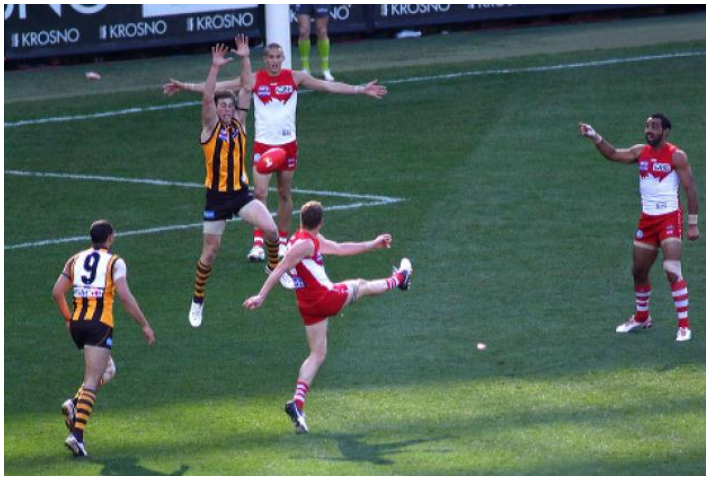
2012 AFL Injury Report



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1 Summary

The 2012 AFL Injury Report is a landmark study, marking 21 years of recording of injury data by the AFL:

- There was 100% participation in the injury survey for all clubs and players, with a public release of the data, the 16th year in a row that both of these have occurred. These outcomes distinguish the AFL Injury Survey as Australia's leading study of its kind and arguably the leader in professional sport around the world. Of the world's major professional sporting competitions, only the NFL has been keeping data for longer but it does not make an annual public release of all data.

- To coincide with this year's public release, data from the 2012 injury survey along with a review of the 21 years is being published in the *American Journal of Sports Medicine*.

- There were decreases in overall injury incidence, prevalence and recurrence rates in season 2012 compared with season 2011. In particular the injury prevalence (missed games per club per season) in 2012 was lower than 2011 and was the lowest value recorded since 2008.

- The number one injury in the game in terms of incidence (new injuries per club per season) and prevalence (number of games missed per injury) remains the hamstring strain. Hamstring injury rates in 2012 were higher than in 2011 (which was a historically low year) but hamstring incidence in 2012 remained significantly below the values seen from 2006-2010 ($p < 0.05$). The other major lower limb muscle injuries showed divergent patterns. Calf strains were high in 2012, whereas quadriceps and groin strains were low.

- As was seen in 2011 (when a more conservative management of concussion was emphasised across the competition), there were higher rates of concussions causing missed games in 2012 than the long-term averages. However these rates remain low relative to other injuries.

- The recurrence rates for all injuries in 2012 are the lowest seen in the survey and minimally reduced from 2011, part of an overall long-term downwards trend in recurrences ($p<0.01$).

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2 Introduction

The Australian Football League (AFL) has commissioned an annual injury surveillance report every year since 1992[1-7], meaning that this is the 21st AFL Injury Report. The first ever scientific publication on injuries in Australian football was in 1965[8]. The first competition-wide injury survey was done in the 1980s[9]. The Australian Sports Commission funded a survey of elite AFL, rugby league and rugby union injuries in 1992[6 7]. The AFL made the decision to continue funding annual surveillance in 1993 and has done so ever since. A major summary of the methods of the AFL injury survey and data from recent seasons was published a decade ago in the *British Journal of Sports Medicine*[2], one of the world's leading peer-reviewed sports medicine journals. In the years since, the AFL Injury Report has regularly been reprinted in *Sport Health*, *Sports Medicine Australia*'s publication for members[10-14]. This year's report is being released alongside a summary paper in another of the world's leading sports medicine peer-reviewed publications, the *American Journal of Sports Medicine*. It is believed to be the first co-publication of an annual injury report with a leading scientific sports medicine journal.

Injury surveillance is now recognised as an important obligation of professional sporting bodies [2 15-18], with various levels of success reported[4]. On a national and international level the AFL injury survey model is highly acclaimed, particularly for the annual public release and consistent methodology[19]. The 5th annual AFL Injury Report was publicly released in 1996[20], believed to be the first occasion worldwide that a professional sport openly tabled its injury data. The National Football League (NFL) in the USA has conducted injury surveillance since the 1980s but does not publicly release its data on annual basis (although multiple studies arising have been published in the scientific literature[21-26]). Other bodies known to conduct regular injury surveillance (with various degrees of disclosure) include Cricket Australia[27 28], the National Rugby League (NRL)[29], the National Collegiate Athletic Association (NCAA)[30-32], Union of European Football Associations (UEFA) [15 33 34] and the Rugby Football Union (RFU)[35 36].

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 a willingness to consider and implement rule changes to improve player safety, where necessary. A documented successful example of this was the centre circle rule change, which has decreased the incidence of ruck-related posterior cruciate ligament (PCL) injuries[3]. The injury survey has also been pivotal 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, currently devoting approximately $400,000 per annum towards injury research.

It is an ongoing aim of the AFL and the AFL Medical Officers Association (AFLMOA) to remain 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 [2 12]. However, minor changes to injury category codes are made on an annual basis (discussed in section 3.2 below). All teams now keep electronic records of injuries. For season 2012, 8 out of 18 teams used the Athletic Logic electronic record system. The remaining clubs used various other methods and forwarded on their data in alternate formats to the injury survey coordinator.

The standard AFL player contract now includes consent for players' injury records to be passed from team medical staff to the researchers for the purposes of standard injury surveillance. The methods of the survey are approved by the AFL Medical Officers Association and AFL Research Board. For additional studies (e.g. case follow ups of certain injuries) which require identification of players to obtain extra information, further consent from each player involved is required.

3.1 Injury definition

From 1997 onwards, the definition of an injury has been an "injury or medical condition which causes a player to miss a match". This definition and methodology has been chosen to promote consistency across all AFL clubs and from season to season[19]. 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 [2 19]. In 2001 this was extended to include rookie listed players and finals matches. 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 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 coded [37-39] and onset of injury. 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.

The definition of a condition "causing a player to miss a match" 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.

