31%	6%	16%	20%	23%	20%	24%	23%	28%	38%	20%
Ankle sprains or joint injuries	20%	21%	9%	11%	17%	16%	6%	11%	15%	10%	20%	9%
Quadriceps strains	35%	20%	20%	18%	10%	17%	9%	6%	20%	19%	18%	15%
Calf strains	15%	15%	17%	32%	17%	13%	14%	6%	12%	7%	9%	5%
All injuries	20%	19%	14%	16%	15%	13%	14%	11%	14%	12%	16%	13%

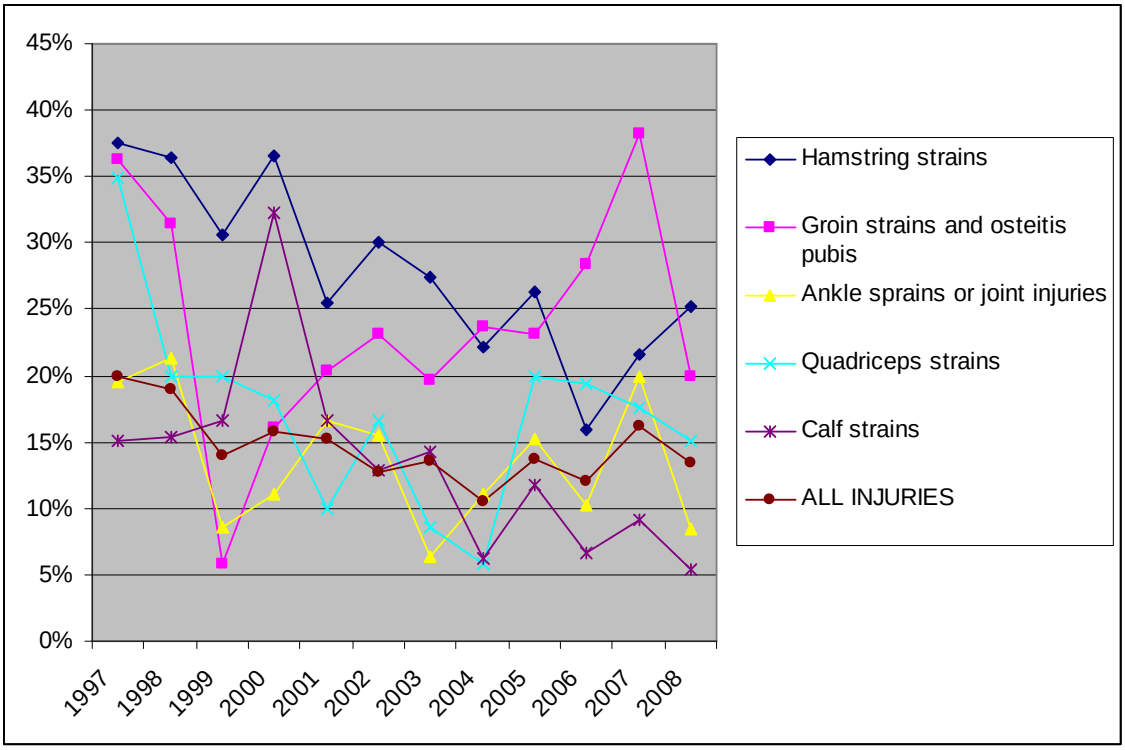

Figure 1- Recurrence rates (recurrent injuries as a percentage of new injuries)

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 44-45 players in any given week for 2008 was:

- 34 players playing football per week;
- 7 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
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
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
TOTAL playing	32.8	33.4	33.4	33.3	34.9	34.1	34.0	33.9	34.2	33.8	33.9	33.7
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
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
TOTAL not playing	9.6	8.3	8.3	8.0	8.5	8.9	8.2	8.9	9.1	10.1	10.4	10.8
Players in injury survey (per club)	42.3	41.7	41.7	41.4	43.4	43.0	42.2	42.8	43.3	43.9	44.2	44.6
Injury prevalence (%)	18.1%	16.1%	15.4%	15.0%	15.5%	15.3%	13.5%	14.9%	14.7%	15.9%	16.8%	16.7%

Table 5 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. There was an increase in the amount of missed playing time lost to hamstring injuries in 2008, with knee ACL prevalence similar to 2007 and groin injury prevalence lower than the corresponding figure in 2007.

