



# SPORTS PERFORMANCE

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KNOWLEDGE ATTITUDES AND BEHAVIOURS (KAB) SURVEYS ON CONCUSSION IN SPORTS:  
PHYSIOTHERAPISTS SURVEY 2018

REPORT #6 TO ACCIDENT COMPENSATION CORPORATION (ACC)

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## OVERVIEW

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The purpose of the study was to determine the knowledge, attitudes and behaviours of New Zealand Physiotherapists to sports related concussion (SRC). This report is the sixth report in a series presenting the changes in Knowledge Attitudes and Behaviours (KAB) around concussion in sport.

The 'Sports Concussion in New Zealand ACC National Guideline' was released in 2014. The KAB studies aim to assess current knowledge and attitudes of secondary school students, coaches, parents, referees, equestrian riders and health professionals towards concussion in sport following release of the guideline. To date there have been no surveys undertaken in the NZ Physiotherapy profession. A survey of medical practitioners was undertaken by this research group in 2017 (Reid et al., 2017). The findings of that report submitted to ACC showed that most General Practitioners and Urgent Care Physicians in the survey were lacking confidence in the overall management of SRC, particularly with regards to timeframes to return to sports. There was also limited use of the SCAT tool due to time constraints during appointments. As physiotherapists are a key part of the health management of people that suffer sports related concussion, their KAB around concussion needed to be assessed.

The results from the *Physiotherapists December 2018 Survey* suggest that the physiotherapists in this survey are very knowledgeable regarding concussion and show positive attitudes towards correct management of the injury. They are very good at recognising the key signs and symptoms and have good referral patterns to medical practitioners. They share a strong desire to be more involved in sideline management and testing and would like to see a more multidisciplinary approach to return to play decision making. Further work should look at exploring the potential for physiotherapists to be able to make decisions around return to play along-side medical practitioners as is currently possible in other countries.

### Recommendations:

- That physiotherapists take a greater role in the education of players to improve symptom recognition and management of sports related concussion.
- That there are discussions with the variety of practitioners involved with concussion management to improve strategies to manage return to play in a more multidisciplinary environment.
- That there should be discussions around the scope of physiotherapy practice with respect to decision making around management and return to play.
- That there should be a KAB survey of strength and conditioning practitioners as they too are often involved in return to play decisions in a sports team environment.

## INTRODUCTION

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The aims of the KAB concussion research programme are to undertake surveys of secondary school students, coaches, parents, referees, equestrian riders and health professionals to understand their current knowledge and attitudes towards the management of sports related concussion. This report overviews the findings from NZ Registered Physiotherapists.

The key outcomes of this review are:

- A comprehensive overview of the KAB of sports related concussion in physiotherapists after the implementation of the ACC Sports Concussion Guidelines.
- Recommendations of the key areas for improvement related to KAB of sports related concussion.

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 (TBI) are sustained in the sports arena. Rugby, cycling and equestrian activities have been identified as the most common cause of mild-TBI/concussion in sports (Theadom et al., 2014). In 2014 The Accident Compensation Corporation (ACC, 2014) released a guideline on the management of sports concussion.

Physiotherapists are a key part of the health management of people that suffer sports related concussion. They are often the only health professional available at the sports field to potentially assess and manage acute concussion episodes and the sequelae. There is no previous research into the knowledge, attitudes and behaviours of New Zealand physiotherapists to sports related concussion. There is research in the USA around this topic (Yorke et al., 2016) that found that American Physical Therapists had very good knowledge and attitudes to SRC but were less confident in their knowledge of return to play decisions. A 2017 survey of NZ Medical Practitioners (Reid et al., 2017) also found that medical professionals lacked confidence in return to play decision making. It is therefore timely to survey physiotherapists in relation to their knowledge, attitudes and behaviours to SRC in a NZ setting.

### Purpose

The purpose of this report is to provide the results of the *Physiotherapists 2018 Survey* on their knowledge, attitudes and behaviours around sports related concussion.