3.2 Injury categories

Injury categories are amended slightly on an annual basis depending on which specific diagnoses (using OSICS codes version 9 [38 39]) 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 previously published data.

3.3 Injury rates

The major measurement of the number of injuries occurring is seasonal injury incidence measured in units of new injuries per club per season (where a club is defined as 40 players and a season is defined as 22 rounds). Since the average club now has approximately 47 players on the list and plays for slightly over 22 rounds (including finals), the exact number of injuries occurring per club is slightly greater than the figures tabulated. For example, a hamstring injury incidence of 6 new injuries per club per season (for 40 players playing 22 weeks) would be equivalent to 7 new injuries per club per season (for 46 players over 23 weeks). The modification is required so that the year-to-year figures are comparable, because average list size changes from year-to-year.

The major measurement of the amount of playing time missed through injury is injury prevalence measured in units 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.

Statistical analysis of temporal trends in injury rates over the 21 years was made using the linear regression (LINEST) function in Microsoft Excel. Temporal trends were considered statistically significant if $p<0.05$. For injury incidence prior to and after a rule change, comparisons between injury incidence were made using calculation of 95% confidence intervals.

3.4 Discussion of methodology

Although the injury definition attracts some criticism as is does not include the entire spectrum of injuries (e.g. excluding valid injuries which do not cause a player to miss a match[40]), its enormous strength is that a consistent comparison can be made. For a longitudinal study such as the current analysis, if a broader definition were used there would be more concern about changing thresholds for reporting an injury by team medical staff over time[19].

The units used also differ from those in many other sports and attract some criticism. Many other sports prefer to measure injury incidence, for example, in units of number of injuries per 1000 player hours or per 1000 athlete exposures. Whilst these units have benefits from an academic viewpoint, the public release of the AFL Injury Report makes our choice of units preferable. A layperson cannot easily conceptualise how common an injury is if expressed in units of 'x per 1000 player hours', whereas it is easily understood that an injury with a rate of 6 per club per season is common, whereas an injury with a rate of 0.5 per club per season is uncommon. Similarly it is easiest for a layperson to understand injury prevalence if expressed in values such as 150 matches missed through injury per club per season. Approximate conversions to injury rates per 1000 player match hours (if desired for comparisons with other sports) can be made using the exposures at the start of the results (e.g. every value in Table 2 could be multiplied by 1000 and divided by 1200 to give units of "new injuries per 1000 player hours of match exposure"). However, doing so raises another issue with the 'standard' injury incidence units of how to handle injuries of gradual onset that do not specifically occur during either training or matches.

4 Results

There were 4492 players listed over the 21-year period, with average age of 23.6 years (range 15.9-38.8). They played a combined total of 162683 matches at AFL (national league) level and 91098 matches at other (lower) levels (e.g. state league), from a total of 328181 weeks (possible matches) of exposure. There were 13606 new injuries/illnesses and 1965 recurrent injuries/illnesses that caused 51919 matches to be missed. Key indicators for the past 21 years are shown in Table 1. The injury incidence (number of new injuries per club per season) for 2012 was 38.1, a minimal reduction from 2011. Injury prevalence was 147.7 missed games per season, which was a lower figure than that seen over the years 2009-2011. The rate of recurrent injuries (3.5 per team per season or 9.3%) was slightly reduced in 2012 and again set a new low for the 21 years of the survey (down from a 9.4% recurrence rate in 2011, which was a previous low).

Table 1 – Key indicators for all injuries over the 21 seasons

All injuries	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Incidence (new injuries per club per season)	35.4	30.3	33.7	38.2	38.9	40.1	40.3	36.9	37.4	35.8
Incidence (recurrent)	8.8	7.3	6.0	6.2	4.9	8.0	7.6	5.2	5.9	5.5
Incidence (total)	44.2	37.6	39.7	44.4	43.8	48.1	47.9	42.1	43.3	41.3
Prevalence (missed games per club per season)	145.9	122.5	116.3	133.1	140.0	151.2	141.9	135.9	131.8	136.4
Average injury severity	4.1	4.0	3.5	3.5	3.6	3.8	3.5	3.7	3.5	3.8
Recurrence rate	25%	24%	18%	16%	13%	20%	19%	14%	16%	15%
Clubs participating	12/15	14/15	15/16	15/16	16/16	16/16	16/16	16/16	16/16	16/16
Average players per club	46.1	44.6	42.5	42.3	44.1	44.2	41.7	41.7	41.4	43.4

All injuries	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Incidence (new injuries per club per season)	34.4	34.1	34.8	35.3	34.0	34.6	36.9	37.8	38.7	38.4	**38.1**
Incidence (recurrent)	4.4	4.6	3.7	4.8	4.1	5.6	5.4	3.6	4.7	3.6	**3.5**
Incidence (total)	38.7	38.7	38.5	40.1	38.2	40.3	42.3	41.4	43.3	42.0	**41.7**
Prevalence (missed games per club per season)	134.7	118.7	131.0	129.2	138.3	146.7	147.1	151.2	153.8	157.1	**147.7**
Average injury severity (number of missed games)	3.9	3.5	3.8	3.7	4.1	4.2	4.0	4.0	4.0	4.1	**3.9**
Recurrence rate	13%	14%	11%	14%	12%	16%	15%	10%	12%	9%	**9%**
Clubs participating	16/16	16/16	16/16	16/16	16/16	16/16	16/16	16/16	16/16	17/17	**18/18**
Average players per club	43.0	42.2	42.8	43.3	43.9	44.2	44.6	46.1	46.4	46.9	**46.7**

4.1 Injury Incidence

Table 2 (on the following page) details the incidence (new injuries only) of all defined categories. Injury incidence (new injuries per team per season) has stayed fairly constant over the 21-year period, varying between 30 and 40 injuries per team per season. As general trends, injury incidence rose 2.0/year from 1993-1998 ($p<0.01$), fell 1.2/year from 1998-2003 ($p<0.01$) and rose 0.6/year from 2003-2010 ($p<0.01$). There were some trends in injury incidence that were significant across the entire 21-year period. Head and neck injuries have fallen 0.03/year over the 21 years ($p=0.02$), whereas shoulder sprains have risen 0.05/year over the 21 years ($p<0.01$).