Shoulder injuries showed an increase in the amount of lost playing time in 2008, whereas facial fractures dropped to a level that was lower than previous years. Even though there is year-to-year variation amongst the values, there is far more consistency than differences in the injury profile from season to season.

Table 5 - Injury prevalence (missed games per club per season)

Body area	Injury type	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Head/ neck	Concussion	0.7	0.7	0.5	0.7	1.3	2.0	0.6	0.3	0.9	0.3	0.3	0.5
	Facial fractures	2.5	2.0	2.2	2.0	1.3	1.4	1.0	2.2	1.4	0.8	0.7	0.5
	Neck sprains	0.6	0.7	1.6	0.3	0.2	0.0	0.0	0.6	0.3	0.3	1.1	1.1
	Other head/neck injuries	0.3	0.2	0.4	0.8	1.5	0.2	0.7	0.2	0.2	1.1	1.6	0.1
Shoulder/ arm/ elbow	Shoulder sprains and dislocations	5.3	5.9	5.6	4.0	5.4	5.9	5.7	5.9	7.7	10.8	6.4	10.2
	A/C joint injuries	2.2	2.1	0.9	3.1	2.1	2.4	0.7	2.5	1.9	2.7	1.4	1.5
	Fractured clavicles	1.4	1.6	1.2	3.0	1.6	2.0	1.0	3.5	1.3	1.7	1.8	1.1
	Elbow sprains or joint injuries	0.7	1.2	0.2	0.1	0.4	0.3	0.4	0.7	0.4	0.7	0.8	0.5
	Other shoulder/ arm/elbow injuries	2.4	1.9	0.3	1.3	1.3	3.4	1.6	1.6	2.4	1.7	0.7	0.7
Forearm/ wrist/ hand	Forearm/wrist/hand fractures	4.1	5.4	5.9	5.6	2.7	3.1	2.5	3.9	3.8	4.3	2.3	3.2
	Other hand/wrist/ forearm injuries	0.6	1.3	0.9	1.4	0.3	2.2	2.9	1.2	1.2	0.5	3.1	1.4
Trunk/ back	Rib and chest wall injuries	2.8	1.0	2.0	1.3	0.7	1.5	1.7	1.3	0.6	2.2	1.9	1.3
	Lumbar and thoracic spine injuries	9.7	4.3	7.9	8.4	5.6	5.8	2.1	5.4	6.4	5.4	2.8	5.0
	Other buttock/back/ trunk injuries	6.0	1.6	2.3	2.6	1.5	1.6	1.6	2.3	0.7	1.3	1.7	1.3
Hip/ groin/ thigh	Groin strains/osteitis pubis	17.4	13.6	9.4	7.5	13.6	15.7	13.7	13.3	11.2	14.0	18.0	12.4
	Hamstring strains	20.9	21.0	22.3	22.4	21.3	15.6	18.6	21.6	18.6	21.8	24.3	25.8
	Quadriceps strains	8.6	9.5	6.7	5.6	3.8	4.3	6.0	4.2	6.4	5.5	5.6	6.5
	Thigh and hip haematomas	2.4	1.8	1.5	1.8	0.6	1.9	0.5	1.7	1.6	1.4	1.0	0.6
	Other hip/groin/thigh injuries	1.7	0.5	2.3	1.4	1.7	1.2	1.5	2.6	1.0	2.3	4.5	3.4
Knee	Knee ACL	19.8	15.8	10.8	4.8	13.6	15.3	10.8	10.1	9.3	15.3	15.9	15.3
	Knee MCL	3.3	4.3	3.3	3.5	4.8	2.8	2.9	2.9	3.0	1.7	4.7	4.0
	Knee PCL	1.9	2.2	5.2	2.3	5.9	2.3	2.0	6.5	2.7	1.8	1.6	2.2
	Knee cartilage	4.0	5.6	5.3	8.6	12.5	6.0	7.0	6.1	7.8	5.7	9.1	8.9
	Patella injuries	0.9	1.6	0.8	1.8	0.8	2.5	0.6	0.1	0.8	1.2	2.7	1.0
	Knee tendon injuries	2.4	1.6	3.9	3.9	2.5	3.7	2.9	0.9	2.6	1.8	0.7	1.1
	Other knee injuries	3.9	0.8	2.2	3.6	2.5	1.0	2.4	1.3	3.8	0.2	2.6	2.7
Shin/ ankle/ foot	Ankle sprains or joint injuries	7.2	6.9	3.9	6.8	4.3	5.9	5.3	6.4	9.2	8.1	7.1	7.0
	Calf strains	5.8	6.4	3.4	5.7	3.4	4.4	3.8	1.7	4.5	3.4	3.1	4.3
	Achilles tendon injuries	1.3	1.4	1.3	1.6	0.7	0.9	1.5	0.8	1.9	2.1	2.2	4.1
	Leg and foot fractures	2.6	5.4	8.8	4.6	7.0	7.9	2.9	3.7	2.7	5.7	2.7	3.2
	Leg and foot stress fractures	4.9	4.0	6.7	3.8	4.4	3.9	5.3	6.3	5.1	8.2	6.8	7.3
	Other leg/foot/ankle injuries	6.4	5.1	3.1	3.9	4.2	2.3	3.7	4.3	4.2	4.1	4.2	4.6
Medical	Medical illnesses	4.2	3.7	2.8	2.8	2.6	2.9	3.8	4.2	3.6	0.7	3.1	3.5
Non-football injuries		0.1	0.8	0.6	0.6	0.3	2.4	1.0	0.4	0.1	0.5	1.0	0.7
MISSED GAMES / CLUB / 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**

