

AFL INJURY REPORT: SEASON 2005

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Highlights:

- Presents findings from the 14th consecutive year of injury surveillance for the AFL, the last nine years with 100% compliance.
- Season 2005 was another low year for injuries compared to the long-term average, with the second lowest injury prevalence since the survey was commenced.
- A reduction in ruck-related posterior cruciate ligament (PCL) injuries justifying the recent rule change to the centre bounce.
- Again reveals the hamstring strain to be the most common and most prevalent injury in the AFL with a long-term slight reduction in incidence and recurrence rates.



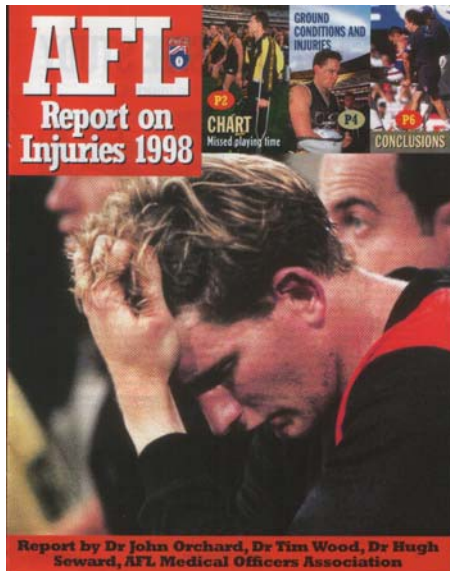


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INTRODUCTION

The fourteenth season of the AFL Injury Survey was completed in 2005, with the AFL commissioning injury surveillance continually since 1992¹ and publicly releasing the results of the annual injury report since 1996². The



AFL injury survey is therefore the world's longest running professional sport injury survey that has been publicly released on an annual basis^{3 4} (the NFL in the USA has conducted injury surveillance for a longer period but does not provide an annual public release of data). The injury survey also guides the AFL Research Board to fund projects to study injuries that are common, severe and/or increasing in incidence in AFL players. Since 1997, the injury survey has accounted for every case of senior listed players missing games through injury in the home & away season³. In 2001 this was extended to include rookie listed players and finals matches.

METHODS

The methods of the injury survey are now well established and have been previously described in detail ³, although minor changes may be made on an annual basis. The definition of an injury is “any injury or other medical condition that prevents a player from participating in a regular season (home and away) or finals match”. This definition has been chosen to promote consistency across the 16 AFL clubs and from season to season. It allows a ‘cross-check’ of compliance with the injury definition to be performed using player movement monitoring. 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. Since the 1997 season, all teams have been required to notify the AFL of the status of all players in the week after each match. Details of injuries (such as specific diagnosis, onset and mechanism) are not reported to the injury survey coordinator until the season has been completed, in order to minimise any concerns about the passing on of data during the playing season. 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 ‘realtime’ 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, but a mechanism is in place for further study to be conducted on a specific injury type. Thus Player Movement Monitoring has allowed the injury survey to achieve ‘100% compliance’ for all instances of missed player games since 1997.

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. Each year, where changes are made to injury definitions, categories and methods of analysis from year to year, these changes are made *retrospectively* for all previous survey years. Therefore, some of the data presented in this report for previous years varies slightly from what is apparently the same data which has been published before in the reports of previous years.

RESULTS

Weekly player status

Table 1 details player status on a weekly basis over the past nine seasons. The ‘average’ status of a club list of 43 players in any given week for 2005 was: 34 players playing football per week, 6 missing through injury and 3 missing through other reasons (such as suspension, being used as a travelling emergency, team bye in lower grade etc.). The injury prevalence in 2005 of 14.7% was low in terms of the historical average, being the second lowest (to 2003) overall prevalence recorded since 1997.