The relative risk (comparative ratio) of knee PCL (posterior cruciate ligament) injuries in the five years from 2005-2009, after the centre circle rule change was 0.46 (95% CI 0.29-0.73) compared to the previous five years. The relative risk incidence of hamstring injuries in the two years 2011-2012 was 0.81 (95% CI 0.69-0.94) compared to the previous five years. The relative risk of knee ACL (anterior cruciate ligament) injuries over the period 1999-2012 was 0.76 (95% CI 0.60-0.97) compared to the period 1992-1998.

The highlights for 2012 in terms of new injury incidence were:

- Like 2011, concussion incidence in 2012 was above the long-term average but still a low figure relative to other injuries (1 player per team per season missing games through concussion).
- Shoulder injuries – which had been increasing in recent years – actually fell below the 10-year average in 2012.
- Although hamstring strains increased in 2012 compared to 2011, the incidence remained below the 10-year average.
- Groin injuries fell further in 2012 and stayed below the 10-year average (although there was an increase in hip joint injuries).
- Calf strains increased to a level that was the highest incidence seen over the 21-year period.
- Knee and ankle injuries were generally very close to the 10-year averages.

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

Body area	Injury type	Av 92-02	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Av 03-12
Head/ neck	Concussion	0.8	0.3	0.3	0.7	0.3	0.3	0.4	0.5	0.5	1.1	**1.0**	0.5
	Facial fractures	0.6	0.6	0.8	0.6	0.3	0.4	0.2	0.5	0.5	0.5	**0.6**	0.5
	Neck sprains	0.1	0.0	0.1	0.2	0.3	0.1	0.2	0.1	0.1	0.1	**0.1**	0.1
	Other head/neck injuries	0.1	0.3	0.2	0.1	0.2	0.2	0.1	0.1	0.2	0.2	**0.2**	0.2
Shoulder/ arm/ elbow	Shoulder sprains and dislocations	0.8	1.3	1.0	1.4	1.6	1.0	1.8	1.3	1.6	1.8	**1.3**	1.4
	A/C joint injuries	0.9	0.3	1.1	0.8	1.2	0.8	0.7	0.5	0.8	0.7	**0.5**	0.7
	Fractured clavicles	0.3	0.2	0.6	0.3	0.3	0.3	0.1	0.2	0.2	0.1	**0.2**	0.3
	Elbow sprains or joint injuries	0.1	0.1	0.3	0.1	0.1	0.1	0.1	0.2	0.2	0.3	**0.3**	0.2
	Other shoulder/ arm/elbow injuries	0.5	0.5	0.4	0.6	0.3	0.2	0.3	0.1	0.3	0.4	**0.6**	0.4
Forearm/ wrist/ hand	Forearm/wrist/hand fractures	1.3	0.8	1.1	1.3	1.1	0.9	1.2	1.1	1.2	1.6	**0.8**	1.1
	Other hand/wrist/ forearm injuries	0.4	0.7	0.4	0.3	0.3	0.6	0.4	0.4	0.3	0.4	**0.5**	0.4
Trunk/ back	Rib and chest wall injuries	0.9	0.8	0.7	0.4	1.0	0.4	0.7	0.3	0.6	0.4	**0.4**	0.6
	Lumbar and thoracic spine injuries	1.5	0.8	1.6	2.1	1.5	1.3	1.5	1.4	1.7	1.4	**1.5**	1.5
	Other buttock/back/ trunk injuries	0.8	0.5	0.6	0.4	0.6	0.5	0.7	0.5	0.4	0.6	**0.9**	0.6
Hip/ groin/ thigh	Groin strains/osteitis pubis	3.2	2.9	3.1	2.9	3.3	4.0	3.2	3.3	4.1	2.8	**2.6**	3.2
	Hamstring strains	6.0	5.7	6.3	5.2	6.4	6.7	6.6	7.1	6.0	4.8	**5.7**	6.0
	Quadriceps strains	2.0	2.0	1.9	1.9	1.7	1.8	1.8	2.1	1.7	1.4	**1.6**	1.8
	Thigh and hip haematomas	1.2	0.3	1.1	1.0	1.1	0.6	0.5	1.0	1.1	0.5	**0.4**	0.8
	Other hip/groin/thigh injuries, including hip joint	0.2	0.4	0.3	0.2	0.3	0.8	0.8	1.0	0.7	1.0	**1.2**	0.7
Knee	Knee ACL	0.9	0.6	0.5	0.6	0.9	0.6	0.9	0.7	0.6	0.9	**0.8**	0.8
	Knee MCL	1.1	1.0	0.7	1.0	0.8	1.4	1.3	0.7	0.8	1.0	**0.9**	0.9
	Knee PCL	0.5	0.5	0.7	0.4	0.3	0.2	0.3	0.3	0.4	0.6	**0.3**	0.4
	Knee cartilage	1.4	1.7	1.2	1.3	1.0	1.2	1.6	2.0	1.7	1.5	**1.0**	1.4
	Patella injuries	0.3	0.1	0.1	0.3	0.3	0.3	0.2	0.2	0.5	0.4	**0.2**	0.3
	Knee tendon injuries	0.5	0.7	0.4	0.7	0.4	0.3	0.3	0.5	0.4	0.6	**1.0**	0.5
	Other knee injuries	0.9	0.7	0.7	0.9	0.2	0.8	1.0	1.0	0.4	0.8	**0.8**	0.7
Shin/ ankle/ foot	Ankle joint sprains, including syndesmosis sprains	2.3	2.6	2.5	2.5	2.1	2.2	2.5	2.6	3.4	2.9	**2.6**	2.6
	Calf strains	1.7	1.6	0.9	1.9	1.6	1.2	2.0	1.3	1.7	2.1	**3.0**	1.8
	Achilles tendon injuries	0.4	0.4	0.2	0.3	0.3	0.4	0.6	0.6	0.4	0.9	**0.7**	0.5
	Leg and foot fractures	0.7	0.5	0.5	0.4	0.7	0.5	0.5	1.0	0.9	0.7	**0.3**	0.6
	Leg and foot stress fractures	0.8	0.9	0.9	0.9	1.1	1.1	0.9	0.9	1.2	1.3	**1.3**	1.1
	Other leg/foot/ankle injuries	1.4	1.5	1.7	1.3	1.5	1.3	1.1	1.5	1.7	2.5	**2.0**	1.6
Medical	Medical illnesses	1.7	2.4	2.0	2.2	0.7	1.9	2.1	2.9	2.1	1.8	**2.2**	2.0
Non-football injuries		0.2	0.4	0.1	0.1	0.2	0.2	0.3	0.2	0.5	0.1	**0.5**	0.3
NEW INJURIES / CLUB / SEASON		36.6	34.1	34.8	35.3	34.0	34.6	36.9	37.8	38.7	38.4	**38.1**	36.4