4.4 Analysis and discussion for significant injury categories

(a) Hamstring injuries

Hamstring strains remain the most common and prevalent injury in the AFL (Table 6). Previous analysis of hamstring and other muscle strain data shows a high rate of recurrence [12-19]. 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 injury[13] and that performance of players is often decreased in the matches soon after return from hamstring strain[19]. Hamstring injuries are known to affect older players and those with a past history of injury more often[12-19].

Table 6 - Key indicators for hamstring strains over the past twelve seasons

Hamstring injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
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
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
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
Recurrence rate	38%	36%	31%	37%	25%	30%	27%	22%	26%	16%	22%	25%

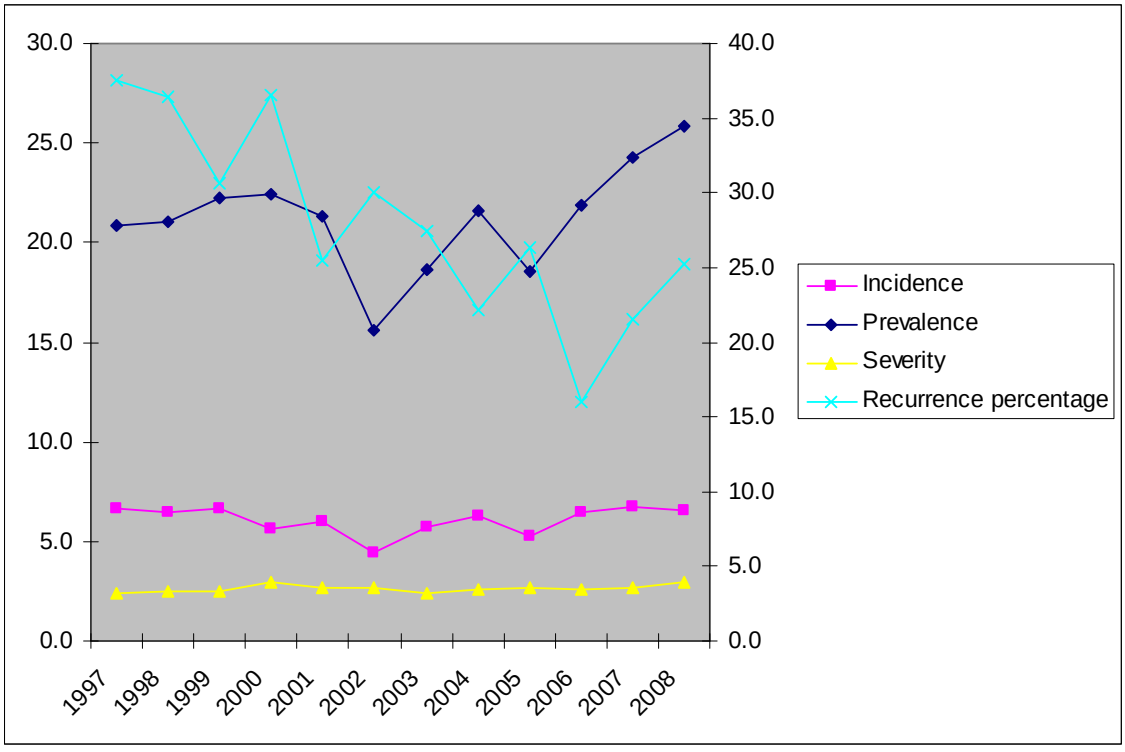

Figure 2 - Key indicators for hamstring strains over the past twelve seasons

(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 five reported PCL injuries in season 2008, and although two of these did occur at centre bounce ruck duels, these are the first from this reported mechanism since 2005. There has certainly been a long-term decline in the incidence and prevalence of PCL injuries.

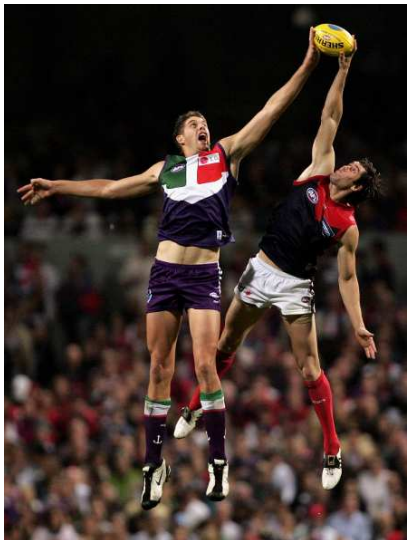

Figure 3 - Ruck duel

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 three 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). Unfortunately with respect to ACL injuries, this does not seem to have also been associated with a lower rate of injury recurrence, with four players in 2008 suffering a re-injury to their previous ACL graft. Although it would make intuitive sense that a more conservative return should increase the success rate on return (as has been observed with muscle strains), this does not seem to be the experience with ACL reconstruction.

Table 7 - Key indicators for major knee ligament injuries over the past twelve seasons

Knee ligament injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
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
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
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
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
ACL incidence	1.2	0.8	0.7	0.5	0.9	0.8	0.6	0.5	0.6	1.0	0.7	0.9
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
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

(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. 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 twelve seasons

Head & neck injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Incidence	1.8	1.6	1.6	1.6	1.5	1.2	1.2	1.4	1.6	1.0	0.9	0.8
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
