



SPORTS PERFORMANCE
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KNOWLEDGE and ATTITUDES (KA) SURVEYS ON CONCUSSION IN SPORTS: REFEREE MARCH 2017 SURVEY

REPORT #1 TO ACCIDENT COMPENSATION CORPORATION (ACC)

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AUGUST 7th 2017

Acknowledgement

Thanks to Olivia Howe and Brent Crossan, Year 4 Physiotherapy students, for assisting with the data collection and analysis.

OVERVIEW

This report is the first in a series presenting baseline Knowledge and Attitudes (KA) around concussion in sport in Rugby Referees *March 2017 Survey*.

The 'Sports Concussion in New Zealand ACC National' Guideline was released in 2014. The KA analysis provided an opportunity to assess current knowledge and attitudes of rugby referees towards concussion in sport.

The results from the *Referee March 2017 Survey* suggest that the Auckland-based sample of 140 rugby union referees are knowledgeable regarding concussion, and show positive attitudes towards correct management of the injury. There was a general consensus of the referees that further education for players, coaches and referees is required to optimise management and improve the awareness of concussion. Almost 50% of the referees who participated in the survey reported experiencing a previous concussion, and this, in addition to the high level of current media coverage surrounding concussion, may have contributed to improved recognition of key concussion signs and symptoms.

Recommendations

- Further education is required to understand some of the symptoms of sports concussion such as amnesia and the use of devices that may affect cognitive function
- Further education is needed over the time frames to return to sport
- Continuing education programmes are required to ensure the current overall high levels of knowledge in the referees group remain high.
- It will be of interest to measure the impact of the ACC Concussion Guidelines and the Blue Card initiative with this group.

INTRODUCTION

The aims of the KA concussion project are to undertake surveys of secondary school students, coaches, parents, referees, and general practitioners to understand their current knowledge and attitudes towards the management of concussion. The key outcomes of the review will be:

- **A comprehensive overview of the KA of sports related concussion in secondary school students, coaches, parents, referees, and general practitioners before and after the implementation of the ACC Sports Concussion Guidelines.**
- **Recommendations on the impact of the guidelines on knowledge and attitudes (KA).**

Sport related concussion is a significant problem in New Zealand sporting populations (Theadom et al., 2014). It has been estimated that 21% of all traumatic brain injuries are sustained in the sports arena. Rugby, cycling and equestrian activities have been identified as the most common cause of mild-TBI in sports (Theadom et al., 2014).

A survey of 600 NZ Secondary school rugby players (Sye et al., 2006), demonstrated that at that time, only half of the players were aware of any guidelines for the management of concussion. Approximately half of the players also identified they had been concussed but only 22% had been medically cleared to return to sport. This demonstrated a significant lack of understanding of the management of this condition.

In 2014 The Accident Compensation Corporation (ACC, 2014) released a guideline on the management of sports concussion. A study conducted in secondary rugby school players in NZ (Pickup et al., 2015) just prior to the release of the ACC guideline, found that whilst knowledge of concussion was generally good, more than half of the players felt that they didn't know enough about concussion and reported that their response to concussion would depend on the nature of the game.

Purpose

The purpose of *Referee March 2017 Survey* was to assess the current state of knowledge around concussion guidelines and management for rugby referees in 2017 and to understand if there is need for an intervention to address any gaps in knowledge

METHODOLOGY

Data collection process

The *Referee March 2017 Survey* was undertaken over three nights in the Auckland region during scheduled information evenings for referees run by the Auckland Rugby Union in early March. The focus of the information evening was to inform the referees of the use of the “blue card’ to manage on-field concussion in the 2017 season. The information evenings focus fitted well with the intent of the research to collect baseline data in 2017 and repeat this again in 2018 for KAB related to concussion for referees.

The methodology used to ascertain the Knowledge and Attitudes (KA) of the Auckland-based referees used a prospective questionnaire design. The 35-item multi choice questionnaire for the referees was designed based on previous studies of this nature by Pickup (2014), Sye et al. (2006) and Register Mihalik et al. (2013).