4.2 Injury Recurrence

Table 3 shows the rate of recurrence of some of the common injury types that are prone to high recurrence rates. Season 2012 demonstrated the lowest recurrence rates seen in the 21 years of the survey, both for injuries overall (9.3%, down minimally from 9.4% in 2011 which was the previous low) and many of the major categories, including quadriceps strains and ankle sprains. The rate of recurrent injuries has fallen fairly substantially over the 21-year period (falling 0.6% per year over the entire period, $p<0.001$). The common muscle strains have also shown a steady decline in recurrence rates over the 21 years ($p<0.01$ for the declines in hamstring, calf & quadriceps recurrence rates; $p=0.06$ for the decline in groin injury recurrence rate).

The current AFL data suggest that, over the last 21 years, players are taking longer to return to play from muscle injuries, with recurrence tending to decrease but severity (using average missed matches per injury as the measure) tending to slightly increase (this trend $p<0.02$ for hamstring injuries). There has been a game trend to give all returning players substantial game time through interchange usage (as opposed to giving a player returning from injury limited game time 'off the bench', which was more common in the 1990s). Whilst this report lacks the detailed ability to completely separate the relative influence of a more risk-averse return-to-play paradigm, the reductions in recurrence rates are so dramatic that they are almost certainly due in part to improvements in prognostic accuracy afforded by modern clinical testing (e.g. MRI scans).

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

Recurrence rates	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	11yrA
Hamstring strains	45%	40%	31%	29%	25%	38%	36%	31%	37%	25%	30%	33%
Groin strains and osteitis pubis	29%	43%	33%	27%	22%	36%	31%	6%	16%	20%	23%	25%
Ankle sprains or joint injuries	9%	28%	4%	9%	11%	20%	21%	9%	11%	17%	16%	14%
Quadriceps strains	35%	19%	15%	21%	26%	35%	20%	20%	18%	10%	17%	22%
Calf strains	28%	26%	0%	16%	15%	15%	15%	17%	32%	17%	13%	17%
All injuries	25%	24%	18%	16%	13%	20%	19%	14%	16%	15%	13%	17%

Recurrence rates	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	10yrA
Hamstring strains	27%	22%	26%	16%	22%	27%	18%	14%	12%	**14%**	20%
Groin strains and osteitis pubis	20%	24%	23%	28%	39%	23%	19%	20%	15%	**17%**	23%
Ankle sprains or joint injuries	6%	11%	15%	10%	20%	9%	10%	5%	13%	**5%**	10%
Quadriceps strains	9%	6%	20%	19%	18%	15%	15%	18%	7%	**3%**	13%
Calf strains	14%	6%	12%	7%	9%	5%	0%	12%	5%	**6%**	8%
All injuries	14%	11%	14%	12%	16%	15%	10%	12%	9%	**9%**	12%

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 47 players in any given week for 2012 was: 35 players playing football per week, 22 in the AFL; 8 missing through injury; and 4 missing due to other reasons (such as suspension, being used as a travelling emergency, team bye in a lower grade, etc). There has been a slight trend upwards in the category of "not playing for other reasons", which encompasses suspension, lower grade team having a bye, player missing for personal reasons and simply "rested/rotated". It is a limitation of the survey that it is sometimes difficult to correctly assign a player who is missing a game with "general soreness" to the category of "injured" or "not playing for other reasons". For the purpose of the injury survey, club medical staff are used as the final arbiter on whether a player was missing through injury or "rested" (uninjured). The modern trend towards greater "resting" of players could affect injury incidence and prevalence results either way, in that sometimes slightly injured players could get misclassified as "rested" or alternatively that rested players could be misclassified as "injured" if they have received an injury payment from their club. The AFL is currently exploring ways of better capturing such situations in the 2013 Injury Report. Despite this limitation, the cut-off threshold for "missing a game" to qualify as injured appears to be generally robust as there is good consistency of data over the various years of the survey.

Table 4 – Average weekly player status by season

All injuries	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Playing AFL	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	**22.0**
Playing lower grade football	12.0	11.9	12.2	11.8	11.9	11.7	12.8	12.8	12.5	**12.5**
TOTAL playing	34.0	33.9	34.2	33.8	33.9	33.7	34.8	34.8	34.5	**34.5**
Not playing because of injury	5.7	6.4	6.4	7.0	7.4	7.4	7.9	8.1	8.4	**7.8**
Not playing for other reasons	2.5	2.5	2.8	3.1	2.9	3.4	3.5	3.5	4.0	**4.4**
TOTAL not playing	8.2	8.9	9.1	10.1	10.4	10.8	11.4	11.6	12.4	**12.2**
Players in injury survey (per club)	42.2	42.8	43.3	43.9	44.2	44.6	46.1	46.4	46.9	**46.7**
Injury prevalence (%)	13.5%	14.9%	14.7%	15.9%	16.8%	16.7%	17.2%	17.5%	17.8%	**16.8%**

Table 5 (on the following page) details the amount of missed playing time attributed to each injury category. The injury prevalence categories tend to move with the injury incidence results, i.e. similar categories in Table 5 showing increases and decreases to those in Table 2. Groin injuries & osteitis pubis had lower than usual prevalence in 2012, whereas many of the foot & ankle categories had higher than usual prevalence in 2012. The overall prevalence in 2012 was reduced compared to the period 2009-2011 and is similar to the levels seen in 2007-2008.