Table 1 - Average weekly player status by season (home & away season)

Status	1997	1998	1999	2000	2001	2002	2003	2004	2005
Playing AFL	21.0	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
<i>TOTAL playing</i>	32.8	33.4	33.4	33.3	34.9	34.1	34.0	33.9	34.2
Not playing because of injury	7.7	6.7	6.4	6.2	6.7	6.6	5.7	6.4	6.4
Not playing for other reasons	1.9	1.6	1.8	1.8	1.8	2.3	2.5	2.5	2.8
<i>TOTAL not playing</i>	9.6	8.3	8.3	8.0	8.5	8.9	8.2	8.9	9.1
<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
<i>Injury prevalence (%)</i>	18.1%	16.1%	15.4%	15.0%	15.5%	15.3%	13.5%	14.9%	14.7%

Injury incidence

Table 2 details the incidence of the major injury categories. The injury incidence (number of new injuries per team per season) continued in 2005 at a level which was historically low. Hamstring strains have been the most common injury in every year of the survey, with generally 6 of these injuries occurring per club per season and these injuries were again very common in 2005, although slightly down on the 2004 incidence.

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

Body area	Injury type	1997	1998	1999	2000	2001	2002	2003	2004	2005
Head/neck	Concussion	0.6	0.7	0.5	0.6	0.7	0.7	0.3	0.3	0.7
	Facial fractures	0.8	0.7	0.8	0.7	0.4	0.4	0.6	0.8	0.6
	Neck sprains	0.1	0.2	0.2	0.2	0.1	0.0	0.1	0.1	0.2
	Other head and neck injuries	0.2	0.2	0.2	0.1	0.3	0.2	0.3	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	1.3
	A/C joint injuries	0.9	0.9	0.6	1.3	0.9	1.1	0.3	1.2	0.7
	Fractured clavicles	0.4	0.4	0.3	0.5	0.3	0.3	0.2	0.6	0.3
	Elbow sprains or joint injuries	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.3	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
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
	Other forearm/wrist/hand injuries	0.4	0.4	0.4	0.7	0.3	0.4	0.9	0.4	0.3
Trunk/back	Rib and chest wall injuries	1.1	0.5	0.8	0.7	0.4	0.8	0.7	0.6	0.3
	Lumbar and thoracic spine injuries	1.9	1.6	1.5	2.2	1.6	0.9	1.0	1.7	2.1
	Other trunk/back/buttock injuries	1.0	0.9	1.0	0.5	0.4	0.4	0.4	0.7	0.4
Hip/groin/ thigh	Groin strains and osteitis pubis	4.1	3.3	3.1	3.0	3.5	3.9	2.8	3.1	2.8
	Hamstring strains	6.8	6.4	6.8	5.8	6.1	4.5	5.9	6.4	5.2
	Quadriceps strains	2.5	3.0	2.4	2.0	1.6	1.7	2.0	1.9	1.9
	Thigh and hip haematomas	1.3	1.3	1.1	1.1	0.6	1.0	0.3	1.1	1.0
	Other groin/hip/thigh injuries	0.4	0.2	0.3	0.4	0.3	0.3	0.4	0.3	0.2
Knee	Knee ACL	1.2	0.8	0.7	0.5	0.9	0.8	0.6	0.5	0.6
	Knee MCL	0.7	1.3	1.2	0.9	1.2	0.9	1.0	0.7	1.0
	Knee PCL	0.6	0.3	0.7	0.5	1.0	0.4	0.5	0.7	0.4
	Knee cartilage	0.9	1.1	1.1	1.2	1.9	1.3	1.7	1.2	1.3
	Patella injuries	0.2	0.4	0.1	0.2	0.2	0.4	0.1	0.1	0.3
	Knee and patella tendon injuries	0.5	0.6	0.7	0.7	0.5	0.8	0.7	0.4	0.7
	Other knee injuries	1.4	0.4	0.9	1.3	0.8	0.5	0.7	0.7	0.9
Shin/ankle/ foot	Ankle sprains or joint injuries	2.7	2.8	2.1	2.7	2.0	2.5	2.6	2.7	2.5
	Calf strains	1.9	2.3	1.4	1.9	1.6	2.2	1.6	0.9	1.9
	Achilles tendon injuries	0.4	0.3	0.5	0.4	0.2	0.4	0.4	0.2	0.3
	Leg and foot fractures	0.5	0.8	1.1	0.6	1.0	0.9	0.5	0.5	0.4
	Leg and foot stress fractures	0.8	0.7	0.8	0.5	0.9	0.7	0.9	0.9	0.9
	Other leg/foot/ankle injuries	1.9	1.7	1.3	1.4	1.7	0.9	1.5	1.7	1.3
Medical illness	Medical illnesses	2.5	2.8	1.6	1.9	1.8	2.3	2.4	2.1	2.2
TOTAL INJURIES PER CLUB		41.9	40.3	36.9	37.4	35.8	34.4	34.1	35.6	35.8

