



# Concussion Management in a Professional Senior AFL Team Over 10 Years: Assessing re-injury rate and performance

Dr Nathan Gibbs, Dr Dan Bates (B.Med, BSc(HONS)),  
Dr Mark Watsford

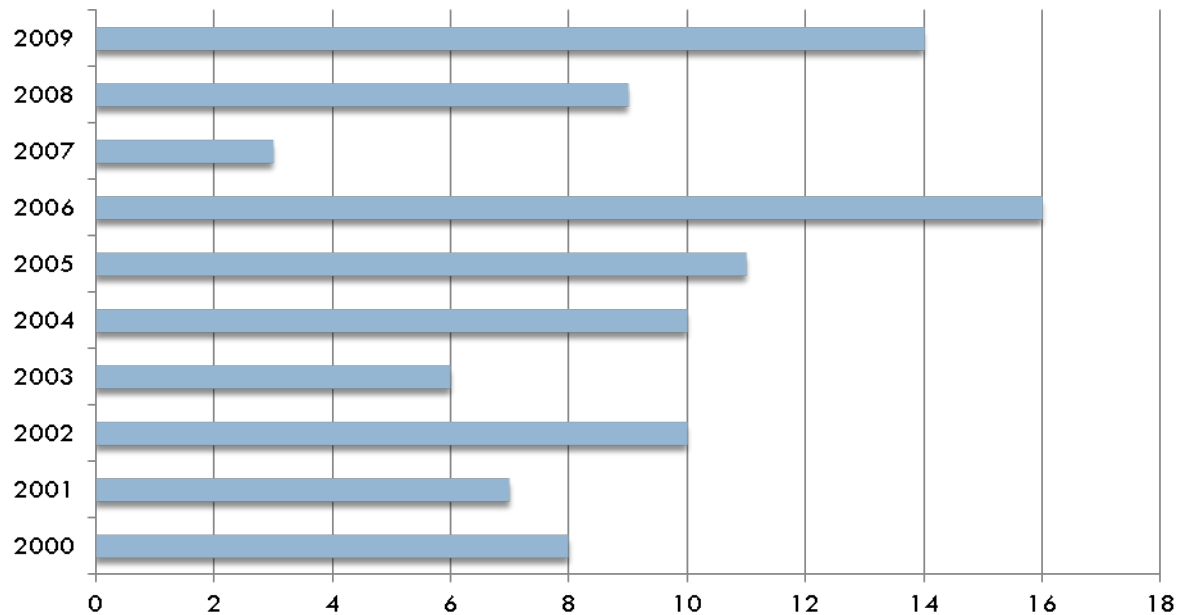
## Questions:

- **What is the incidence of concussion as the Sydney Swans?**
- **How many games are missed due to concussion?**
- **What is the incidence repeat concussion within the season?**
- **Are the players that continue, or come off and go back on, at**
  - At increased risk of repeat concussion?
  - At increased risk of injury?

## Questions:

- **At the return game (next week) are concussed players at**
  - At increased risk of injury
  - At increased risk of repeat concussion
  - At risk of decreased performance
- **In the return game (next week), are players that continue, or come off and go back on**
  - At increased risk of injury
  - At increased risk of repeat concussion
    - At risk of decreased performance

## Incidence of concussion 2000 - 2009



| Concussed 2000-2009 | Average per year | New concussion/<br>1000pgh |
|---------------------|------------------|----------------------------|
| 94                  | 9.4              | 13                         |

## Inclusion in the analysis:

|         | Concussed | No performance data | Concussed in final game | Did not play due to injury | Total included |
|---------|-----------|---------------------|-------------------------|----------------------------|----------------|
| Players | 94        | 7                   | 3                       | 3                          | 81             |

### No performance data

- 7 dropped from the senior team and no performance data was available for the next week.
- All 7 players played in reserves
- 0 players suffered a recurrent concussion in that week.

## Game day management:

### Return to play in same game criteria:

- Resolution of symptoms
- Symptom-free off-field exertion test.
- Sideline neuropsychometric testing was not performed.

|              | Concussed | Did not return | Go off and come back on | Continued | Go off and come back on or continued |
|--------------|-----------|----------------|-------------------------|-----------|--------------------------------------|
| Players      | 81        | 21             | 36                      | 24        | 60                                   |
| % of players | 100%      | 26%            | 44%                     | 30%       | 74%                                  |

## Post concussion management:

### **Gradual RTP program over 6-8 days – 24 hours between each stage**

- **Day 1:** Observation for 4-6 hours
- **Day 2:** Review
- **Day 3-4:** Rest for 2-3 days until resolution of all symptoms
- **Day 4/5:** 30 minute bike session (symptom free)
- **Day 5/6:** Low intensity weights session (symptom free)
- **Day 6/7:** Full team training with avoidance of contact drills (symptom free)
- **Day 7/8:** Game

## Missed games Post-Concussion

|         | Missed following weeks<br>game due to Concussion | Missed following weeks<br>game due to injury |
|---------|--|--|
| Players | 0  | 3  |

- **Injuries**
  - Broken Jaw
  - Ankle sprain
  - Hamstring tear

## Repeat concussion – same season

|                | <b>Total<br/>concussion</b> | <b>Concussion<br/>following<br/>week</b> | <b>2<sup>nd</sup><br/>concussion<br/>same season</b> | <b>3<sup>rd</sup><br/>concussion<br/>same season</b> |
|----------------|-----------------------------|--|--|--|
| <b>Players</b> | 94                          | 0  | 17 (19.3%)   | 3 (3.4%)   |