Ethics was provided by AUTEK Application # **16/187**

Participants and their recruitment

The 140 referees were recruited by the Auckland Rugby Union. See Table 1

Data analysis

All data were analysed descriptively via SPSS. Means and standard deviations and 95% confidence intervals are reported as appropriate for the data gained.

RESULTS

Participants

Table 1 details the demographic characteristics of the 140 referees (85% response rate) who completed the survey. The majority of those who completed the survey were male and of New Zealand Pakeha ethnicity. Rugby union at a club level past secondary school education was the most common grade refereed, with at least five years of experience declared by 72% of participants.

Table 1: Demographics of the 140 referees who completed the *Referee March 2017 Survey*.

Demographic characteristic	Mean (SD) or (frequency %)
Age	Mean 44 (SD 14.5) (95% CI 42.1, 47.1)
Gender	Male 134 (95.7) Female 6 (4.3)
Ethnicity	New Zealand Pakeha 99 (70.7) Māori 6 (4.3) Pacific Islands 11 (7.9) Middle Eastern 2 (1.4) Asian 1 (0.7) Other 8 (5.7)
Main sport coached/refereed	Rugby Union 140 (100)
Type of school refereed	Secondary School 48 (34.3) Past Secondary School 92 (65.7)
Highest level coached/refereed	Recreational 4 (2.9) Club 55 (39.3) School 46 (32.9) Regional 28 (20) National 7 (5)
Number of years coaching/refereeing	Mean 4.4 (SD 1.0) 1 year 6 (4.3) 2 years 6 (4.3) 3 years 11 (7.9) 4 years 15 (10.7) 5 years 101 (72)
Personal history of concussion	Yes 69 (49.3) No 65 (46.4)

SD: standard deviation; 95% CI: 95% confidence interval.

Knowledge of concussion

Table 2 consists of the responses for eight the 15 knowledge items in the survey. The term concussion had been heard by 98.6% of participants with only three participants unable to correctly state its definition. The most common signs and symptoms identified for concussion were blurred vision (93.6%), confusion (94.3%), dizziness (91.4%), headache (92.1%) and loss of consciousness (88.6%). The ACC concussion guidelines were known to 93.6% of the referees. The majority of participants obtained their information on these protocols from sports clubs (52.1%) and ACC (46.4%). Other

providers of information were media (27.1%), school (11.4%), teachers (5.7%) and parents (4.3%), with most participants selecting multiple options.

Regarding decision making with return to training and games after a concussion, a doctor was correctly identified by 95.7% of respondents as the most competent person to judge when a player was ready to return to sport. A small minority (3.6%) believed parents or caregivers should be responsible for this decision.

Gaps in knowledge of concussion included the ability to understand what amnesia was, the fact that insomnia is often a key part of the ongoing symptoms that players may get increasing symptoms over time and that blue screen devices such as phone to deliver text messages and similar activities that require cognitive function may need to be avoided until symptoms have settled. There was also some confusion over the time frame to return to sport with some (42%) thinking it is appropriate to return to sport after three weeks rather than when symptoms have resolved.

Table 2: Knowledge of concussion of the 140 referees who completed the *Referee March 2017 Survey*. Data are frequency (%) unless otherwise stated.

