COPYRIGHT NOTICE

FedUni ResearchOnline

<http://researchonline.federation.edu.au>

This is the peer reviewed version of the following article: Ekegren, C., Gabbe, B., Finch, C. (2015) Injury surveillance in community sport: Can we obtain valid data from sports trainers? Scandinavian Journal of Medicine and Science in Sports, 25(3), 315-322; which has been published in final form at <http://doi.org/10.1111/sms.12216>. This article may be used for non-commercial purposes in accordance with [Wiley Terms and Conditions for Self-Archiving](#).

Injury surveillance in community sport: Can we obtain valid data from sports trainers?

Christina L Ekegren¹, Belinda J Gabbe¹, Caroline F Finch²

Running head: Can we obtain valid data from sports trainers?

¹ Department of Epidemiology and Preventive Medicine, Monash University, Alfred Centre, 99 Commercial Rd, Melbourne, VIC, 3004, Australia, Telephone +613 9903 0555, Fax +613 9903 0556

² Australian Centre for Research into Injury in Sport and its Prevention, Federation University Australia, Ballarat, VIC 3353, Australia

Christina L Ekegren: PhD candidate, Department of Epidemiology and Preventive Medicine, Monash University

Belinda J Gabbe: Professor, Department of Epidemiology and Preventive Medicine, Monash University

Caroline F Finch: NHMRC Principal Research Fellow, Robert HT Smith Professor and Personal Chair in Sports Safety, Australian Centre for Research into Injury in Sport and its Prevention, Federation University Australia

Correspondence to: Christina L Ekegren christina.ekegren@monash.edu

ABSTRACT

A lack of available injury data on community sports participants has hampered the development of informed preventive strategies for the broad-base of sports participation. In community sports settings, sports trainers or first-aiders are well-placed to carry out injury surveillance but few studies have evaluated their ability to do so. The aim of this study was to investigate the reporting rate and completeness of sports trainers' injury records and agreement between sports trainers' and players' reports of injury in community Australian football. Throughout the football season, one sports trainer from each of four clubs recorded players' injuries. To validate these data, we collected self-reported injury data from players via short message service (SMS). In total, 210 discrete injuries were recorded for 139 players, 21% by sports trainers only, 59% by players via SMS only, and 21% by both. Completeness of injury records ranged from 95-100%. Agreement between sports trainers and players ranged from $K=0.32$ (95%CI:0.27,0.37) for date of return to football to $K=1.00$ for activity when injured. Injury data collected by sports trainers may be of adequate quality for providing an understanding of the profile of injuries. However, data are likely to underestimate injury rates and should be interpreted with caution.

KEY WORDS: validity, reliability, epidemiology, methodology

1 INTRODUCTION

2 Currently in Australia, 27% of adults and 60% of children participate in organised sport, with most
3 participation taking place within community-based clubs (Australian Bureau of Statistics, 2012a,
4 Australian Bureau of Statistics, 2012b). Although there are important health benefits associated with
5 sport participation, there is also a substantial risk of injury (National Center for Injury Prevention and
6 Control, 2009). Despite the recognition of sports injury as a considerable public health problem
7 (National Center for Injury Prevention and Control, 2009), the lack of available injury data has
8 hampered the development of informed preventive strategies for the broad-base of community
9 participation (Finch, 2012). While hospital and emergency department surveillance systems can
10 provide data on the more serious medical-attention injuries in community sports, they cannot
11 provide the full picture (Mummery et al., 2002). This is because the majority of sports injuries are
12 treated by the athletes themselves, by general practitioners and physiotherapists or receive no
13 treatment at all (Mitchell et al., 2010).

14 In 1995, an Australian report was commissioned to address the lack of information available on the
15 injury problem across a range of sports settings (Finch et al., 1995). The report highlighted the
16 substantial contextual challenges presented by community sports settings for conducting injury
17 surveillance, such as a lack of resources, a reliance on volunteers and an absence of on-site medical
18 professionals. It was suggested that, in several community sports, club-based personnel such as
19 sports trainers would be well-placed to carry out injury surveillance. In Australia, sports trainers are
20 employed by clubs to provide on-site first aid and acute injury management. To qualify, sports
21 trainers are required to attend courses provided by regulatory bodies, such as Sports Medicine
22 Australia (SMA), on first-aid, taping and injury-management (Donaldson and Finch, 2012). In sports
23 such as Australian football and rugby league, sports trainers are present at most competitions and
24 some training sessions (Zazryn et al., 2004, Casey et al., 2004, Donaldson et al., 2004a).

