



SPORTS PERFORMANCE

RESEARCH INSTITUTE, NEW ZEALAND

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**KNOWLEDGE ATTITUDES AND BEHAVIOURS (KAB)
SURVEYS ON CONCUSSION IN SPORTS: RUGBY REFEREES
MARCH 2018 SURVEY**

REPORT #4 TO ACCIDENT COMPENSATION CORPORATION (ACC)

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OVERVIEW

This is the fourth report focused on referees in the series of surveys presenting Knowledge and Attitudes (KA) and Behaviours (B) around concussion in sport. The survey is referred to as the *Rugby Referees March 2018 Survey*.

Of the Auckland-based sample of 48 rugby union referees who participated in the survey, 47.9% reported experiencing a previous concussion. There were differences in the years of refereeing experience (more experience in the 2018 cohort) and the mean age (older in 2018 cohort) between the two survey years.

Overall the trend was for an improvement in knowledge for correctly identifying the signs and symptoms of concussion, the possible complications of multiple concussions, what headgear helps prevent, and which activities should be avoided following a concussion. There was an improvement in knowledge regarding the time frame to return to sport with the correct answer of “when symptoms have resolved” reported by 66% of participants (compared with 57.1% in 2017). However, 35.4% thought three weeks and 85% thought four weeks was appropriate for return to sport.

There was an overall improvement in 2018 compared with 2017 in the referees’ attitudes towards concussions being reported, players not participating in physical activity with concussion signs and symptoms, and players being well educated about concussion.

The percentages for referees seeing players playing on with a suspected concussion were too high with referees (26.7%) and coaches (13.3%) allowing players to play on. Players are still putting pressure on other players to play on with a suspected concussion according to 15.6% of the referees.

Overall there was an improvement in knowledge, attitudes and behaviours reported by referees for concussion identification and management. However, additional education on the time frame for return to sport and the need for signs and symptoms to have fully resolved, including with progressive exercise, is needed. There was not 100% strong agreement that players should not participate in physical activity with concussion signs and symptoms, or that concussion guidelines should be followed, or that possible concussion should be reported to a medical professional. Given these are key aims of the concussion education programme by ACC, further work is needed to educate referees why these, and other aspects of concussion identification and management, are important.

It is recommended that there is:

- Further education regarding the conditions to return to sport, with clarity provided over time to return to sport in weeks versus returning after complete symptom resolution.
- Continuing education programmes to ensure the overall high levels of knowledge and attitudes towards concussion in the referees group remain high.
- Additional strategies to increase positive behaviours towards concussion identification and management.

INTRODUCTION

The aims of the KA concussion project were to undertake surveys of secondary school students, coaches, parents, referees, equestrian riders and general practitioners to understand their current knowledge and attitudes towards the management of concussion. The question for this contributing report was what improvement was there from 2017 to 2018 in the rugby union referees' knowledge and attitudes regarding concussion.

The results from the *Rugby Referee March 2017 Survey* suggested that the Auckland-based sample of 140 rugby union referees were relatively knowledgeable regarding concussion and appeared to show positive attitudes towards correct management of the injury. There was a general consensus that further education for players, coaches and referees was 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 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. Therefore, a decision was made to repeat the survey in 2018 to see if there had been any improvement in the knowledge and attitudes of referees regarding concussion.

In 2018 ACC had implemented the ACC Sports Concussion Guidelines and a Social Media Campaign 2018 to school students, parents and coaches attending tournament week (3-7 September 2018). Given the 2018 survey took place in March it is unlikely that referees were exposed to the social media campaign.

Purpose

The purpose of the *Rugby Referee March 2018 Survey* was to assess the knowledge, attitudes and behaviours around concussion guidelines and management for rugby referees in 2018 and compare with findings from the *Referee March 2017 Survey*.

METHODOLOGY

Data collection process and ethics

The *Referee March 2018 Survey* was undertaken via SurveyMonkey in March 2018. The survey was the same as that used in 2017. In 2017 the survey was delivered physically at a series of evenings promoting the use of the "blue card". This was not possible in 2018 as the evenings were not run and hence SurveyMonkey was used. The methodology 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 48 referees were recruited by the Auckland Rugby Union via an email invitation. The referees' response rate via survey monkey was 48 from pool of 140 (33% response rate).

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. Percentage differences between 2017 and 2018 survey responses were calculated. Trends for improvement in knowledge are indicated by vertical green arrows for a positive improvement, and a horizontal arrow for no improvement, using a 5% threshold for change.