Injury recurrence

Table 3 shows the rate of recurrence of the some of the common injury types, particularly muscle strains which have a comparatively high recurrence rate. Some other injuries, such as fractures, concussion and ‘cork’ injuries have a low recurrence rate. The issue of recurrence for muscle strains is the subject of ongoing research ⁵. The rate of injury recurrence has been showing a steady decline over the last 9 years. Season 2004 had the lowest recurrence rate on record, although season 2005 was still low by historical terms.

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

Injury type	1997	1998	1999	2000	2001	2002	2003	2004	2005
Hamstring strains	37%	36%	30%	39%	25%	30%	27%	22%	27%
Groin strains and osteitis pubis	36%	31%	6%	16%	20%	23%	20%	24%	24%
Ankle sprains or joint injuries	20%	21%	9%	11%	17%	16%	6%	11%	15%
Quadriceps strains	35%	20%	20%	18%	10%	17%	9%	6%	20%
Calf strains	15%	15%	17%	32%	17%	13%	14%	6%	12%
ALL INJURIES	20%	19%	14%	16%	15%	13%	14%	11%	14%

Injury prevalence

Table 4 details the amount of missed playing time attributed to the most notable injury categories. In season 2005, hamstring also continued as the no. 1 injury in the game with respect to missed playing time, surpassing both groin injuries and knee ACL injuries. Based on injury prevalence (missed playing time), knee ACL injuries, hamstring injuries and groin & hip injuries are considered to be the ‘big three’ injury categories affecting AFL players. The majority of the occurrences of these ‘big three’ injuries have a non-contact mechanism.

Table 4 - Injury prevalence (missed games per club per season)