1 In Australian community sports settings, sports trainers are now encouraged to routinely record
2 injury data at their clubs using online tools or paper forms (Sheehan, 2011, Ekegren et al., 2012). It is
3 anticipated that de-identified data captured via online tools, such as SMA's Sports Injury Tracker
4 (Sports Medicine Australia, 2012b), could eventually be used to inform and evaluate wide-scale
5 injury prevention strategies for community sport (Sheehan, 2011). Before this happens, there is a
6 need to investigate the accuracy of the data recorded by sports trainers. The aims of this study were
7 to determine: a) the proportion of injuries reported by sports trainers compared to self-
8 report by players; b) the completeness of the data recorded by sports trainers; and c) the agreement
9 between the profiles of injury data recorded by sports trainers and player self-report. _

12 **MATERIALS AND METHODS**

13 **Study population**

14 The study was conducted in community Australian football and formed part of a larger injury
15 prevention project entitled 'National Guidance for Australian Football Partnerships and Safety'
16 (NoGAPS) (Finch et al., 2011). Australian football is a fast moving team-sport, characterised by
17 physical contests between players, kicking, handballing and running (Australian Football League,
18 2010). There is a high frequency and rate of injury across all levels of the sport (Cassell et al., 2012,
19 Finch et al., 2013). At the community level, the sport is played from March to September with
20 matches played over 16-18 rounds.

21 Four community Australian football clubs in Victoria were randomly selected from a pool of 22 clubs
22 concurrently enrolled in the NoGAPS project. Clubs were drawn from different arms of the parent
23 project ensuring that they came from a mix of urban and rural settings across a wide geographical
24 area. They ranged in size from 67-112 players and covered a range of competition levels. Prior to the

1 start of the football season, the research team contacted each club's current sports trainer via email
2 and/or phone to request their involvement in the study. Sports trainers were asked to record
3 players' injuries throughout the football season using an online injury surveillance program, Sports
4 Injury Tracker. In three out of four clubs, the sports trainer agreed to do this. At the remaining club,
5 a team of sports trainers collected the information using an identical paper-based version of the
6 program (see Supporting Information) (Sports Medicine Australia, 2012a) and then the information
7 was uploaded to the online program by the club's senior coach. The coach felt this would be a more
8 feasible way to record injuries and in the interests of optimising utility, the alternate method was
9 approved. The data recorders had 1-6 years of experience at their respective clubs.

10 Players received information about the study from the research team at training sessions prior to
11 the start of the football season and were given the opportunity to ask questions before providing
12 informed consent. Players were included if they were male, aged 18+ years and had no extended
13 absences from football planned throughout the season. Ethics approval was received from the
14 Monash University Human Research Ethics Committee (approval no. CF12/0398 – 2012000169).

15 **Procedures**

16 Throughout the football season (16-18 rounds), consenting players were required to report any
17 injuries fitting the injury definition to their club's sports trainer. The definition of injury was "any
18 new football-related injury" and only injuries that had been sustained during football training
19 sessions or matches were recorded. The definition of injury was kept deliberately broad to provide
20 an opportunity to evaluate the feasibility of recording different types of injuries. Data recorders
21 were asked to log into Sports Injury Tracker on a weekly basis to record any new injuries occurring in
22 the last seven days. None of the data recorders had ever used Sports Injury Tracker before so each
23 of them received verbal instructions either in-person or over the phone on how to use the system
24 and were also provided with a detailed user-manual. They were given the opportunity to receive

1 additional follow-up assistance with the system throughout the season although ultimately it was
2 not required. All injury variables recorded in Sports Injury Tracker are shown in Table 1. The coding
3 scheme for each variable within Sports Injury Tracker was developed from the Australian Sports
4 Injury Data Dictionary (ASIDD) (Australian Sports Injury Data Working Party, 1998). Within Sports
5 Injury Tracker, mild injuries were classified as leading to 1-7 days modified activity, moderate leading
6 to 8-21 days modified activity and severe injuries leading to >21 days modified or lost (see
7 Supporting information). If any diagnostic or prognostic information was unavailable at the time of
8 injury, trainers were instructed to revise their injury reports once the information was obtained.