RESULTS

Participants

Table 1 details the demographic characteristics of the 48 from pool of 140 referees (33% response rate) who completed the survey in 2018. The majority of those who completed the survey were male and of New Zealand Pakeha ethnicity. The referee survey participants were on average five years older in the 2018 survey (49.8 ± 13.8) compared with the 2017 survey (44.0 ± 14.5). There were 85.4% of participants who had at least five years of refereeing experience. The proportions with club or national level refereeing experienced increased from 2017 to 2018.

Table 1: Demographics of the 48 referees who completed the *Referee March 2018 Survey* and the 140 referees who completed the *Referee March 2017 Survey*.

Demographic characteristic	2018 Mean \pm SD or frequency % (95% CI) range (N=48)	2017 Mean \pm SD (frequency %) [95% CI] range (N=140)	2017 to 2018 change direction
Age	49.8 \pm 13.8 [95% CI 45.8, 53.8] 14-84	44.0 \pm 14.5 [95% CI 42.1, 47.1]	↑↑
Gender	Male 47 (97.9) Female 1 (2.1)	Male 134 (95.7) Female 6 (4.3)	↔ ↔
Ethnicity <i>(can choose >1 ethnicity)</i>	New Zealand Pakeha 48 (100) Māori 7 (14.6) Pacific Islands 3 (6.3) Middle Eastern - Asian 1 (2.1) Other 4 (8.3)	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 48 (100)	Rugby Union 140 (100)	↔
Type of school refereed	Secondary School 15 (32) Past Secondary School 33 (68)	Secondary School 48 (34.3) Past Secondary School 92 (65.7)	
Highest level coached/refereed	Recreational -0(0) Club 26 (54.2) School 10 (20.8) Regional 7 (14.6) National 5 (10.4)	Recreational 4 (2.9) Club 55 (39.3) School 46 (32.9) Regional 28 (20) National 7 (5)	↑↑ ↓ ↓ ↓ ↑
Number of years coaching/refereeing	1 year 2 (4.2) 2 years 3 (6.3) 3 years 1 (2.1) 4 years 1 (2.1) 5 years 41 (85.4)	1 year 6 (4.3) 2 years 6 (4.3) 3 years 11 (7.9) 4 years 15 (10.7) 5 years 101 (72.0)	↔ ↔ ↓ ↓ ↑
Personal history of concussion	Yes 23 (47.9) No 19 (39.6) Don't Know 3 (6.3)	Yes 69 (49.3) No 65 (46.4)	↔ ↓

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

Knowledge of concussion

Overall the trend was for an improvement in knowledge for correctly identifying the signs and symptoms of concussion, the possible complications of multiple concussions, what headgear helps prevent, and which activities should be avoided following a concussion (Table 2). There was an improvement in knowledge regarding the time frame to return to sport with the correct answer of “when symptoms have resolved” reported by 66% of participants (compared with 57.1% in 2017). However, 35.4% thought three weeks and 85% thought four weeks was appropriate for return to sport.

Table 2: Knowledge of concussion of the 48 referees who completed the *Referee March 2018 Survey* and the 140 referees who completed the *Referee March 2017 Survey*. Data are frequency (%) unless otherwise stated.

Knowledge Items	2018 Frequency (%) of correct answers	2017 Frequency (%) of correct answers	2017 to 2018 change direction
Please indicate which statements you would consider to be a sign or symptom of concussion:			
Abnormal sense of smell (false)	13 (27.1)	126 (90.0)	↓
Abnormal sense of taste (false)	12 (25.0)	124 (88.6)	↓
Amnesia (true)	38 (79.2)	91 (65.0)	↑
Joint stiffness (false)	3 (6.3)	129 (92.1)	↓
Blurred vision (true)	45 (93.8)	131 (93.6)	↔
Black eye (false)	12 (25)	117 (83.6)	↓
Bleeding from the ear (false)	19 (39.6)	85 (60.7)	↓
Bleeding from the mouth (false)	8 (16.7)	115 (82.1)	↓
Bleeding from the nose (false)	14 (29.2)	99 (70.7)	↓
Confusion (true)	45 (93.8)	132 (94.3)	↔
Fever (false)	7 (14.6)	130 (92.9)	↓
Dizziness (true)	44 (91.7)	128 (91.4)	↔
Headache (true)	44 (91.7)	129 (92.1)	↔
Insomnia (true)	21 (43.8)	48 (34.3)	↑
Loss of consciousness (true)	43 (89.6)	124 (88.6)	↔
Nausea (true)	39 (81.3)	107 (76.4)	↑
Numbness or tingling of the arms (false)	16 (33.3)	49 (35.0)	↔
Skin rash (false)	48 (100)	135 (96.4)	↔
Sharp burning pain in neck (false)	8 (16.7)	114 (81.4)	↓
Weakness in neck movements (false)	13 (27.1)	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)	45 (93.8)	129 (92.1)	↔
A team mate is complaining of headaches and blurred vision (true)	44 (91.7)	133 (95.0)	↔
After a ruck/fall/head clash a player is left on the ground not moving (true)	44 (91.7)	126 (90.0)	↔
A player complains of stinging or burning in his calf muscles (false)	44 (91.7)	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)	44 (91.7)	135 (96.4)	↔
General knowledge			