Severity	2.3	2.2	3.0	2.3	2.9	3.0	1.8	2.4	1.7	2.6	4.0	2.8

(d) Shoulder injuries

Table 9 shows a slight but steady increase in the rates of shoulder injuries over the past twelve years, with the exception of recurrence rates which are falling. It is possible that the number of or risk associated with tackles has slightly increased the likelihood of shoulder injury over this time period. 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 twelve seasons

Shoulder sprains & dislocations	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
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
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
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
Recurrence rate	12%	13%	27%	17%	10%	13%	9%	11%	20%	13%	16%	9%

(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. Previous study has shown that groin injuries do not affect older or younger players more often, although there is a perception that younger players are susceptible to osteitis pubis (possibly due to the fact that younger players suffer fewer injuries overall, leaving groin injuries to make up a greater percentage of the injuries suffered in younger players).

Table 10 - Key indicators for groin injuries over the past twelve seasons

Groin injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
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
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
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
Recurrence rate	36%	31%	6%	16%	20%	23%	20%	24%	23%	28%	38%	20%

Figure 4 - MRI scan of osteitis pubis

5 Conclusion

The AFL injury profile, compared to most of the other football codes, exhibits predominantly more non-contact than contact mechanism injuries. Some of the major contact-mechanism injuries such as head and neck injuries, rib injuries and knee PCL injuries have been reducing in incidence in recent years. There has been no such reduction and hence there remains a challenge for the AFL and clubs to control the most significant non-contact soft tissue injuries such as hamstring and groin strains.

The AFL injury profile continues to be consistently defined and published in sports medicine scientific literature and in public media releases[3 9 20 21]. 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;
- The survey has run for 17 seasons, achieving 100% participation and compliance over the last 12 seasons;
- The survey defines an injury as a 'condition which causes a player to miss a game' striking a balance which has enabled comprehensive analysis without sacrificing compliance[8]; and
- The survey has led directly and indirectly to dozens of published studies[3 9 22-28] and interventions which have improved the safety of the AFL competition (e.g. ruck rule changes to decrease PCL injuries).

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