## METHODOLOGY

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**Data collection process** The *Physiotherapy 2018 Survey* was undertaken from December 2018 to February 2019 via a Survey Monkey Platform. The survey was sent to members of two physiotherapy special interest groups; the NZ Manipulative Physiotherapists Association (NZMPA; 383 members) and the Sports and Exercise Physiotherapists New Zealand (SEPNZ; 796 members). The survey was also sent to a small group of physiotherapists with a special interest in concussion who mostly work in concussion clinics.

The methodology used to ascertain the Knowledge Attitudes and Behaviours (KAB) of the physiotherapists used a cross-sectional questionnaire design. The 35-item multi-choice questionnaire used in the ACC survey of students was designed based on previous studies of this nature by Murphy et al. (2015), Sye et al. (2006) and Register Mihalik et al. (2013). Ten questions on behaviours towards SRC were added to gain more physiotherapy specific replies to certain behaviours. Ethical approval was provided by AUTEC Application # 16/187. The ACC Ethics Committee also approved the study.

**Participants and their recruitment** Participants were 20 years of age or older. Of the 1179 potential participants, 158 started the survey but there were only 122 complete responses, therefore the response rate was 10%.

**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

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**Participants** Table 1 details the demographic characteristics of the participants who completed the survey. The mean age of the participants was 40.4 (SD: 11) years with the majority being female (60%). The dominant ethnicity was New Zealand European (79%). The majority worked in sports private practice (74%) and most had been in practice for between 10 and 30 years (69%). The main area of sports engagement was rugby (45%).

**Table 1:** Demographics of the 122 Physiotherapist who completed the *Physiotherapy 2018 Survey*.

Demographic characteristics	Mean (SD) or Percentage (Freq)
Age	Mean 40.4 (SD 11.7)
Gender	Female 60.5 (72) Male 39.5 (47)
Ethnicity	NZ European 79.1 (95) Māori 4.1 (5) Pacific Islander 0.8 (1) Asian 3 (4) Other 16 (20)
Type of practice	Private Practice/Sports 74.3 (87) Public Hospital outpatients 1.7 (2) Public Hospital inpatients 4.2 (5) Designated Concussion clinic 5.1 (6) Non-Government provider 4.2 (5) Other 10.6 (12)
Main sport engaged with	Rugby Union 45 (49) Rugby League 2.7 (3) Netball 6.4 (7) Football 14.7 (16) Other 31 (34)
Years working	1-5 17.3 (21) 5-10 12.4 (15) 10-20 32.3 (39) 20-30 24.7 (30) More than 30 13.2 (16)

SD Standard deviation

### **Knowledge items**

Table 2 consists of the responses of the 20 knowledge items in the survey. Participants were able to choose more than one answer in this section of the questionnaire. Ninety eight percent of participants recognised concussion as an injury to the brain. With respect to symptoms the participants identified all the key symptoms to a very high level of consistency. These were blurred vision (99%), confusion (99%), dizziness (98%), headache (99%), insomnia (80%), nausea (94%) and loss of consciousness (97%). They also recognised who would possibly present with concussion in the short scenarios that were presented in the questionnaire (99-100%). The responses to the question regarding who the best person is to decide who should make the return to play decision were varied. Whilst 58% agreed this should be a doctor, 33% stated ‘other’. In reading the free text answers the ‘other’ was determined as a multidisciplinary team. Relevant information on concussion management was gained from the medical profession or physiotherapists (88%) with 84% stating information was gained from ACC.

Participants also correctly identified that head gear was only useful in preventing cuts and grazes (85%). Ninety percent recognised head gear does not prevent concussion. Most participants stated that someone who has been concussed should return to play when symptoms had resolved (81%) or following medical clearance (85%). There was good awareness of the need for cognitive rest and the need to avoid blue screen devices whilst recovering (Facebook 81%, texting 79%).