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

Body area	Injury type	Av 92-02	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Av 03-12
Head/ neck	Concussion	1.1	0.6	0.3	0.9	0.3	0.3	0.5	0.7	0.8	2.2	**1.6**	0.9
	Facial fractures	2.0	1.0	2.2	1.4	0.8	0.7	0.5	1.1	1.4	1.6	**1.5**	1.2
	Neck sprains	0.4	0.0	0.6	0.3	0.3	1.1	1.1	0.1	0.1	1.5	**0.1**	0.5
	Other head/neck injuries	0.4	0.7	0.2	0.2	1.1	1.6	0.1	0.3	1.3	0.2	**0.3**	0.6
Shoulder/ arm/ elbow	Shoulder sprains and dislocations	4.7	5.7	5.9	7.7	10.8	6.4	10.2	7.7	10.9	12.1	**9.0**	8.7
	A/C joint injuries	2.1	0.7	2.5	1.9	2.7	1.4	1.5	1.2	1.5	2.3	**1.0**	1.6
	Fractured clavicles	1.5	1.0	3.5	1.3	1.7	1.8	1.1	0.6	0.7	0.6	**0.6**	1.3
	Elbow sprains or joint injuries	0.5	0.4	0.7	0.4	0.7	0.8	0.5	1.5	0.2	1.3	**0.7**	0.7
	Other shoulder/ arm/elbow injuries	1.5	1.6	1.6	2.4	1.7	0.7	0.7	1.0	0.3	1.3	**2.1**	1.3
Forearm/ wrist/ hand	Forearm/wrist/hand fractures	4.8	2.5	3.9	3.8	4.3	2.3	3.2	4.8	3.4	5.4	**3.3**	3.7
	Other hand/wrist/ forearm injuries	1.0	2.9	1.2	1.2	0.5	3.1	1.4	0.8	1.1	1.8	**1.6**	1.6
Trunk/ back	Rib and chest wall injuries	1.6	1.7	1.3	0.6	2.2	1.9	1.3	0.6	1.3	0.7	**0.9**	1.2
	Lumbar and thoracic spine injuries	5.9	2.1	5.4	6.4	5.4	2.8	5.0	4.6	6.9	5.9	**5.9**	5.1
	Other buttock/back/ trunk injuries	2.0	1.6	2.3	0.7	1.3	1.7	1.3	1.2	1.0	1.7	**1.7**	1.4
Hip/ groin/ thigh	Groin strains/osteitis pubis	11.7	13.7	13.3	11.2	14.0	17.5	12.4	11.7	15.3	7.9	**6.9**	12.3
	Hamstring strains	19.7	18.6	21.6	18.6	21.8	24.3	25.8	21.8	20.6	16.5	**21.5**	21.1
	Quadriceps strains	6.1	6.0	4.2	6.4	5.5	5.6	6.5	8.4	6.3	5.7	**4.0**	5.9
	Thigh and hip haematomas	1.8	0.5	1.7	1.6	1.4	1.0	0.6	1.2	1.9	0.7	**0.5**	1.1
	Other hip/groin/thigh injuries, including hip joint	1.1	1.5	2.6	1.0	2.3	4.5	3.4	6.9	4.7	5.9	**5.6**	3.9
Knee	Knee ACL	12.9	10.8	10.1	9.3	14.1	15.1	15.3	11.1	7.8	13.6	**13.5**	12.1
	Knee MCL	3.8	2.9	2.9	3.0	1.7	4.7	4.0	2.3	2.5	3.2	**3.5**	3.1
	Knee PCL	3.1	2.0	6.5	2.7	1.8	1.6	2.2	1.2	3.2	4.8	**2.0**	2.8
	Knee cartilage	6.9	7.0	6.1	7.8	5.7	9.1	8.5	10.7	13.0	7.6	**4.8**	8.0
	Patella injuries	1.6	0.6	0.1	0.8	1.2	2.7	1.0	1.8	2.4	1.7	**1.1**	1.4
	Knee tendon injuries	2.3	2.9	0.9	2.6	1.8	0.7	1.1	0.8	0.8	2.3	**2.8**	1.7
	Other knee injuries	2.4	2.4	1.3	3.8	0.2	2.6	2.7	2.6	0.9	2.3	**2.0**	2.1
Shin/ ankle/ foot	Ankle joint sprains, including syndesmosis sprains	5.9	5.3	6.4	9.2	8.1	7.1	7.0	8.9	9.2	8.7	**10.7**	8.2
	Calf strains	4.4	3.8	1.7	4.5	3.4	3.1	4.4	3.0	3.7	5.5	**7.1**	4.1
	Achilles tendon injuries	1.4	1.5	0.8	1.9	2.1	2.2	4.1	2.2	3.4	4.0	**5.0**	2.8
	Leg and foot fractures	5.5	2.9	3.7	2.7	5.7	2.7	3.2	7.5	7.6	4.6	**4.9**	4.6
	Leg and foot stress fractures	4.9	5.3	6.3	5.1	8.2	6.8	7.3	11.0	8.5	10.2	**8.6**	7.8
	Other leg/foot/ankle injuries	3.7	3.7	4.3	4.2	4.1	4.2	4.6	6.8	5.7	9.3	**6.7**	5.5
Medical	Medical illnesses	3.0	3.8	4.2	3.6	0.7	3.1	3.5	3.7	3.2	3.2	**4.2**	3.3
Non-football injuries		0.9	1.0	0.4	0.1	0.5	1.4	1.1	1.3	2.4	0.5	**2.1**	1.1
MISSED GAMES / CLUB / SEASON		135.6	118.7	131.0	129.2	138.3	146.7	147.1	151.2	153.8	157.1	**147.7**	142.6

4.4 Analysis and discussion for significant injury categories

(a) Hamstring and lower limb muscle strain injuries

Clearly the most common and prevalent injury in the AFL over the 21-year period is the hamstring strain. There were 2253 new and 588 recurrent hamstring strains, causing 7322 matches to be missed. This resulted in an average 21-year injury incidence of 6.0 new hamstring strains per club per season, causing 20.4 missed matches per club per season, with an average recurrence rate of 26%. Known risk factors include player age, past history of hamstring injury, strength deficits, indigenous race and past history of other injuries (including calf, knee, ankle and groin injuries)[41-44].