9 <Insert Table 1 about here>

10 To validate the injury data recorded by sports trainers, we obtained self-reported injury data from
11 players via short message service (SMS). After providing consent, players provided their mobile
12 phone numbers and preferred days and times for receiving messages. One to two days after each
13 match, players received a message on their personal mobile phones reading "Please reply 'yes' or
14 'no' indicating whether you have experienced a new football injury in the last seven days". If they
15 did not respond to the message they received two more reminders that week. If a player had
16 sustained an injury, they received an immediate follow-up phone call from the primary author (CLE),
17 a physiotherapist, to discuss the details of their injury. The standardised phone interview, lasting
18 around 10 minutes, was structured according to the variables included in Sports Injury Tracker.
19 Injured players were followed up weekly via SMS to ascertain their date of return to football. Full
20 details of the player SMS reporting is described elsewhere (Ekegren et al., 2014).

1 While players had agreed to report their injuries to their sports trainer, they were
2 blinded to the fact that this information was being validated against their text message responses.
3 Likewise, sports trainers were blinded to the concurrent text messaging procedures with players.

4 **Data analysis**

5 Weekly SMS responses ('yes'/'no') were downloaded from the research team's mobile phone to an

Excel® (Microsoft Office Excel 2010) spread sheet, as were the injury data from Sports Injury Tracker. All data were then exported to Stata® 12 (StataCorp 2011) for analysis. To compare the proportion of injuries reported by both methods, we calculated the percentage of injuries reported by players only (via SMS), by sports trainers only (via Sports Injury Tracker) and by both. For all injuries recorded by sports trainers in Sports Injury Tracker, the percentage of 'unknown' or missing responses for each injury variable was calculated as an estimate of completeness. We reported the profile of injuries as frequencies for each injury variable. For these variables, we also reported the proportion of each injury type reported by sports trainers. For any injuries that were reported by both players and sports trainers, we calculated the percentage of agreement between sources and the kappa (K) co-efficient (+ 95% confidence intervals) for a range of injury variables. A scale proposed by Landis and Koch (1977) was used to interpret the magnitude of agreement for a range of kappa values. To verify that the same injury was being compared between sources, the injury was required to match on body part and date of onset within seven days (Yard, 2009).

RESULTS

Proportion of injuries reported

Of the 316 football players registered at the four clubs, 44% (n=139) agreed to report their injuries to trainers and respond to weekly SMS requests. The mean (SD) age of players was 25 (4) years, ranging from 18 to 38 years. Seventeen players were lost to follow-up over the course of the season; two due to severe injury, 10 due to quitting football and five for unknown reasons. A total of 210 discrete injuries were recorded by both sports trainers and players combined. Seventy-nine per cent of players (n=110) reported at least one injury over the season. In total, 167 injuries were reported by players via SMS (range=30-69 across clubs) and 86 reported by sports trainers (range=9-52 across clubs). The proportion of injuries reported by sports trainers and players are presented in Figure 1 and Table 2.

<Insert Figure 1 about here>

<Insert Table 2 about here>

Completeness of injury records

For the 86 injuries reported by sports trainers, we calculated the proportion of injury records with missing responses. There was one missing response for the following variables: nature of injury, provisional severity assessment and treating person (99% of injury records complete). There were four injuries with an 'unknown' date of return to football (95% of injury records complete). All other variables were fully completed for all 86 injuries.

Profile of reported injuries

Table 3 presents the profile of all injuries reported by both sports trainers and players combined (n=210) and the proportion of these injuries that were reported by sports trainers. The vast majority of injuries occurred during matches rather than at training (n=189). Of the 15 training injuries, only

one was reported by sports trainers. Over half of all injuries (n=110) did not result in any missed matches and, of these, only 34% were reported by sports trainers. Of those injuries that led to four or more missed matches (i.e. 'severe' injuries) (n=25), 48% were reported by sports trainers. For those injuries requiring attention from a sports trainer (n=193), roughly half required additional medical attention from other health professionals, such as doctors or physiotherapists (n=102). Sports trainers reported a greater proportion of these injuries (56%) than those that received attention from a sports trainer alone (30%).

Sports trainers reported (46%) of injuries caused by a 'collision with other player or referee', whereas they only reported 27% of injuries caused by overexertion. Only 29% of bruises/contusions were reported by sports trainers but they reported 58% of fractures. Sports trainers reported a greater proportion of concussions than ankle sprains (50% versus 31%).

<Insert Table 3 about here>

Agreement between sources

Table 4 presents the agreement between sports trainers and players across a range of variables.

