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KNOWLEDGE and ATTITUDES (KA) SURVEYS ON CONCUSSION IN SPORTS: PARENTS SEPTEMBER 2017 SURVEY

REPORT #3 TO ACCIDENT COMPENSATION CORPORATION (ACC)

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OVERVIEW

This report is the third in a series presenting baseline Knowledge and Attitudes (KA) around concussion in sport. The first report (Reid et al., 2017) focused on referees' and the second report focused on secondary school students' knowledge and attitudes about concussion (Reid et al., 2018). This third report focuses on the parents of secondary school students and is termed the "*Parents Survey September 2017 Survey*".

The 'Sports Concussion in New Zealand ACC National Guideline' was released in 2014. The KA studies aim to assess current knowledge and attitudes of secondary school students involved in sports and referees and parents towards concussion in sport following release of the guideline.

The results from the *Parents September 2017 Survey* suggest that the parents of school children involved in coached sports (69/100 = 69% response rate) have some knowledge regarding concussion and show positive attitudes towards correct management of the injury. However, parents expressed a need to know more about how concussion happens, and its prevention and management. The participants in this study have large gaps in their ability to recognise key symptoms and the safe time frame to return to play. Parents reported receiving most information on concussion from medical professionals and their school. Only a small percentage (13%) recognised ACC as source of information and guidance for concussion.

Recommendations:

- Further education of parents is required to increase understanding of some of the symptoms of sports concussion including amnesia, nausea and insomnia. Changes to simpler terms may be needed.
- Further education of parents is needed with regards to the fact that onset of symptoms of concussion may not be evident immediately following injury and can emerge up to several days following injury.
- Further education of parents is needed regarding the time frames to return to sport.
- Further education of parents is required regarding the potential impacts of multiple concussions.
- Further education of parents is required regarding avoiding the use of devices that may affect cognitive function after concussion.
- Continuing education programmes for parents are required to ensure the current overall moderate levels of knowledge in the parent group improve.

INTRODUCTION

The aims of the KA concussion research programme 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. This report overviews the findings from parents of secondary school students involved in key team sports.

The key outcomes of this review are:

- **A comprehensive overview of the KA of sports related concussion in secondary school student's parents after the implementation of the ACC Sports Concussion Guidelines.**
- **Recommendations of the key areas where improvements can be made to improve KA of 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 2006, 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. Whilst there are a number of studies that have explored parents' knowledge and understanding of sport related concussion only a small number of these have taken place in a NZ population setting. Overseas research by Coghlin et al (2009) indicates that parents have a disconnect in recognising the key components of concussion especially with symptoms such as difficulty sleeping, disorientation symptoms, and emotional irritability. Other studies have found there are high levels of awareness about concussion and that it is a critical issues but that caring about the impact of concussion was not seen in a positive light (Bloodgood et al, 2013). Given these findings it would be timely to investigate NZ parent's knowledge and attitudes of sports concussion.

Purpose

The purpose of the *Parents September 2017 Survey* was to assess the current state of knowledge and attitudes around concussion guidelines and management for parents of secondary school players in 2017 and to understand if there is need for an intervention to address any gaps in knowledge.

METHODOLOGY

Participants and their recruitment

A sample of convenience of parents attending the secondary school sports tournaments listed in Table 1 below was undertaken. Participants had to be parents of a student 16 years of age or older, who was involved in organised coached secondary school sports. Of the 100 estimated participants at the targeted sports events, 69 parents were recruited (See Table 2). The response rate was 69%.

Table 1: *Parents September 2017 Survey venues and sports.*

Event	Sport	Venue and date
National Secondary Schools Tournament	Rugby League	Bruce Pulman Park, Auckland, September 4th-8th 2017
Jock Hobbs U19s Tournament	Rugby	Taupo, September 9th–16th 2017
AA Secondary Schools Premierships Zone 2	Basketball	Tauranga, September 5 th –8th 2017,
Secondary Schools Top 4 Tournament	Rugby	Palmerston North, September 9th–16 th 2017.
Secondary Schools Premierships Zone 1 (Nationals Qualifier)	Basketball	Albany, September 5 th –8th 2017
NZ Secondary School Champs	Netball	Rotorua, 10th–13th October 2017
Northern Secondary Schools Cup Zone 1 (Non-Qualifier)	Basketball	Papakura, September 5th–8th 2017

Data collection process and ethical approval

The methodology used to ascertain the Knowledge and Attitudes (KA) of the parents of the secondary school students used a cross-sectional questionnaire design. The 35-item multi-choice questionnaire for the parents was designed based on previous studies of this nature by Murphy et al., (2015), Sye et al., (2006) and Register Mihalik et al., (2013). The questionnaire was handed out in paper format at tournaments as listed in Table 1.