Previous analyses of hamstring and other muscle strain data show a high rate of recurrence [42 44-50]. Hamstring management has become slightly more conservative over the 21-year period in the AFL (severity, or average number of games missed per new injury has increased at a rate of 0.03 per year, $p<0.02$). Management of hamstring injuries is also considered to have improved over this period. This change in management strategy has possibly been led by research showing that recurrence rates remain high for many weeks after the initial injury[46] and that performance of players is often decreased in the matches soon after return from hamstring strain[50]. There has not been as much of an increase in severity in the second decade of the injury survey compared to the first, suggesting that the recent falls in hamstring recurrence rates are mainly due to improved management (better decision making with respect to return to play and improved management techniques).

Table 6 shows that in 2011 there was a major drop in hamstring incidence, prevalence and recurrence rates. In 2012, rates were higher than 2011 but still lower than the period 2007-2009. Analysis of the drop in hamstring injuries in 2011 suggested that the reduced rest time spent on the interchange bench in that season had a greater protective effect than the extra bye each team had in 2011[51].

Table 6 – Key indicators for hamstring strains over the past decade

Hamstring injuries	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	10yrA
Incidence	5.7	6.3	5.2	6.4	6.7	6.6	7.1	6.0	4.8	**5.7**	6.0
Prevalence	18.6	21.6	18.6	21.8	24.3	25.8	21.8	20.6	16.5	**21.5**	21.1
Severity	3.2	3.4	3.6	3.4	3.6	3.9	3.1	3.4	3.4	**3.8**	3.5
Recurrence rate (%)	27%	22%	26%	16%	22%	27%	18%	14%	12%	**14%**	20%

(b) Groin injuries

Groin injuries (including osteitis pubis) have been generally 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.

Difficulties in achieving an accurate and consistent (from team to team) diagnosis in the groin region justify grouping many of these diagnoses together in the one category. However, there is an increasing appreciation of the role of hip joint pathology in treating groin pain, as evidenced by the increasing rates of 'other hip and thigh' injuries over the past decade. Recent falls in the incidence and prevalence of groin injuries are somewhat mirrored by the increases in "other hip" injuries, reflecting the trend to diagnose hip pathology more often. This is particularly done in cases where hip surgery has been undertaken.

Even after taking the diagnostic issues into account, there is no doubt that 2012 was a 'good' year for groin injuries with historically low incidence, prevalence and recurrence rates (Table 7).

Table 7 – Key indicators for groin and hip injuries over the past two decades

Groin injuries	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	10yrA
Incidence	2.9	3.1	2.9	3.3	4.0	3.2	3.3	4.1	2.8	**2.6**	3.2
Prevalence	13.7	13.3	11.2	14.0	17.5	12.4	11.7	15.3	7.9	**6.9**	12.2
Severity	4.8	4.4	3.9	4.3	4.3	3.9	3.5	3.7	2.8	**2.6**	3.8
Recurrence rate	20%	24%	23%	28%	39%	23%	19%	20%	15%	**17%**	23%
Other hip	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	10yrA
Incidence	0.4	0.3	0.2	0.3	0.8	0.8	1.0	0.7	1.0	**1.2**	0.7
Prevalence	1.5	2.6	1.0	2.3	4.5	3.4	6.9	4.7	5.9	**5.6**	3.9

(c) Shoulder injuries

Table 8 shows a steady increase in the prevalence and severity of shoulder injuries over the past decade, after the results were fairly stable in the 1990s. There are two major potential drivers of this trend. It is likely that the increased number of tackles per game during the last decade has contributed to the increased risk of shoulder injury, simply by weight of greater exposure. Both the tackling and tackled player may injure their shoulder, with number of tackles in matches (which have increased over the past decade) indicating increased exposure to shoulder injuries. Although relevant statistics are not available, it is also quite possible that the number of tackles at training has increased with the greater focus on tackling in games.

Table 8 – Key indicators for shoulder injuries over the past decade

Shoulder sprains & dislocations	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	10yrA
Incidence	1.3	1.0	1.4	1.6	1.0	1.8	1.3	1.6	1.8	**1.3**	1.4
Prevalence	5.7	5.9	7.7	10.8	6.4	10.2	7.7	10.9	12.1	**9.0**	8.7
Severity	4.4	5.9	5.6	6.7	6.3	5.8	5.7	6.9	6.8	**6.8**	6.2
Recurrence rate	9%	11%	20%	13%	16%	9%	12%	26%	11%	**14%**	14%

There is also a likely contribution of a greater tendency for teams to end a player's season somewhat earlier with shoulder reconstruction. In the 1990s, the standard management for a shoulder instability episode was to return the player back to competition as soon as possible. If a player had suffered multiple shoulder instability episodes during the season, then once the season had finished a specialist's opinion was sought and the player considered for shoulder reconstruction. The management in recent years has changed. Players are given longer to return (if they do choose to return) and hence the severity is higher but recurrence rate is lower. In particular, surgery is often performed mid-season if the player is young, considered highly likely to suffer from a recurrence, or if the team is unable to make the finals.

Although there has been a long-term trend towards increased shoulder injuries, in 2012 there was actually a reduction in incidence and prevalence of shoulder injuries compared to 2010 and 2011.

(d) Knee PCL injuries

The two major knee ligament injuries are anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) injuries. There have been substantially lower rates of PCL injuries since the introduction of the centre circle rule in season 2005 (Table 9) [3]. After 5 centre bounce PCL injuries in 2004, there were only 8 in total for the seven seasons from 2005-2011. There were no ruck-related PCL injuries in 2012.