Concussion is an injury to the _____ (correct answer brain)	48 (100)	137 (97.9)	↔
Concussion only occurs if you lose consciousness (false)	44 (91.7)	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)	43 (89.6)	131 (93.6)	↔
What are the possible complications of multiple concussions?			
No complications exist (false)	48 (100)	139 (99.3)	↔
Increased symptoms (true)	35 (72.9)	90 (64.3)	↑↑
Increased risk of further injury (true)	43 (89.6)	103 (73.6)	↑↑
Brain damage (true)	43 (89.6)	133 (95.0)	↔
Memory problems (true)	43 (89.6)	125 (89.3)	↔
Joint problems (false)	45 (93.8)	132 (94.3)	↔
Unsure of answer (false/not selected)	48 (100)	139 (99.3)	↔
What are the possible complications of returning to play too soon?			
No complications exist (false)	47 (97.9)	140 (100)	↔
Increased risk of further injury (true)	44 (91.7)	130 (92.9)	↔
Paralysis (false)	23 (47.9)	73 (52.1)	↔
Brain damage (true)	44 (91.7)	135 (96.4)	↔
Reduced sports performance (true)	36 (75)	95 (67.9)	↔
Joint problems (false)	45 (93.8)	131 (93.6)	↔
If a player gets concussed, how long should they wait before returning to training or games?			
Get straight back on (false)	48 (100)	140 (100)	↔
1 week (false)	48 (100)	139 (99.3)	↔
2 weeks (false)	1 (2.1)	123 (87.9)	↓↓
3 weeks (true)	17 (35.4)	59 (42.1)	↓↓
4 weeks (true)	41 (85)	128 (91.4)	↓↓
When the symptoms have fully resolved (true)	32 (66.0)	80 (57.1)	↑↑
What does headgear prevent?			
Cuts & grazes (true)	40 (83.3)	102 (72.9)	↑↑
Cauliflower ears (true)	38 (79.2)	93 (66.4)	↑↑
Concussion (false)	43 (89.6)	115 (82.1)	↑↑
Neck injury (false)	48 (100)	135 (96.4)	↔
Skull fracture (false)	45 (93.8)	121 (86.4)	↑↑
Unsure of answer (false/not selected)	48 (100)	133 (95.0)	↑↑
Which activities should be avoided following a concussion?			
Texting (true)	37 (77.1)	28 (20.0)	↑↑
Facebook (true)	36 (75.0)	29 (20.7)	↑↑
TV (false)	36 (75.0)	101 (72.1)	↔
Long walks (true)	29 (60.4)	52 (37.1)	↑↑
Jogging (true)	41 (85.4)	122 (87.1)	↔
Gym training (true)	44 (91.7)	122 (87.1)	↔
School work (true)	29 (60.4)	19 (13.6)	↑↑
Going to sleep (false)	31 (64.6)	78 (55.7)	↑↑

Attitudes towards concussion

There was an overall improvement in 2018 compared with 2017 in the referees' attitudes towards concussions being reported, players not participating in physical activity with concussion signs and symptoms, and players being well educated about concussion (Table 3).

Table 3: Attitudes towards concussion of the 48 referees who completed the *Referee March 2018 Survey* and the 140 referees who completed the *Referee March 2017 Survey*.