Ethical approval was provided by AUTEK application #16/187. The ACC Ethics Committee also approved the study.

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 2 details the demographic characteristics of the participants who completed the survey. There was a relatively even split of male to female participants (45 vs 52% respectively). The majority of participants were of New Zealand Pakeha ethnicity (49%).

Table 2: Demographics of the 69 parents who completed the *Parent 2017 Survey*.

Demographic characteristics	Mean (SD) or Frequency (%)
Age (yrs)	Mean 45 (SD 6.8) (95% CI 43.5, 46.8) range 33-65
Gender	Female 37 (52.0%) Male 32 (45.0%)
Ethnicity	NZ European 34 (49.0%) Maori 15 (22 %) Pacific Islander 4 (6.0%) Asian 4 (6.0%) Other 12 (17.0%)

Knowledge of concussion

Table 3 consists of the responses for eight of the 15 knowledge items in the survey. Participants were able to choose more than one answer in this section of the questionnaire. The term concussion was known to 94% of participants and the same proportion clearly understood concussion was a brain injury. The most common signs and symptoms were not well identified for concussion with only 62% recognising dizziness, 59% headache, 58% confusion, 49% nausea, 24% insomnia and 25% numbness in the arms.

The majority of participants obtained their information on concussion from a medical professional (23%), teachers and coaches (14%), television (19%), and ACC (13%). Regarding decision-making related to returning to training and games after a concussion, a doctor was correctly identified by only 48% of respondents as the most competent person to judge when a player was ready to return to sport. There were high levels of knowledge that head gear does not prevent concussion (84%) or reduce neck injuries (97%).

There were low levels of awareness (38%) that blue screen devices such as a phone to deliver text messages and similar activities that require cognitive function may need to be avoided until symptoms have settled. There was greater awareness of the need to avoid jogging (51%) and gym training (58%) until symptoms had settled. Only 48% of respondents recognised that it was safe to return to sport only when symptoms had resolved. However, 20% did not know when it was safe to return to sport. This identifies a relatively low level of awareness of return to play time frames by the parents.

Table 3: Knowledge of concussion of the 69 parents who completed the *Parent 2017 Survey*. Data are presented as 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	
Joint stiffness (false)	68 (99)
Fever (false)	67 (97)
Skin rash (false)	67 (97)
Black eye (false)	63(91)
Bleeding from the nose (false)	63 (91)
Abnormal sense of smell (false)	62 (90)
Bleeding from the mouth (false)	62 (90)
Abnormal sense of taste (false)	61 (88)

Bleeding from the ear (false)	53 (77)
Weakness in neck movements (false)	53 (77)
Sharp burning pain in neck (false)	52 (75)
Loss of consciousness (true)	45 (65)
Blurred vision (true)	44 (64)
Dizziness (true)	43 (62)
Headache (true)	41 (59)
Amnesia (true)	40 (58)
Nausea (true)	34 (49)
Confusion (true)	23 (33)
Numbness or tingling in the arms (true)	17 (25)
Insomnia (true)	17 (24)

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)	33 (48)
A team mate is complaining of headaches and blurred vision (true)	39 (56)
After a ruck/fall/head clash a player is left on the ground not moving (true)	39 (56)
A player complains of stinging or burning in his calf muscles (false)	68 (99)
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)	41 (59)

Concussion is an injury to the _ (correct answer brain or head) 66 (93)

A concussion only occurs if you lose consciousness (false) 53 (75)

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) 63 (89)

If a player gets concussed, how long should they have to stay away for before practicing fully or playing again

2 weeks (false)	4 (6)
3 weeks (false)	12 (17)
4 weeks (false)	6 (9)
When symptoms have fully resolved (true)	33 (48)
Don't know	14 (20)

What are the possible complications of multiple concussions?

No complications exist (false)	67 (97)
Increased symptoms (true)	25 (36)
Increased risk of future injury (true)	26 (38)
Brain damage (true)	45 (65)
Memory problems (true)	46 (66)
Joint problems (false)	64 (92)
Unsure of answer (false/not selected)	67 (97)

What are the complications of multiple concussions?