Table 9 – Key indicators for PCL injuries over the past decade

PCL injuries	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	10yrA
PCL incidence	0.5	0.7	0.4	0.3	0.2	0.3	0.3	0.4	0.6	**0.3**	0.4
PCL prevalence	2.0	6.5	2.7	1.8	1.6	2.2	1.2	3.2	4.8	**2.0**	2.8
No of PCL injuries (total)	8	13	7	5	3	5	6	8	13	**7**	7.5
Number of centre bounce PCL injuries	2	5	1	0	0	2	1	0	4	**0**	1.5

(e) Knee ACL injuries

Knee ACL injury incidence has been generally steady over the past few seasons (Table 10). Although ACL injury rates have remained fairly constant over the past decade, there has been a statistically significant lowering of ACL injury incidence in the period from 1999 onwards compared to the period from 1992-1998 ($p<0.05$). This coincided with the first observations that ACL injuries were more common in the warmer parts of Australia and efforts to change the preparation of the playing surface in response to these observations[52-55]. Recent research of all ACL injuries in Australia has confirmed these trends. At an amateur (population) level, Australia has one of the highest rates of ACL reconstruction in the world[56]. In addition, the northern parts of Australia have a higher rate of ACL reconstruction than the southern parts [56]. This suggests that weather/grass conditions are a risk factor for ACL injuries in amateur sports played outdoors on all types of grass[57]. Although the number of AFL teams in the north of Australia has recently increased (which would tend to increase the risk of ACL injury) the risk of northern venues compared to Victorian ones was greater in the 1990s compared to recent years, suggesting that venue management at northern grounds (e.g. use of ryegrass[57]) has contributed to the fall in ACL injury rates since 1998.

Table 10 – Key indicators for ACL injuries over the past decade

ACL injuries	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	10yrA
ACL incidence	0.6	0.5	0.6	0.9	0.6	0.9	0.7	0.6	0.9	**0.8**	0.8
ACL prevalence	10.8	10.1	9.3	14.1	15.1	15.3	11.1	7.8	13.6	**13.5**	12.1
No of ACL reconstructions	11	9	10	19	13	17	13	9	20	**16**	13.7
Pre-existing ACL injuries/non-AFL injuries	0	0	0	1	1	0	0	3	0	**1**	0.6

ACL injuries	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	10yrA
No of graft ruptures	0	2	1	4	2	4	1	0	4	**1**	1.9
Partial injuries	0	0	0	0	0	1	1	2	1	**1**	0.6

(f) Responsible approach to concussion

The AFL and AFL Medical Officers Association introduced revised Concussion Management Guidelines at the beginning of the 2011 Season that reinforced a more conservative approach to concussion management.

Table 11 shows consistently low incidence and prevalence for concussions that cause a game to be missed (generally one injury or less per club per season). However, there was an apparent rise in both incidence and prevalence in 2011 and 2012. The rise over the last two years in the AFL corresponds with a worldwide trend amongst many sports to recognise the potential long-term effects of concussion[58-60] and the adoption of a more conservative approach with return-to-play decisions. The figures reported in Table 11 are those concussions that require a player to miss a match. Recent research that has been undertaken on concussions in AFL matches not requiring a player to miss a match has demonstrated these additional concussions to be approximately 6-7 per team per season.

Whilst additional research on concussion in the AFL is already underway[61], any change to the definition of concussion for the survey should be avoided so as to not affect the ability to detect long-term trends. AFL players are strongly encouraged by clubs to report all instances of suspected concussion, and research to date has suggested the current AFL practices are consistent with the best available standards[61]. This has been demonstrated by several other sports using the new AFL Concussion Guidelines as a benchmark for adjusting their own approach to concussion management.

The AFL remains strongly committed to player welfare and has introduced several law and tribunal changes in recent years to reduce the risk of head and neck injury such as a reduced tolerance of head-high contact, stricter policing of dangerous tackles, and the introduction of rules to penalise a player who makes forceful contact to another player with his head over the ball.

Several members of the AFL Concussion Working Group delivered presentations at the 2012 International Conference on Concussion in Sport in Zurich, Switzerland, and following this conference some further enhancements will be made to the Concussion Management guidelines for the 2013 Season.

Table 11 – Key indicators for concussion over the past decade

Concussion	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	10yrA
Incidence	0.3	0.3	0.7	0.3	0.3	0.4	0.5	0.5	1.1	**1.0**	0.5
Prevalence	0.6	0.3	0.9	0.3	0.3	0.5	0.7	0.8	2.2	**1.6**	0.9

4.5 Relationship between interchange use and injuries

In 2011, the interchange system was changed from an unlimited bench of four interchange players to three interchange players and one substitute player who can only enter the ground to replace another player who stays off permanently. The AFL is the first sport which has created a hybrid bench, although team sports in general have a diverse variety of interchange and substitute arrangements[62]. There were multiple rationales for the institution of the substitute rule, including 1) congestion, 2) fairness and 3) injury.

In the period 2002-09 there was a slight increase in AFL injury incidence and prevalence, particularly in terms of lower limb muscle strains (e.g. there was a significant ($p<0.01$) increase in hamstring incidence injury over the period 2002-2009 of 0.3 injuries per club per year). Over this same time period average interchange use by AFL teams had substantially increased[63] from 18 in 2002 to 117 in 2010, which was one of the likely causes of the increase in average player speed. Detailed published analysis of hamstring injury data, the most common injury, has now shown that interchanges are protective for the individual player but increase risk for opposition players[63]. Whilst this association has been demonstrated, it is difficult to prove cause and effect given the multifactorial nature of hamstring injuries.

Since the introduction of the substitute rule (2011-2012), compared with the previous 5 years, risk for hamstring injury incidence has significantly reduced, RR 0.81 (95% CI 0.69-0.94). It is promising that a long-term trend towards increased injury rates over the last decade does appear to have been arrested somewhat in 2011 and 2012, however further analysis and monitoring is required to determine the effects of the interchange modifications on injury rates.

The substitute rule has improved medical management in the AFL, reducing the pressure on doctors to withdraw an injured player from a match in the knowledge there is a substitute player available, in cases where the substitute hasn't already been used. This is especially the case with regard to concussed players, who are not permitted to return to play. There is still a 'fairness' issue when a team suffers a subsequent (second or third) injury and no substitute is available, and a number of options are being explored in conjunction with the AFL Medical Officers Association that may assist in such situations.