Body area	Injury type	1997	1998	1999	2000	2001	2002	2003	2004	2005
Head/neck	Concussion	0.7	0.7	0.5	0.7	1.3	2.0	0.6	0.3	0.8
	Facial fractures	2.5	2.1	2.3	2.0	1.3	1.4	1.0	2.2	1.4
	Neck sprains	0.7	0.7	1.6	0.3	0.2	0.0	0.3	0.6	0.3
	Other head and neck injuries	0.3	0.2	0.4	0.8	1.5	0.2	0.7	0.2	0.2
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
	A/C joint injuries	2.2	2.1	0.9	3.1	2.1	2.4	0.7	2.5	1.9
	Fractured clavicles	1.4	1.6	1.2	3.0	1.6	2.0	1.0	3.5	1.3
	Elbow sprains or joint injuries	0.7	1.2	0.2	0.1	0.4	0.3	0.4	0.7	0.4
	Other shoulder/arm/elbow injuries	2.4	1.9	0.3	1.3	1.3	4.0	1.6	1.6	2.4
Forearm/wrist/hand	Forearm/wrist/hand fractures	4.1	5.4	5.9	5.6	2.8	3.1	2.6	3.9	3.8
	Other forearm/wrist/hand injuries	0.7	1.3	0.9	1.8	0.3	2.2	3.1	1.2	1.2
Trunk/back	Rib and chest wall injuries	2.5	1.0	1.8	1.0	0.5	1.3	1.5	1.1	0.5
	Lumbar and thoracic spine injuries	12.2	4.6	8.0	8.5	5.8	5.8	2.4	5.9	6.4
	Other trunk/back/buttock injuries	3.7	1.4	2.0	2.2	1.5	1.7	1.5	2.1	0.7
Hip/groin/ thigh	Groin strains and osteitis pubis	17.4	13.9	9.4	7.5	13.6	15.8	13.6	13.3	11.2
	Hamstring strains	21.0	21.0	22.6	22.9	21.4	15.7	18.8	21.7	19.1
	Quadriceps strains	8.6	9.5	6.7	5.6	3.8	4.3	6.0	4.2	6.4
	Thigh and hip haematomas	2.4	1.8	1.5	1.8	0.6	1.9	0.5	1.7	1.6
	Other groin/hip/thigh injuries	1.7	0.5	2.3	1.5	1.7	1.2	1.5	2.6	0.5
Knee	Knee ACL	19.8	15.8	10.8	4.8	13.6	16.5	10.8	10.1	9.3
	Knee MCL	3.3	4.3	3.3	3.5	4.8	3.3	2.9	2.9	3.0
	Knee PCL	1.9	2.2	5.2	2.3	5.9	2.3	2.0	6.5	2.7
	Knee cartilage	4.0	5.6	5.3	8.6	12.5	6.0	7.0	6.1	7.8
	Patella injuries	0.9	1.6	0.8	1.8	0.8	2.5	0.6	0.1	0.8
	Knee and patella tendon injuries	2.4	1.6	3.9	3.9	2.5	3.7	2.9	0.9	2.6
	Other knee injuries	3.9	1.2	2.2	3.6	2.5	1.0	2.4	1.3	3.8
Shin/ankle/ foot	Ankle sprains or joint injuries	7.2	6.9	3.9	6.8	4.3	5.9	5.3	6.7	9.2
	Calf strains	5.8	6.4	3.4	5.7	3.4	4.4	3.9	1.7	4.5
	Achilles tendon injuries	1.3	1.4	1.3	1.6	0.7	0.9	1.5	0.8	1.9
	Leg and foot fractures	2.6	5.4	8.8	4.6	7.2	7.9	3.0	3.7	2.7
	Leg and foot stress fractures	4.9	4.0	6.7	3.8	4.4	3.9	5.3	6.3	5.1
	Other leg/foot/ankle injuries	6.4	5.1	3.1	4.1	4.2	2.3	3.7	4.3	4.3
Medical illness	Medical illnesses	4.2	3.7	3.3	2.8	2.6	2.9	3.9	4.2	3.6
MISSED GAMES PER CLUB PER SEASON		159.2	141.9	135.9	131.8	136.4	134.7	118.7	131.0	125.4

ANALYSIS & DISCUSSION FOR SIGNIFICANT INJURY CATEGORIES

Hamstring injuries

Hamstring strains remain the most common injury in the AFL. Previous analysis of hamstring and other muscle strain data shows a high rate of recurrence ⁵⁻⁸. The current AFL data shows that management of these injuries has become more conservative over the last decade in the AFL. The



mechanisms of hamstring injury in football are overstriding when sprinting, bending to pick up the ball while running, or attempting to break out of a tackle ⁹. The risk of recurrence is high and persists for three months after return to play because players often return with subtle strength deficits and/or biomechanical compensations ⁵. There is research identifying the role of MRI as a predictor for safe

return to play (without recurrence) from hamstring strains through the measurement of the size of the lesion ¹⁰.

In a similar fashion to injuries overall, Table 5 shows that hamstring strains have decreased in incidence, prevalence and recurrence rate over recent seasons, with little change in overall average hamstring injury severity.