**Table 2:** Knowledge of concussion of the 122 Physiotherapists who completed the 2018 survey. Data are presented as percentage (frequency) unless otherwise stated.

Knowledge items	Percentage (Freq) of correct answers
<b>Please indicate which statements you would consider to be a sign of symptom of concussion</b>	
Abnormal sense of smell (false)	34.7 (42)
Abnormal sense of taste (false)	32.3 (39)
Amnesia (true)	96.6 (117)
Joint stiffness (false)	14.8 (18)
Blurred vision (true)	99.1 (120)
Black eye (false)	19 (23)
Bleeding from the ear (false)	34 (41)
Bleeding from the mouth (false)	18.8 (22)
Bleeding from the nose (false)	22.3 (27)
Confusion (true)	99 (120)
Fever (false)	3.3 (4)
Dizziness (true)	98.3 (119)
Headache (true)	99 (120)
Insomnia (true)	80.1 (97)
Loss of consciousness (true)	97 (117)
Nausea (true)	94.2 (114)
Numbness or tingling in the arms (false)	28.1 (34)
Skin rash (false)	2.4 (3)
Sharp burning pain in neck (false)	19.3 (24)
Weakness in neck movements (false)	24.7 (30)
<b>Which of the following player would you say might be “concussed”?</b>	
After a big knock/fall/head clash the player starts making wrong decisions or actions during the game (true)	100 (121)
A team mate is complaining of headaches and blurred vision (true)	95 (115)
After a ruck/fall/head clash a player is left on the ground not moving (true)	99.1 (120)
A player complains of stinging or burning in his calf muscles (false)	0.8 (1)
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)	98.3 (119)
<b>Concussion an injury to the ___ (correct answer brain or head)</b>	98.7 (122)
<b>A concussion only occurs if you lose consciousness (false)</b>	100 (121)
<b>If you are experiencing any signs and symptoms of concussion after a blow to the head or sudden movement of the body, you should not return to play (true)</b>	97.5 (115)
<b>If a player gets concussed, how long should they have to stay away for before practicing fully or playing again?</b>	
Get straight back on	
1 week (false)	0.8 (1)
2 weeks (false)	4.1 (5)
3 weeks (false)	12.4 (15)
4 weeks (false)	2.4 (3)
When symptoms have fully resolved (true)	81.8 (99)
Only with Medical Clearance (true)	85.9 (104)
Depends on the rules of the sport (true)	24.7 (30)

<b>What are the possible complications of returning to play too soon?</b>	
No complications exist (false)	0.8 (1)
Increased symptoms (true)	94.2 (114)
Increased risk of future injury (true)	96.7 (117)
Brain damage (true)	74.3 (90)
Memory problems (true)	79.3 (96)
Joint problems (false)	7.4 (9)
<b>What are the complications of multiple concussions?</b>	
No complications exist (false)	1.65 (2)
Increased risk of further injury (true)	90 (109)
Paralysis (false)	14.1 (17)
Brain damage (true)	89.2 (108)
Reduced sports performance (true)	85.1 (103)
Joint problems (false)	7.4 (9)
<b>If a player has suffered a concussion who is the best person to decide if you were able to train/play again?</b>	
Self	0 (0)
Coach	0 (0)
Doctor	57.8 (70)
Parents/caregiver	0 (0)
Other	33 (41)
<b>Have you ever had any information about concussion from any of the following?</b>	
Teacher/Coach	12.9 (15)
Other players	6.0 (7)
Doctor/Physiotherapist	88.7 (103)
School nurse	0.8 (1)
Other medical staff	31 (36)
Accident Compensation Corporation	84.4 (98)
Your sports club	16.3 (19)
Seen on TV	19.8 (23)
<b>What does head gear prevent?</b>	
Cuts and grazes (true)	85.9 (104)
Cauliflower ears (true)	85.1 (103)
Concussion (false)	9.0 (11)
Neck injury (false)	1.6 (2)
Skull fracture (false)	19.1 (23)
Unsure of answer (false/not selected)	3.3 (4)
Don't have contact with any sports that use head gear	4.13 (5)
<b>Which activities should be avoided following concussion?</b>	
Texting (true)	79.1 (95)
Facebook (true)	81.6 (98)
TV (false)	82.5 (99)
Long walks (true)	17.5 (21)
Jogging (true)	76.6 (92)
Gym training (true)	80.8 (97)
School work (true)	65.8 (79)
Going to sleep (false)	18.3 (22)