Scored from a scale of 1 (strongly agree) to 5 (strongly disagree)	2018 Frequency (%)	2017 Frequency (%)	↔ ↑ ↓
Concussion guidelines should be followed	Strongly agree: 44 (91.7) Agree: 1 (2.1)	Strongly agree: 127 (90.7) Agree: 12 (8.6)	↔ ↓
Concussions are often not reported	Strongly agree: 11 (22.9) Agree: 24 (50.0) Not sure: 4 (8.3) Disagree: - Strongly disagree: 6 (12.5) Neutral 4 (8.3)	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)	Mildly serious: 1 (2.3) Moderately serious: 4 (8.9) Very serious: 15 (33.1) Extremely serious: 25 (55.5)	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	Strongly agree: 42 (93.3) Agree: 2 (4.5) Disagree: 1 (2.1)	Strongly agree: 115 (82.1) Agree: 24 (17.1) Disagree: 1 (0.7)	↑ ↓ ↔
It is important to understand how concussion happens	Strongly agree: 40(83) Agree: 5 (10.5)	Strongly agree: 116 (82.9) Agree: 23 (16.4)	
It is important to understand concussion prevention	Strongly agree: 37 (84.1) Agree: 7 (15.9)	Strongly agree: 117 (83.6) Agree: 22 (15.7)	↔ ↔
It is important to understand what to do if you see a concussion	Strongly agree: 40 (88.9) Agree: 5 (11.1)	Strongly agree: 122 (87.1) Agree: 17 (12.1)	↔ ↔
Possible concussion should be reported to medical professional	Strongly agree: 38 (84.4) Agree: 7 (15.6)	Strongly agree: 113 (80.7) Agree: 23 (16.4)	↔ ↔
Coaches & referees should be informed of concussion signs & symptoms	Strongly agree: 43 (95.6) Agree: 2 (4.2)	1.1 ±0.3 [95% CI 1.0, 1.1]; Strongly agree: 122 (87.1) Agree: 18 (12.9)	↑ ↓
Players are not well educated about concussion	Strongly agree: 13 (28.9) Agree: 24 (54) Not sure: 4 (8.9) Disagree: 4 (8.9)	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

Behaviours towards concussion

Table 4 gives the frequency of behaviours towards concussion reported by the 48 referees who completed the *Referee March 2018 Survey*. These questions were not asked in the 2017 survey. The percentages for referees seeing players playing on with a suspected concussion were too high with referees (26.7%) and coaches (13.3) allowing players to play on. Players are still putting pressure on other players to play on with a suspected concussion according to 15.6% of the referees.

Table 4: Behaviours towards concussion reported by the 48 referees who completed the *Referee March 2018 Survey*.

Scored from a scale of 1 (often) to 4 (never)	Frequency (%) 2018
Have you seen players playing on with a suspected concussion when you thought they should not have?	Often 5 (11.1) Sometimes 22 (48.9) Rarely 10 (22.2) Never 7 (15.6)
Have you seen coaches allowing players to play on with a suspected concussion?	Often 6 (13.3) Sometimes 19 (42.2) Rarely 11 (24.4) Never 9 (20)
Have you seen referees/umpires allowing players to play on with a suspected concussion?	Sometimes 12 (26.7) Rarely 15 (33.3) Never 18 (40)
Have you seen players putting pressure on other players to play on with a suspected concussion?	Often 7 (15.6) Sometimes 17 (37.8) Rarely 12 (26.7) Never 9 (20)

DISCUSSION

The question for this report was what improvement had there been from 2017 to 2018 in the rugby union referees' knowledge and attitudes regarding concussion? Questions on observation of behaviours towards concussion were added in the 2018 survey.

Overall there was an improvement in knowledge, attitudes and behaviours reported for concussion identification and management. However, additional education on the time frame for return to sport and the need for signs and symptoms to have fully resolved, including with progressive exercise, is needed. There was not 100% strong agreement that players should not participate in physical activity with concussion signs and symptoms, or that concussion guidelines should be followed, or that possible concussion should be reported to a medical professional. Given these are key aims of the concussion education programme by ACC, further work is needed to educate referees why these, and other aspects of concussion identification and management, are important.

CONCLUSION

Overall there was an improvement in knowledge, attitudes and behaviours reported by referees for concussion identification and management.

Recommendations

- Further education is needed over the conditions to return to sport with clarity provided over time to return to sport in weeks versus returning after complete symptom resolution.
- Continuing education programmes are required to ensure the overall high levels of knowledge and attitudes towards concussion in the referees group remain high.

- Additional strategies are needed to increase positive behaviours towards concussion identification and management.

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