Table 5 - Key indicators for hamstring strains over the past nine seasons

Hamstring strains	1997	1998	1999	2000	2001	2002	2003	2004	2005
Incidence	6.8	6.4	6.7	5.6	6.1	4.5	5.8	6.3	5.2
Prevalence	21.0	21.0	22.6	22.9	21.4	15.7	18.8	21.7	22.7
Severity	3.1	3.3	3.4	4.1	3.5	3.5	3.2	3.5	4.4
Recurrence rate	37%	36%	30%	39%	25%	30%	27%	22%	27%

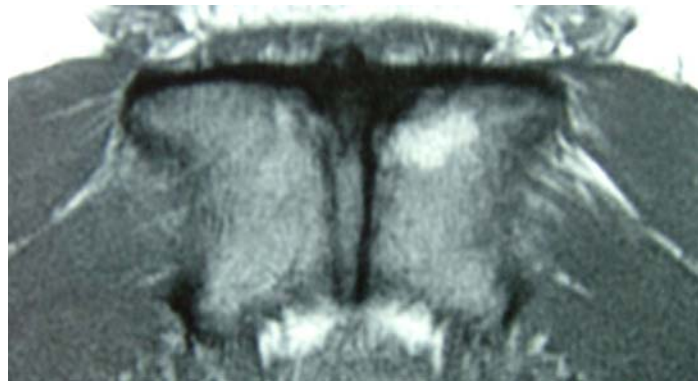
Groin injuries

Table 6 - Key indicators for groin injuries over the past nine seasons

Groin	1997	1998	1999	2000	2001	2002	2003	2004	2005
Incidence	4.1	3.3	3.1	3.0	3.5	3.9	2.8	3.1	2.8
Prevalence	17.4	13.9	9.4	7.5	13.6	15.8	13.6	13.3	10.0
Severity	4.3	4.2	3.0	2.5	3.9	4.1	4.8	4.4	3.6
Recurrence rate	36%	31%	6%	16%	20%	23%	20%	24%	24%

Groin injuries (including osteitis pubis) have been a major source of concern in AFL clubs over the past decade. These injuries have a high rate of recurrence and of becoming chronic.

Fortunately Table 6 reveals that the incidence is certainly not increasing and may be decreasing over the past 9 years.



Prevalence has decreased in each of the past three seasons, although it is still higher than in 1998-1999. The recurrence rate for these injuries remains high. 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 over all, leaving groin injuries to make up a greater percentage of the injuries suffered in younger players). There is still very little consensus on the correct usage of surgery for chronic groin injuries, although it is likely that surgery is used less often in recent years than it was during the 1990s.

Knee anterior cruciate ligament (ACL) injuries

In the AFL competition over recent years great attention has been given to the role of ground and surface conditions with respect to the prevention of ACL injuries. This has been based on research conducted within the AFL competition. The overall ACL injury prevalence has been consistently higher in the teams based in northern states compared to teams based in Victoria and in games played earlier during the season ¹¹ a factor which has led to this interest.

Internationally, the focus on prevention of ACL injuries has been completely different, with the vast majority of work concentrating on the use of balance/strengthening training to prevent these injuries. This relative shift in focus has probably been due to the fact that no other international competition has reported geographical differences in ACL injury rates, yet sex differences (with females more likely to be injured) have been noted in many sports.

It has been hypothesized that perhaps grounds are generally harder in the northern AFL venues, which might lead to greater ACL injury rates, although investigation has shown that grounds in the northern venues are generally not harder than Victorian grounds ¹¹⁻¹⁶. Major AFL venues have taken



Penetrometer readings prior to games to attempt to assess the risk of injury and its relationship to ground hardness ^{4 13}. However, the relationship found between injury and ground hardness to date seems to have been minimal ^{4 13}. Recent research suggests that the grass types used on stadium fields and thatch depth, more so than ground hardness, may be more likely to be

responsible for the ‘early-season’ and ‘warm-season’ biases for ACL injuries that have been previously noted ¹⁷. It is unlikely that surface hardness (independent of shoe-surface traction) is the most important extrinsic risk factor for ACL injury across a variety of sports. Because the interactions of grass type, player choice of boot and shoe-surface traction are not well understood, it is still premature to make any strong recommendations about acceptable ground conditions with respect to safety in preventing ACL injuries. ACL injury rates have fallen over the past few years, but there is not enough comparative data to attribute this to either reductions in ground hardness, traction and/or the removal of cricket pitches at this stage. Perhaps some of these interventions have been successful in combination. There may be other confounding factors, such as individual club proprioceptive training programs, that could have contributed to the recent reduction in ACL injury incidence.