Attitudes towards concussion Table 3 outlines the responses to the attitude items of the survey. These questions examined the current awareness of concussion and how effectively it is presently being managed. Overall the participants had very good attitudes to concussion management. Participants tended to “strongly agree” and “agree” (98%) that guidelines should be followed in sports and that concussion is often not reported (71%). Ninety one percent agreed or strongly agreed physical activity should be avoided while symptoms are still present. Ninety nine percent of participants felt strongly that it was important to report signs and symptoms to a medical professional.

**Table 3:** Attitudes toward concussion of the 122 physiotherapists who completed the survey.

<b>Scored from a scale of 1 (strongly agree) to 5 (strongly disagree)</b>	<b>Percentage (Freq)</b>
Concussion guidelines should be followed in sports	Strongly agree: 84.3 (102) Agree: 14.5 (17)
Concussions are not often reported	Strongly agree: 10.9 (13) Agree: 61.3 (73) Not sure: 9.2 (11) Disagree: 5.8 (7) Strongly disagree: 12.6 (15)
Seriousness of headache and dizziness after a head knock	Mildly serious: 9.0 (11) Moderately serious: 34.7 (42) Very serious: 39.6 (48) Extremely serious: 16.5 (20)
It is important to avoid physical activity when signs and symptoms of concussion are present	Strongly agree: 71.9 (87) Agree: 21.5 (26) Not sure: 2.4 (3) Disagree: 4.1 (5)
Is it important to understand how concussions occur	Strongly agree: 87.6 (106) Agree: 12.4 (15)
Is it important to be informed of how concussion can be prevented	Strongly agree: 46.2 (56) Agree: 38.8 (47) Not sure: 13.2 (16) Disagree: 0.8 (1) Strongly disagree: 0.8 (1)
It is important to understand to be informed of what to do if you have a concussion	Strongly agree: 87.6 (106) Agree: 12.4 (15)
Is it important to report signs and symptoms of concussion to a medical professional	Strongly agree: 89.2 (108) Agree: 10.7 (13)
Is it important that coaches are informed of possible concussion	Strongly agree: 84.3 (102) Agree: 15.7 (19)
Players are not well educated about concussion	Strongly agree: 30.5 (37) Agree: 52.9 (64) Not sure: 10 (12) Disagree: 6.6 (8)

**Behaviour items**

There were 10 additional questions in the 2018 survey that asked about behaviours of participants with respect to the on-field management on concussion. These questions asked participants if they had observed players being encouraged to play if a concussion had occurred. Items were rated from very often to never (See Table 4).

With respect to the question “Have you seen players playing on with a suspected concussion when you thought they should not have”, most participants (65%) stated this sometimes or often happened. Nearly 60% had also sometimes or often seen coaches encouraging players to play on with suspected concussion and 65% stated they had often or sometimes seen players putting pressure on other players to play on with concussion. There was a high percentage of participants who felt as physiotherapists they were being asked to make decisions about return to play very often (14%) and often (34%) and that they were the key medical person to manage concussion often (33%) and very often (16%). A large percentage were always (60%) or often (29%) referred for a medical review before players had to return to sport. Participants felt they should be involved in several stages of concussion management; in particular side-line recognition and removal (98%) and return to play decisions (91%).