Knowledge Items	Frequency (%) of correct answers
Please indicate which statements you would consider to be a sign or symptom of concussion:	
Abnormal sense of smell (false)	126 (90.0)
Abnormal sense of taste (false)	124 (88.6)
Amnesia (true)	91 (65.0)
Joint stiffness (false)	129 (92.1)
Blurred vision (true)	131 (93.6)
Black eye (false)	117 (83.6)
Bleeding from the ear (false)	85 (60.7)
Bleeding from the mouth (false)	115 (82.1)
Bleeding from the nose (false)	99 (70.7)
Confusion (true)	132 (94.3)
Fever (false)	130 (92.9)
Dizziness (true)	128 (91.4)
Headache (true)	129 (92.1)
Insomnia (true)	48 (34.3)
Loss of consciousness (true)	124 (88.6)
Nausea (true)	107 (76.4)
Numbness or tingling of the arms (true)	49 (35.0)
Skin rash (false)	135 (96.4)
Sharp burning pain in neck (false)	114 (81.4)
Weakness in neck movements (false)	103 (73.6)
Which of the following players would you say might be "concussed"?	
After a big knock/fall/head clash the player starts making wrong decisions or actions during the game (true)	129 (92.1)

A team mate is complaining of headaches and blurred vision (true)	133 (95.0)
After a ruck/fall/head clash a player is left on the ground not moving (true)	126 (90.0)
A player complains of stinging or burning in his calf muscles (false)	134 (95.7)
In the team room a couple of hours after the game a team mate complains of feeling sick with a headache (has not been drinking alcohol) (true)	135 (96.4)
General knowledge	
Concussion is an injury to the _____ (correct answer brain)	137 (97.9)
Concussion only occurs if you lose consciousness (false)	138 (98.6)
If you are experiencing concussion signs & symptoms after a head knock or sudden movement to the body you should not return to play (true)	131 (93.6)
What are the possible complications of multiple concussions?	
No complications exist (false)	139 (99.3)
Increased symptoms (true)	90 (64.3)
Increased risk of further injury (true)	103 (73.6)
Brain damage (true)	133 (95.0)
Memory problems (true)	125 (89.3)
Joint problems (false)	132 (94.3)
Unsure of answer (false/not selected)	139 (99.3)
What are the possible complications of returning to play too soon?	
No complications exist (false)	140 (100)
Increased risk of further injury (true)	130 (92.9)
Paralysis (false)	73 (52.1)
Brain damage (true)	135 (96.4)
Reduced sports performance (true)	95 (67.9)
Joint Problems (false)	131 (93.6)
If a player gets concussed, how long should they wait before returning to training or games?	
Get straight back on (false)	140 (100)
1 week (false)	139 (99.3)
2 weeks (false)	123 (87.9)
3 weeks (true)	59 (42.1)
4 weeks (true)	128 (91.4)
When the symptoms have fully resolved (true)	80 (57.1)
What does headgear prevent?	
Cuts & grazes (true)	102 (72.9)
Cauliflower ears (true)	93 (66.4)
Concussion (false)	115 (82.1)
Neck injury (false)	135 (96.4)
Skull fracture (false)	121 (86.4)
Unsure of answer (false/not selected)	133 (95.0)
Which activities should be avoided following a concussion?	
Texting (true)	28 (20.0)
Facebook (true)	29 (20.7)
TV (false)	101 (72.1)
Long walks (true)	52 (37.1)
Jogging (true)	122 (87.1)
Gym training (true)	122 (87.1)
School work (true)	19 (13.6)
Going to sleep (false)	78 (55.7)

Attitudes towards concussion

Table 3 outlines the responses to the attitude items of the survey by the referees. These questions examined the current awareness of concussion and how effectively it is presently being managed. Respondents tended to “strongly agree” and “agree” in favour of a lack of awareness of concussion, and the need for improved management and education. Additionally, 89.3% were attentive to the seriousness of dizziness and headaches after a head knock.

Table 3: Attitudes towards concussion of the 140 referees who completed the *Referee March 2017 Survey*.