Table 7 - Key indicators for knee ACL injuries over the past nine seasons

Knee ACL injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005
Incidence	1.2	0.8	0.7	0.5	0.9	0.8	0.6	0.5	0.6
Prevalence	19.8	15.8	10.8	4.8	13.6	16.5	10.8	10.1	9.3
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

Knee posterior cruciate ligament (PCL) injuries

The rate of knee posterior cruciate ligament (PCL) injuries has varied from year to year. Although the total injury incidence did not particularly increase from 1997 to 2004, it was noted that there was an increase in the number of these injuries occurring at centre bounce ruck duels. Over this same time period, fewer players appeared to have suffered this injury in falls around the ground, which may reflect the improvement in ground preparation producing softer playing surfaces. New rules were introduced in 2005 to limit the ruckman's run up, with the introduction of a 10 metre outer circle. The rationale for this change was to reduce the momentum of any knee contact, while maintaining the spectacle of this unique contest, and thereby reducing the severity of any subsequent injury. There were no centre bounce ruck mechanism PCL



injuries in 2005, indicating success with this rule change. It is expected that the trend of higher PCL injuries amongst ruckmen will be reversed, reducing the morbidity amongst ruckmen and extending their careers.

Table 7 - Key indicators for PCL injuries over the past nine seasons

Knee PCL injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005
Incidence	0.6	0.3	0.7	0.5	1.0	0.4	0.5	0.7	0.4
Prevalence	1.9	2.2	5.2	2.3	5.9	2.3	2.0	6.5	2.8
Severity	3.3	7.4	7.2	4.8	5.9	5.9	4.4	9.0	7.3
Number of centre bounce PCL injuries (compared to total)	0/10	2/5	3/12	4/8	4/18	3/7	2/8	5/13	0/9

CONCLUSIONS

Table 8 - Key indicators for all injuries over the past nine seasons

All injuries	1997	1998	1999	2000	2001	2002	2003	2004	2005
Incidence	41.9	40.3	36.9	37.4	35.8	34.4	34.1	34.8	34.7
Prevalence	159.2	141.9	135.9	131.8	136.4	134.7	118.6	131.0	125.4
Severity	3.8	3.5	3.7	3.5	3.8	3.9	3.5	3.8	3.6
Recurrence rate	20%	19%	14%	16%	15%	13%	14%	11%	14%

Table 15 shows that from 1997 to 2005, injury incidence and injury recurrence rate have gradually decreased. Injury severity (average number of games missed per new injury) has stayed fairly constant. Because the recurrence rate is also gradually dropping, this indicates that the average new injury is keeping players out for longer, but the longer new injury recovery time is being counterbalanced by the reduced time missed from recurrent injuries.

Certainly the ongoing trends in the injury rates vindicate the approach the AFL is taking towards injury surveillance and research. The AFL is one of the few professional sports in the world (if not the only one) which can say it has successfully lowered its overall injury rates over a sustained period with the aid of injury surveillance¹⁸. Possible variables that may have positively affected injury rates include: (1) the program of ground condition surveillance by all major venues with a resulting greater focus on safety (2) the specific move by grounds to promote rye grass use as the predominant species (3) video surveillance and low tolerance to foul or illegal play, showing a continuing influence on reducing concussions (4) the establishment of a research board with a knowledge increase from the specific projects to have arisen out of this funding (5) improved management and prevention of injuries at club level (6) changes to player footwear that have occurred over the past decade (7) changes in styles of play that have occurred over the past decade.

The AFL injury profile continues to be consistently defined and published in both the sports medicine scientific literature and in public media releases³. Hamstring injuries, knee ACL injuries and groin injuries (including osteitis pubis) are consistently the most prevalent injuries in AFL players.

The major findings of the 2005 injury survey are that:

- (1) Ongoing rates of injuries remain low in historical terms.
- (2) Recent trends in PCL injuries in ruckmen justify the recent centre circle rule change.

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