**Table 4:** Behaviours towards concussion of the 122 physiotherapists who completed the *Physiotherapy 2018 Survey*.

Scored from a scale of 1 (often) to 4 (never)	Percentage (Freq) 2018
Have you seen players playing on with a suspected concussion when you thought they should not have?	Very often 5 (6) Often 24.5 (29) Sometimes 41.5 (49) Rarely 20.3 (24) Never 8.4 (10)
Have you seen coaches allowing players to play on with a suspected concussion?	Very often 5 (6) Often 11.9 (14) Sometimes 48.3 (57) Rarely 20.3(24) Never 14.4 (17)
Have you seen referees/umpires allowing players to play on with a suspected concussion?	Very often 1.7 (2) Often 6.8 (8) Sometimes 29 (34) Rarely 42.7 (50) Never 19.6 (23)
Have you seen players putting pressure on other players to play on with a suspected concussion?	Very often 5.0 (6) Often 24.5 (29) Sometimes 41.5 (49) Rarely 20.3 (24) Never 8.4 (10)
As a physiotherapist are you being called upon to make decision about return to play after concussion?	Very often 14.4 (17) Often 34.7 (41) Sometimes 25.5 (29) Rarely 10.1 (12) Never 16.1 (19)
As a physiotherapist do you feel you are in a position of being the key medical person to manage concussion?	Very often 16.4 (19) Often 33.3 (39) Sometimes 21.3 (25) Rarely 17 (20) Never 12 (14)
As a physiotherapist do you feel you are making decisions about the level and seriousness of concussion?	Very often 11 (13) Often 30.25 (36) Sometimes 33.6 (40) Rarely 13.4 (16) Never 11.7 (14)
How important do you think it is that a player you think has concussion is seen by a Doctor on the day of injury?	Very important 36.6 (44) Somewhat Important 33.3 (40) Neutral 27.5 (33) Somewhat unimportant 2.5 (3)
Do you refer all players for a medical review with regards to return to sport?	Always 59.5 (69) Often 28.45 (33) Sometimes 6.0 (7) Rarely 4.3 (5) Never 1.7 (2)

As a physiotherapist what stages of concussion management do you feel you should be part of?	Sideline recognition and removal 98.2 (110) Sideline testing 83 (93) Clinical assessment and evaluation 74.1 (83) Clinical diagnosis 48.2 (54) Administration of treatment modalities 78.5 (88) Return to play decisions 68.7 (77) Return to play integration 91.6 (103)
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## DISCUSSION

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The main findings of the *Physiotherapist 2018 Survey* indicate that this group of health professional are very knowledgeable regarding concussion and have very positive attitudes and behaviours towards correct management of the injury.

### Knowledge of concussion

Participants demonstrated the ability to identify all common signs and symptoms after a concussion to a very high level and in comparison to respondents to the other KAB surveys, were able to identify the more challenging symptoms of “amnesia” (96%), “insomnia” (80%) and “nausea” (94%). These results compare well with the study by Yorke et al. (2016) with more than 94% of participants correctly identifying the main symptoms of concussion.

There were good levels of awareness when participants were asked about which activities should be avoided following a concussion with regards to physical exertion, and the impact of using technology which can over-stimulate a recovering brain—such as texting, Facebook (95% and 98% respectively).

Participants were able to apply their concussion knowledge of signs and symptoms practically, and identified players with concussion from the scenarios presented to a good 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 95-100% of participants in each hypothetical situation. These high levels of response most likely reflect the day to day contact these participants have with those suffering SRC.