Scored from a scale of 1 (strongly agree) to 5 (strongly disagree)	Mean (SD)	95% CI	Frequency (%)
Concussion guidelines should be followed	1.08 (0.3)	1.0, 1.1	Strongly agree: 127 (90.7) Agree: 12 (8.6)
Concussions are often not reported	1.65 (0.7)	1.5, 1.7	Strongly agree: 64 (45.7) Agree: 67 (47.9) Not sure: 3 (2.1) Disagree: 2 (1.4) Strongly disagree: 4 (2.9)
Seriousness of headache & dizziness after head knock (1 = not serious; 5 = extremely serious)	4.3 (0.7)	4.2, 4.4	Mildly serious: 2 (1.4) Moderately serious: 12 (8.6) Very serious: 60 (42.9) Extremely serious: 65 (46.4)
Players shouldn't participate in physical activity with concussion signs & symptoms	1.18 (0.4)	1.1, 1.2	Strongly agree: 115 (82.1) Agree: 24 (17.1) Disagree: 1 (0.7)
It is important to understand how concussion happens	1.1 (0.3)	1.0, 1.2	Strongly agree: 116 (82.9) Agree: 23 (16.4)
It is important to understand concussion prevention	1.15 (0.3)	1.0, 1.2	Strongly agree: 117 (83.6) Agree: 22 (15.7)
It is important to understand what to do if you see a concussion	1.1 (0.3)	1.0, 1.1	Strongly agree: 122 (87.1) Agree: 17 (12.1)
Possible concussion should be reported to medical professional	1.2 (0.4)	1.1, 1.3	Strongly agree: 113 (80.7) Agree: 23 (16.4)
Coaches & referees should be informed of concussion signs & symptoms	1.1 (0.3)	1.0, 1.1	Strongly agree: 122 (87.1) Agree: 18 (12.9)
Players are not well educated about concussion	1.5 (0.7)	1.4, 1.7	Strongly agree: 70 (50.0) Agree: 56 (40.0) Not sure: 9 (6.4) Disagree: 4 (2.9)

Abbreviations: SD, standard deviation; CI: confidence interval

DISCUSSION

The results from the *Referee March 2017 Survey* suggest that the Auckland-based sample of 140 rugby union referees are knowledgeable regarding concussion, and appear to show positive attitudes towards correct management of the injury. There was a general consensus of the referees that further education for players, coaches and referees is required to optimise management and improve the awareness of concussion. Almost 50% of the referees who participated in the survey reported experiencing a previous concussion, and this, in addition to the high level of current media coverage surrounding concussion in sport, may have contributed to improved recognition of key concussion signs and symptoms. However, some specific gaps in knowledge in terms of recommended return to play timeframes, activities to avoid post-concussion, possible complications of multiple injuries, recognition of poor sleep as a symptoms of concussion and amnesia were identified.

Knowledge of concussion

Participants demonstrated an ability with identifying common signs and symptoms after a concussion. Blurred vision, confusion, dizziness, headache and loss of consciousness were well recognised, however a gap in knowledge was apparent with symptoms that are less obvious, less prevalent and receive less advertisement by mainstream media sources (Sullivan et al., 2011). “Amnesia” and “insomnia” were omitted by 35% and 65.7% respectively, indicating a lack of awareness of the resultant symptoms associated with cognitive function and sleep, although this could also reflect understanding of the terms used to describe the symptoms. This was also evident when participants were asked about which activities should be avoided following a concussion. Good awareness was demonstrated with avoiding physical exertion, however the negative impact of using technology which can over-stimulate a recovering brain such as texting, Facebook and school work were very poorly acknowledged (20.0%, 20.7%, 13.6% respectively). These two areas indicate that coaches and referees are unaware of the impact cognitive exertion can have on recovery after a concussion, and information on “cognitive rest” has not been provided. Cognitive activity imposes additional neurometabolic demand on the brain, and an exacerbation of symptoms can indicate that the recovering brain is operating beyond its limits (McLeod, 2010). According to McLeod (2010), cognitive rest can be defined as avoiding excessive cognitive activity in the early post-concussion stage, such as using a computer, texting, watching television or schoolwork. As the key stakeholders of rugby union appear to have minimal understanding about this area of concussion management, a need for specific education is indicated. Clear advice on what cognitive rest means, is needed.