## Are concussed players more likely to be re-injured in the Return game (next week)?

### Total number of injuries 2000-2009 + Return Game injuries for concussed players

|                          | Not concussed | Concussed |
|--------------------------|---------------|-----------|
| Significant injury       | 132           | 2         |
| Non-significant injuries | 527           | 11        |
| Total                    | 659           | 13        |

Significant injury = At least 1 game missed

Non-significant injury = No games missed

## Are concussed players more likely to be re-injured in the Return Game (Next week)?

### Injuries 2000-2009 + Return Game injuries for concussed players Per 1000pgh

|                                      | Not concussed | Concussed | Significance |
|--------------------------------------|---------------|-----------|--------------|
| Significant injury (per 1000pgh)     | 23.5          | 17        | P = 0.86     |
| Non-significant injury (per 1000pgh) | 93            | 77        | P = 0.86     |

**Statistical test = Fisher's Exact test**

**Result:** There is no statistical difference in injury rate in between concussed and non-concussed players in the week following concussion.

## Are concussed players who continue, or go off and go back on likely to be re-concussed or injured?

|         | Concussed | Continued/Go off and come back on | Repeat concussion | Significant injuries | Non-significant injuries |
|---------|-----------|-----------------------------------|-------------------|----------------------|--------------------------|
| Players | 81        | 60                                | 0                 | 2<br>(20/1000pgh)    | 2<br>(20/1000pgh)        |

- Injury rate were too low for statistical analysis so descriptive stats have been used
- Injury rates of those returning to play are comparable to the non-concussed injury rates
- No Repeat concussions
- No Second impact syndrome
- No Structural intracranial injuries

**Result:** There does not appear that there is an increased injury risk for players who continue on in or return to the game on the same day.

# Does concussion affect performance in the Return Game (Next Week)?

## **Performance measure**

- Coach rated match performance (CRMP):
  - Standardised rating out of 50 of player performance
  - Relies on the player performing their role in the team not on number of touches or game statistics.

## CRMP of return game post-concussion Vs season average

### CRMP in same player:

|                  | CRMP – Season average | CRMP – Return game | Significance |
|------------------|-----------------------|--------------------|--------------|
| Concussed player | 42.2 +/- 14.00        | 43.4 +/- 23.93     | P= 0.568     |

### Statistical test: paired t-test

**Result:** There is no statistical difference between return game and season average CRMP

## CRMP return game post-concussion Vs non-concussed players

- Mann-Whitney U test to compare groups
- **Results:** No significant difference in performance except 2005 and 2008 where concussed players played better the following week.

## Did players perform worse the following week if they stayed off, continued, or came off and went back on after concussion?

| Group                   | Players | Mean $\pm$ SD   |
|-------------------------|---------|-----------------|
| Continued               | 24      | 37.2 $\pm$ 25.2 |
| Go off and come back on | 36      | 50.2 $\pm$ 22.1 |
| Did not return          | 21      | 38.5 $\pm$ 23.3 |
| Total                   | 81      | 43.4 $\pm$ 23.9 |

**One-way ANOVA with Bonferroni post-hoc analysis.**

### Results:

- No significant differences between treatment methods  $p=0.066$
- Trend for a higher match rating from the 'go off then come back on' treatment ( $p=0.07$ ).
  - Size effect :  $<0.3$  = trivial,  $0.5$  = moderate,  $>0.7$  = large

## Conclusions and short discussion:

- **Concussion is a common injury in AFL**
  - 13/1000pgh Vs 4.1 (Rugby Union), 3.0 (Rugby League) 5.5 (Ice Hockey)
  - 9.4/season Vs 6.7/season new hamstring injuries
  
- **Concussion is likely underreported in the AFL**
  - 0.3-0.7/season - AFL injury report 2007
  - 199 over 2000-2003 (Makdissi et al, 2009)
  - Swans 33 concussions over same years = 528 across competition.
  
- **Players commonly stay on or RTP in the same game.**
  - Swans – 74%
  - AFL – 43% (McCory et al, 2000)
  - NFL – 49.5% (Pellman et al, 2005)
  - Rugby Union - 58% stayed on or removed later (Kemp, et al, 2008)

## Conclusions and short discussion:

- **Players can return to play in the same game with on increase in risk of injury**
  - 0 structural or intracranial injury
  - 0 recurrent concussions
  - 0 second impact syndrome
  - 2 MSK injuries
  
- **Pellman et al, 2005 concluded that the concern regarding RTP in the same game may be unfounded following analysis of 887 concussions**
  - 0 intracranial lesions
  - 0 second impact syndrome
  - 0 repeat concussion
  - No increase in the rate of concussion in those that RTP in the same game, later in the season

## Conclusions and short discussion:

- **Concussion is commonly a minor injury with short recovery and return to play within a week**
  - NFL – 98% players return to the next game (Pellman et al, 2005)
- **Players can return to sport following symptom free gradual RTP program with no alteration in**
  - Performance
  - Repeat concussion rate
  - Injury rate
- **Game day management strategy (the player stays on, comes off and goes back on, comes off and stays off) for the following week, does not effect**
  - Performance
  - Repeat concussion rate
  - Injury rate

## Conclusions and short discussion:

- There is a trend for players who “come off and go back on” to perform better the following week.
  - This provides medical support maintenance of the free interchange rule

## Limitations:

- **Retrospective study**
  - Prospective study to be performed
- **Limited numbers**
- **No long term effect data**
  - With concussion the most common injury in AFL
  - High recurrence rate in the same season (19.3%)
  - Long term study into the outcomes of concussion in AFL players should be prompted.