The return to play decision questions provided varied responses. Most participants indicated a player should return to play once the symptoms had fully resolved (81%) or when cleared by a medical professional (85%). The respondents did not seem to select the time frames set by sports as a good

indicator of when it is safe to return to play/sport (RTP). One of the most varied responses was to the question ‘who was the best person to decide if a player was ready to return to sport?’ Whilst 58% stated a doctor, a further 33% stated ‘other’. In reviewing the free text associated with this response, the participants stated that RTP should be a multidisciplinary decision, not just the doctors. This is currently outside the recommendations of the ACC Guidelines (2014) but is in keeping with the results of the Yorke et al. (2016) study that found physical therapists felt they should be part of a multidisciplinary team process related to RTP. This is a key area of further research given the limited capacity of medical doctors in the current clinics in New Zealand with waiting times for appointments for SRC assessments. This is also important given that previous research into NZ secondary school rugby players has demonstrated limited knowledge of return to play time frames and under-reporting of concussion (Sye et al., 2006). There is also research that states that when college athletes have greater contact with athletic trainers (who have a mix of strength and conditioning and physical therapy training), they are more likely to report concussion than those without access to athletic trainers (Wallace et al., 2017). This is a useful area of further investigation given that physiotherapists are often at the forefront of side line concussion management. Investigation of the KAB of New Zealand strength and conditioning practitioners should also be investigated in future given these practitioners also have similar training as athletic trainers and may be useful in helping monitor RTP progress and being able to provide referral to physiotherapists and medical doctors for return to play decisions.

#### **Attitudes towards concussion**

Overall physiotherapists have very positive attitudes to the management of concussion and recognise the importance of following the guidelines (98%) and recognising symptoms. They also have strong views that concussion is not well managed, and symptoms are often not reported (72%). A high percentage also stated that players are not well educated about concussion (82% agree or strongly agree). This could be improved given the outcomes of the Wallace et al. (2017) study stated above, with physiotherapists taking a greater educative role.

#### **Behaviour items**

In the 2018 survey, 10 additional questions were included that specifically asked about player, coach, and referee behaviours when dealing with players that might have been concussed and the physiotherapist role in current concussion management. Overall, the participants in this study found that there was sometimes pressure for players to continue with suspected concussion and this pressure came from coaches (48%) and players (41%). These responses are higher than the other

recent KAB surveys (Reid et al., 2019, Reid et al., 2019 , Reid et al., 2019 ) of players, coaches and parents where these pressures were rare events. Again, this may reflect the close contact physiotherapists are having with sports teams on a more day to day basis and their greater expertise in observing/identifying potential SRC.

With respect to the questions around participants making decisions regarding concussion there was a majority (66%) stating they are sometimes or often making decisions about the level and seriousness of concussion. There were also high numbers (88%) of participants referring for medical review about RTP.

The area that drew very strong responses was what stages of management the physiotherapists want to be part of. There was a strong desire to be involved in side-line recognition and removal (98%), side-line testing (83%) and return to play integration (91%). In keeping with the previous comments relating to a multidisciplinary team management approach, these are key areas of future development. It is interesting to note that USA athletic trainers can now legally sign a player back to sport as well as a medical professional (Robinson, 2016). Given that athletic trainers have different training to physical therapists this is an area of review. In NZ we do not have athletic trainers so physiotherapists are the next most likely profession to take on this role. Strength and conditioning specialists also work closely with athletes in their return to play, so their role in the rehabilitation process also needs to be reviewed. It must be noted that medical practitioners have the skills to assess other more difficult aspects of concussion especially when a player has not spontaneously recovered. Therefore, players who are concussed should still be referred for physician medical review.

#### **Methods bias**

It is noted that those with good concussion knowledge and attitudes may be more likely to want to participate in the study.

#### **CONCLUSION**

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The results from the *Physiotherapists December 2018 Survey* suggest that physiotherapists in this survey are very knowledgeable regarding concussion and show positive attitudes towards correct management of the injury. They are very good at recognising the key signs and symptoms and have good referral patterns to medical practitioners. They share a strong desire to be more involved in side-line management and testing and would like to see a more multidisciplinary approach to return to

play decision making. Further work should look at this area as well as the potential for physiotherapists to be able to make decisions around RTP along-side medical practitioners as are currently possible in other countries.