In addition to these cognitive symptoms, “numbness or tingling of the arms” was only attributed to concussion by 35 percent. Numbness is among the least frequently experienced symptoms, Bleeding

from various facial orifices was incorrectly believed to be a symptom of concussion by many participants, with 40.3 percent selecting “bleeding from the ear” as correct. This may indicate that respondents had limited ability to isolate the brain injury from other facial trauma that may occur simultaneously, and when compared to high school athletes in the United States, this sample demonstrated less knowledge in this area (Register-Mihalik, 2013).

This sample were able to apply their concussion knowledge of signs and symptoms practically, and identified scenarios illustrating a player with concussion to a high level. The concussion symptoms exhibited in the scenarios were impaired decision-making, headache, blurred vision, loss of consciousness and nausea, and were correctly identified by over 90 percent of respondents in each hypothetical situation. Although they were able to recognise loss of consciousness as a possible indication of concussion, 98.6% also realised that this does not determine a concussion. It therefore appears that coaches and referees are able to recognise a player demonstrating the classic presentation of concussion.

Overall, there was excellent awareness of the existence of current concussion guidelines, with over 93% confirming this. However, this does not provide an indication of whether the individuals were familiar with the contents, either through their own reading or education from another source.

A major finding of the knowledge section of this survey was that only 42.1% of the coaches and referees could identify the mandatory three-week stand-down period implemented by rugby union. The survey asked of the time a player should wait after being concussed before returning to training or games, and although the majority (91.4 percent) selected four weeks, the majority are obviously unaware of this component of concussion management in rugby union. However, the finding that 42.9 percent of the sample believed a player could return to training and games before their concussion symptoms had fully resolved was more concerning. This is consistent with the finding of Sye et al. (2006). Although they were able to identify key complications of multiple concussions and returning to sport too soon, they seem to have reduced awareness of the serious impact on a player’s health that these can impose. Therefore, coaches and referees should be further educated on why returning to sport too soon may be detrimental to long-term health, which should subsequently result in a reduction in serious associated conditions such as post-concussion syndrome and secondary impact syndrome.

The different messages and guidelines on return to sport for different sports could be confusing people. It would be desirable for international and domestic sports organisations to collaborate and provide a standardised recommendation for return to sport guidelines, so there is one message for all to enable a clear message.

Attitudes towards concussion

Overall the referees have a very positive attitude to the management of concussion and recognise that guidelines are followed and that recognition of symptoms is important. They also have strong views that concussion is not well managed and symptoms are often not reported. They do recognise that symptoms need to be reported to medical professionals but also that coaches and referees equally need to be informed when players have symptoms. These results are similar to the findings of Register Mikhailik et al. (2013) who found that high school athletes had good attitudes to the recognition and management of concussion and the symptoms.

CONCLUSION

The results from the *Referee March 2017 Survey* suggest that the Auckland-based sample of 140 rugby union referees are relatively knowledgeable regarding concussion, and appear to show positive attitudes towards correct management of the injury. There is a general consensus that further education for players, coaches and referees is required to optimise management and improve the awareness of concussion. Almost 50% of participants reported experiencing a previous concussion, and this, in addition to the high level of current media coverage, may have contributed to improved recognition of key concussion signs and symptoms. Gaps in knowledge of concussion included the ability to understand what amnesia was, the fact that insomnia is often a key part of the ongoing symptoms, which players may get increasing symptoms over time and that text message and similar activities that require cognitive function may need to be avoided until symptoms have settled. There was also some confusion over the time frame to return to sport with some (42%) thinking it is appropriate to return to sport after three weeks rather than when symptoms have resolved.

Recommendations

- Further education is required to understand some of the symptoms of sports concussion such as amnesia and the use of devices that may affect cognitive function
- Further education is needed over the time frames to return to sport
- Continuing education programmes are required to ensure the current overall high levels of knowledge in the referees group remain high.

- It will be of interest to measure the impact of the ACC Concussion Guidelines and the Blue Card initiative with this group.

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