No complications exist (false)	69 (100)
Increased risk of further injury (true)	43 (62)
Paralysis (false)	52 (75)
Brain damage (true)	49 (71)
Reduced sports performance (true)	36 (52)
Joint problems (false)	67 (97)

If a player has suffered a concussion who is the best person to decide if you were able to train/play again?

Self	2 (3)
Coach	5 (7)
Doctor	33 (48)
Parents/caregiver	6(9)
Other	1(1)
Have you ever had any information about concussion from any of the following	
Teacher/Coach	10 (14)
Other players	1 (1.0)
Doctor/Physiotherapist	16 (23)
School nurse	2 (3)
Other medical staff	4 (6)
Accident Compensation Corporation	9 (13)
Your sports club	5 (7)
Seen on TV	13 (19)
Other	2 (3)
No Information	11 (16)
What does head gear prevent?	
Cuts and grazes (true)	17 (25)
Cauliflower ears (true)	17 (25)
Concussion (false)	58 (84)
Neck injury (false)	67 (97)
Skull fracture (false)	58 (84)
Unsure of answer (false/not selected)	66 (96)
Don't have contact with any sports that use head gear	4 (6)
Which activities should be avoided following concussion?	
Texting (true)	26 (38)
Facebook (true)	25 (36)
TV (false)	46 (67)
Long walks (true)	9 (13)
Jogging (true)	35 (51)
Gym training (true)	40 (58)
School work (true)	14 (20)
Going to sleep (false)	45 (65)

Attitudes towards concussion

Table 4 outlines the responses of the parents to the attitude items of the survey. These questions examined the current awareness of concussion and how effectively it is presently being managed. Participants tended to “strongly agree” and “agree” (81%) that guidelines should be followed at school level but 74% “strongly agree” and “agree” that there was a need to provide better education around concussion and improve reporting.

Table 4: Attitudes toward concussion of the 69 parents who completed the survey.

Scored from a scale of 1 (strongly agree) to 5 (strongly disagree)	Mean \pm SD	95% CI	Frequency (%)
Concussion guidelines should be followed at school level	3.1 \pm 1.5	2.7 - 3.4	Strongly agree: 43 (63) Agree: 12 (18)
Concussions are not often reported	1.4 \pm 1.1	1.1 - 1.6	Strongly agree: 14 (21) Agree: 28 (41) Not sure 18 (26) Disagree 4 (6)

Seriousness of headache & dizziness after a head knock	2.8 ±0.9	2.6 - 3.0	Strongly disagree 4 (6) Mildly serious: 5 (7) Moderately serious 20 (30) Very serious 23 (34) Extremely serious 19 (28)
It is important to avoid physical activity when signs and symptoms of concussion are present	0.6 ±0.9	0.3 - 0.8	Strongly agree 42 (63) Agree 18 (27) Disagree 1 (2)
Is it important to understand how concussions occur	0.2 ±0.9	0.1 - 0.3	Strongly agree 51 (77) Agree 15 (23)
Is it important to be informed of how concussion can be prevented	0.3 ±0.6	0.1 - 0.5	Strongly agree 49 (74) Agree 16 (24) Strongly disagree 1 (1.5)
It is important to understand what to do if you have a concussion	0.2 ±0.6	0.1 - 0.3	Strongly agree: 56 (84) Agree: 9 (24) Strongly disagree: 1 (1.0)
Is it important to report signs and symptoms of concussion to a medical professional	0.3 ±0.7	0.1 - 0.5	Strongly agree: 52 (79) Agree: 10 (15) Not sure: 3 (4) Strongly disagree: 1 (1)
Is it important that coaches are informed of possible concussion	0.2 ±0.5	0.1 - 0.3	Strongly agree: 54 (82) Agree: 10 (15) Not sure: 2 (3)
Players are not well educated about concussion	0.9 ±0.9	0.7 - 1.1	Strongly agree 26 (37) Agree: 26 (37) Not sure: 11 (17) Disagree 3 (4)

SD: standard deviation. CI: confidence interval.

DISCUSSION

The results from the *Parents 2017 Survey* suggest that parents are knowledgeable regarding some aspects of concussion and appear to show positive attitudes towards correct management of the injury. There was a general consensus from the parents that they wanted to know more about how concussion happens, prevention and effective management. The majority of information on the awareness and management of concussion is coming from medical professionals, teachers and coaches with some from sports clubs and ACC. An increase in the awareness of the ACC Guidelines and why these are important to follow is warranted in this group. Some specific gaps in knowledge in terms of onset of symptoms, activities to avoid post-concussion, possible complications of multiple injuries and recognition of amnesia, nausea, trouble sleeping as symptoms of concussion were identified.