### Recommendations

- That physiotherapists take a greater role in the education of players to improve symptom recognition and management of sports related concussion.
- That there are discussions with the variety of practitioners involved with concussion management to improve strategies to manage return to play in a more multidisciplinary environment.
- That there should be discussions around the scope of physiotherapy practice with respect to decision making around management and return to play decision.
- That there should be a KAB survey of strength and conditioning practitioners as they too are often involved in return to play decisions in a sports team environment.

### REFERENCES

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Murphy, K., Starkey, N., & Theadom, A. (2015). *What do secondary school rugby players think about concussion?* Unpublished Master's Thesis, University of Waikato.

Register-Mihalik, J. K., Guskiewicz, K. M., Valovich McLeod, T. C., Linnan, L. A., Mueller, F. O., & Marshall, S. W. (2013). Knowledge, attitude, and concussion-reporting behaviours among high school athletes: a preliminary study. *Journal of Athletic Training*, 48(5), 645-653. doi:10.4085/1062-6050-48.3.20.

Reid, D.; Stuart, C.; Fulcher, M.; Hume, P.; Theadom, A.; Whatman, C.; & Walters, S. (2017). Knowledge and Attitudes (KA) surveys on concussion in sports: Doctors September 2017 survey. *Report to Accident Compensation Corporation*. SPRINZ, Auckland University of Technology.

Reid, D., Hume, P., Theadom, A., Whatman, C., & Walters, S. (2019). *Knowledge attitudes and behaviours (KAB) surveys on concussion in sport: Secondary School Students September 2018 Survey. Report # 1 to Accident Compensation Corporation*. SPRINZ, Auckland University of Technology. (1).

Reid, D., Hume, P., Theadom, A., Whatman, C., & Walters, S. (2019). *Knowledge, attitudes and behaviours (KAB) surveys on concussion in sport: Parents September 2018 Survey. Report #2 to Accident Compensation Corporation. SPRINZ, Auckland University of Technology 2019.* (2).

Reid, D., Hume, P., Theadom, A., Whatman, C., & Walters, S. (2019). *Knowledge attitudes and behaviours (KAB) surveys on concussion in sport: Secondary School Coaches September 2018 Survey. Report#3 to Accident Compensation Corporation. SPRINZ, Auckland University of Technology.* (3).

Reid, D., Hume, P., Theadom, A., Whatman, C., & Walters, S. (2019). *Knowledge attitudes and behaviours (KAB) surveys on concussion in sport: Rugby Referees March 2018 Survey. Report #4 to Accident Compensation Corporation. SPRINZ, Auckland University of Technology*

Robinson, B. (2016). Return to Play: Who Makes the Decision? Retrieved from <https://www.nfhs.org/articles/return-to-play-who-makes-the-decision/>

Sport Concussion in New Zealand: *ACC National Guidelines. Accident Compensation Corporation 2015*  
[www.acc.co.nz](http://www.acc.co.nz).

Sye, G., O'Sullivan, J., & McCrory, P. (2006). High school rugby players' understanding of concussion and return to play guidelines. *British Journal of Sports Medicine, 40*, 1003-1005.

Theadom, A., Starkey, N., Dowell, T. et al. (2014). Sports-related brain injury in the general population: An epidemiological study. *Journal of Science and Medicine in Sport, 17*(1), 591–596. doi:10.1016/j.jsams.2014.02.001

Wallace, J., Covassin, T., Nogle, S., Gould, D., & Kovan, J. Knowledge of Concussion and Reporting Behaviours in High School Athletes with or without Access to an Athletic Trainer Journal of Athletic Training 2017;52(3):228–235 doi: 10.4085/1062-6050-52.1.07

Yorke, A.M., Littleton, S., & Alsalaheen, B.A. Concussion attitudes and beliefs, knowledge, and clinical practice: survey of physical therapists. *Phys Ther. 2016;96: 1018–1028.]*