4.6 Injury prevalence in different age cohorts (younger and older players)

Table 12 – Comparative injury prevalence between players of different ages in key categories

Era	1992-1998			1999-2005			2006-2012		
Age groups	<=21	22-25	26+	<=21	22-25	26+	<=21	22-25	26+
Concussion	1.1	1.1	0.7	0.8	0.5	1.5	0.8	1.0	1.1
Facial fractures	1.5	3.0	2.4	1.3	1.5	2.3	1.0	1.1	1.2
Shoulder sprains and dislocations	3.4	5.3	4.8	7.4	5.5	3.1	14.0	6.2	4.6
A/C joint injuries	2.5	2.3	1.2	2.2	1.9	1.5	1.9	2.1	0.6
Fractured clavicles	1.3	0.9	1.5	2.9	1.4	0.9	1.2	1.0	0.5
Forearm/wrist/hand fractures	5.5	3.7	6.2	3.9	3.3	4.7	4.3	3.9	2.7
Rib and chest wall injuries	1.4	1.9	2.4	1.0	1.3	1.8	1.2	1.0	1.8
Lumbar and thoracic spine injuries	3.9	5.5	7.9	4.7	4.3	10.3	6.8	3.7	4.1
Groin strains and osteitis pubis	11.9	13.0	9.4	14.6	10.6	9.4	14.8	8.8	10.4
Hamstring strains	15.2	20.0	26.0	15.4	19.6	29.5	20.7	20.6	25.2
Quadriceps strains	6.9	7.2	5.9	5.2	5.7	4.9	8.1	4.5	3.3
Thigh and hip haematomas	2.1	2.1	1.5	1.3	1.2	1.5	1.2	0.7	0.9
Other hip/groin/thigh injuries	0.6	0.9	0.8	2.1	1.1	1.6	5.8	3.5	4.5
Knee ACL	8.9	19.7	15.5	8.9	13.3	11.0	11.4	13.5	15.3
Knee PCL	1.8	2.6	4.1	3.0	5.0	3.9	1.9	2.6	3.5
Knee cartilage	3.6	5.2	12.2	5.8	6.8	12.3	5.5	8.8	14.6
Knee and patella tendon injuries	0.9	1.2	3.2	3.8	1.9	2.3	1.4	1.1	2.2
Ankle sprains or joint injuries	5.7	5.2	8.8	6.5	5.8	5.4	8.5	8.5	9.0
Calf strains	1.9	3.7	10.4	2.2	3.2	7.9	2.3	5.0	8.3
Achilles tendon injuries	0.6	1.4	3.5	0.5	1.2	2.8	1.6	4.0	6.0
Leg and foot fractures	4.2	6.3	2.5	5.6	7.0	2.6	5.3	5.0	5.0
Leg and foot stress fractures	6.6	6.2	0.8	5.6	6.0	2.7	11.6	7.0	4.4
Total injuries	109.5	139.7	157.2	122.5	128.6	147.4	152.8	133.5	155.7

Table 12 compares injury prevalence for major categories by age group over eras split into three 7-year periods. It shows that there are some injuries that have consistently affected older players more (e.g. calf and hamstring strains, knee cartilage injuries) over the 21 years of the survey. The injury profile of younger players in recent years has changed quite markedly from the 1990s. The younger player was less prone to injury in the early years of the survey but now has a similar overall risk of missing time through injury as older players. In terms of limitations of the data in Table 12, it is known that in the earliest years of the injury survey (pre-1997) there was potentially a small amount of missing data. It is possible, perhaps likely, that more data may have been missing from the youngest players on lists in the early 1990s than older players. However it is known that all data is accounted for in the periods from 1999 onwards and there is a much higher increase in overall injury prevalence for the youngest players from 1999-2005 to 2006-2012 than other players.

Certain injury categories are now more likely to lead to missed time in younger players (e.g. shoulder sprains & dislocations, groin injuries). This suggests that the intensity of the game for a young player on an AFL list has increased since the 1990s. This may be a consequence of young players in the 1990s being eased into the intensity of AFL football through limited game time when interchange players were more often used as replacement players. With the modern requirement to rotate players rapidly on and off the bench, there is less opportunity to nurse a younger player gradually into the intensity of AFL football. With respect to shoulder injuries in particular, it is known that the number of tackles has increased substantially in recent years in the AFL. Younger players appear to have been more affected by the trend for tackling to become more commonplace, in terms of bearing a disproportionate increase in the risk of shoulder injury. Teams may also now be more likely to address chronic shoulder instability surgically in-season for a younger player, with a more senior player delaying surgery until the end of season.

There is some data available indicating the prevalence of pre-existing injuries (sustained in junior competitions pre-AFL) which young players are suffering from in their first year on an AFL list. It is thought that perhaps the intensity of the pathway competitions has increased in recent years (as players strive to try to perform well to get drafted), although the formal data to support this hypothesis is lacking (i.e. comparative measurements of game intensity of junior football competitions in the 1990s and more recently). It is also worth noting that in other sports (e.g. elite soccer, cricket) both the youngest and oldest players have slightly higher injury rates than those in the middle age groups.

One of the fundamental principles of the injury survey is to avoid club-by-club injury comparisons, as this would potentially jeopardise the universal agreement of all clubs to participate. However it can be noted that in 2011 and 2012 there has been the historically unusual occurrence of two expansion teams playing with particularly young lists compared to the competition average. This situation is a confounder that may have had a slight effect on the injury profiles of 2011 and 2012 (and young players in these years in particular).

5 Conclusions

The 2012 injury profile saw a drop in injury prevalence for the first time since 2008 and brought back the overall rate of injury prevalence back to the approximate level of 2007-2008, after it had risen from 2009-2011.

Recurrence rates continue to fall and are now down to under 10%, the last two seasons having the lowest rates reported in the 21 years of the survey. Regardless of how much of this is due to more conservative practices or better judgment and assessment, it is an exceptional trend and reflects the high standard of medical management provided by AFL Club medical and conditioning staff.

Finally, it is worth reflecting on the achievements of 21 years of AFL injury surveillance:

- The AFL injury survey is the world's longest running publicly released injury survey in sport;
- For the first time, the 2012 report is being co-released with a publication in a major scientific publication (the *American Journal of Sports Medicine*);
- The survey has run for 21 seasons, achieving 100% participation and compliance over the last 16 seasons; and
- The survey has led directly and indirectly to dozens of published studies[2 5 10 12 57 64-67] and interventions which have improved the safety of the AFL competition (e.g. ruck rule changes to decrease PCL injuries).

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