Knowledge of concussion

Participants demonstrated a poor ability to identify common signs and symptoms after a concussion. Blurred vision, confusion, dizziness, and headache were not well recognised. It remains unclear as to whether this finding reflects a lack of knowledge about the links between the specific symptom and concussion or whether these findings reflect a lack of understanding of these more technical terms used to describe the symptoms. For example, terms such as insomnia and nausea may need different use of language with parents such as “problems sleeping” and “feeling sick” respectively. The ability

to recognise disturbed sleep as a major symptom is consistent with findings of a study by Coghlin et al., (2009) investigating parents' ability to accurately report concussion occurrence in children.

There were good levels of awareness with regards to physical exertion when participants were asked about which physical activities should be avoided following a concussion, 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 (38%, 36%, 20% respectively). This indicates that parents 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 et al., 2010). According to McLeod et al., (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. These results are also in contrast to a study by Bloodgood et al., (2013) who found that parents were very aware of the need to monitor the use of blue screen devices, computers TV and social media use. This indicates that greater information provision is needed in this area for parents of school children in New Zealand.

In addition to the cognitive symptoms, "numbness or tingling of the arms" was only attributed to concussion by 25% (numbness is among the least frequently experienced symptoms). Bleeding from various facial orifices was correctly believed not to be a symptom of concussion by many participants, with only 23% selecting "bleeding from the ear" as correct. This may indicate that participants had some ability to isolate the brain injury from other facial trauma that may occur simultaneously which is an improvement when compared to other studies such as Coghlin et al (2009) where a disconnect was found between the parents' knowledge and the signs and symptoms of concussion.

Participants were not able to apply their concussion knowledge of signs and symptoms practically, and had some difficulty identifying scenarios illustrating a player with concussion. The concussion symptoms exhibited in the scenarios were impaired decision-making, headache, blurred vision, loss of consciousness and nausea, and were poorly identified by approximately 50% of respondents in each hypothetical situation. Although they were able to recognise loss of consciousness as a possible indication of concussion, 75% also realised that this does not determine a concussion. It therefore appears that some parents are able to recognise a player demonstrating the classic presentation of concussion. However, further education is required for the remaining 25%. Additionally, parents were able (60%) to spot the possible impact of concussion in the scenario when there was a delayed onset of symptoms. They were relatively unaware of the negative impact on performance (52%) which may be a useful message to highlight in education programmes for parents.

It was disappointing to see that overall only 48% of the parents would wait until all the symptoms had resolved before returning their child to play. This is consistent with findings of the study by Sye et al., (2006), where there was poor knowledge of time frames of secondary school rugby players for stand down and return to sport. Parents 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.

Attitudes towards concussion

Overall the parents have a very positive attitude to the management of concussion and recognised that guidelines should be followed, and that recognition of symptoms is important. They also had strong views that concussion is not well managed, and symptoms are often not reported. They did 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.

Methods bias

It is noted that those with good KA of concussion may be more likely to want to participate in the study. Another limitation of the study is that other sports with high concussion rates such as cycling and equestrian events were not in the survey sample. The actual sample size (69) was also small in this study and could be improved in future.

CONCLUSIONS

The results from the *Secondary School Parents 2017 Survey* suggest that these 69 parents 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 parents of secondary school students is required to optimise management and improve the awareness of concussion. However, there are large gaps in knowledge of concussion including: the ability to understand what amnesia was; the fact that insomnia, amnesia and nausea are common symptoms, which players may experience increasing symptoms over time; and that text messaging and similar activities that require cognitive function may need to be avoided until symptoms have settled. Only 48% of participants understood the need for stand down periods and that return to sport should be delayed until symptoms had fully resolved.

Recommendations

- Further education of parents is required to increase understanding of some of the symptoms of sports concussion including amnesia, nausea and insomnia. Changes to simpler terms may be needed.
- Further education of parents is needed with regards to the fact that onset of symptoms of concussion may not be evident immediately following injury and can emerge up to several days following injury.
- Further education of parents is needed regarding the time frames to return to sport.
- Further education of parents is required regarding the potential impacts of multiple concussions.
- Further education of parents is required regarding avoiding the use of devices that may affect cognitive function after concussion.
- Continuing education programmes for parents are required to ensure the current overall moderate levels of knowledge in the parent group improve.

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