There was 100% agreement ($K=1.00$) between sports trainers and players for the activity at the time of injury (match vs. training). For all other variables, the percentage agreement ranged from 35% to 91% with kappa coefficients ranging from 0.32 to 0.90. Using the scale devised by Landis and Koch (1977) there was 'almost perfect' agreement ($K=0.81-1.00$) for the following variables: date of injury, activity at time of injury and body region injured. There was 'moderate' agreement ($K=0.41-0.60$) for nature of injury and the provisional severity assessment. There was 'fair' agreement ($K=0.21-0.40$) for the mechanism of injury and the date of return to football.

1

<Insert Table 4 about here>

11 **DISCUSSION**

12 The aims of this study were to investigate the proportion of injuries reported by sports
13 trainers in community Australian football compared to self-report by players, the completeness of
14 trainers' injury records and the agreement between injury data recorded by sports trainers and
15 player self-report.

16 Despite the perception that sports trainers are well placed to collect injury data in community sport
17 (Finch et al., 1995), few studies have evaluated the performance of these individuals for this purpose.

18 Overall, a lower proportion of all injuries was reported by sports trainers than by players (41% versus
19 80% of injuries). However, there were differences between clubs, with the sports trainer at Club 3
20 (Table 2) actually reporting a higher percentage of injuries (71%) than reported by players (58%) and
21 the sports trainer at Club 1 reporting a far lower percentage of injuries (18%) than reported by
22 players (91%). At the latter club, sports trainers collected injury data on paper forms and the coach
23 uploaded the data to the online version of Sports Injury Tracker. It is possible that having multiple
24 people involved led to some injuries being missed and therefore, it is recommended that this

1 arrangement be avoided in future. Other than this, it is not clear why such substantial differences
2 existed across clubs. None of the sports trainers received any additional training in the use of the
3 reporting system. However, as is often the case in community sport, it is likely that there were
4 differences between sports trainers at each club in terms of their knowledge and experience, their
5 diligence and motivation in reporting injuries and their availability for such activities (Finch and
6 Hennessy, 2000, Donaldson and Finch, 2012, Donaldson et al., 2012). It is concerning that so many
7 injuries were not reported by sports trainers as this has significant implications for obtaining
8 accurate injury rates. As evident from our medical attention data in Table 3 (showing that trainers
9 attended to the majority of injuries), the issue was not that trainers were unaware of the injuries
10 occurring, but rather that they did not report them. It is recommended that, in future, sports
11 trainers should be vetted for their involvement in injury surveillance, based on their knowledge,
12 motivation and availability and that procedures be put in place making it easier for sports trainers to
13 follow injury recording guidelines.

14 To provide an indication of whether any variables were difficult for trainers to complete, we
15 calculated the proportion of injury cases for which responses were missing or coded as 'unknown'.
16 For the majority of variables in Sports Injury Tracker there were complete responses for 99-100% of
17 injury cases. The only variable with a lower level of completeness (95%) was 'date of return to
18 football', with four cases coded as 'unknown'. It is understandable that this variable was not always
19 completed as injury reports are usually filled out shortly after the injury occurs when the prognosis
20 may still be unclear. Nonetheless, there was a high level of completeness overall which suggests that
21 the variables and response categories included within Sports Injury Tracker are appropriate for its
22 target users.

23 The profile of injuries reported by both sports trainers and players was consistent with previous
24 studies in adult community Australian footballers (Shawdon and Brukner, 1994, Gabbe et al., 2002,
25 McManus et al., 2004, Braham et al., 2004, Finch et al., 2013). As per our findings, more injuries

1 have previously been reported to occur during matches than at training (Gabbe et al., 2002, Braham
2 et al., 2004). Also, collisions (or contact) were the primary mechanisms in all previous studies in this
3 population (Shawdon and Brukner, 1994, Gabbe et al., 2002, Braham et al., 2004, McManus et al.,
4 2004, Finch et al., 2013). The most common natures of injury were muscular strains (Gabbe et al.,
5 2002, McManus et al., 2004, Finch et al., 2013), fractures (Shawdon and Brukner, 1994) and,
6 consistent with the findings of this study, bruises or soft tissue injuries (Braham et al., 2004). Finally,
7 across all studies, the lower limb was the most commonly injured body region (Shawdon and
8 Brukner, 1994, Gabbe et al., 2002, Braham et al., 2004, McManus et al., 2004, Finch et al., 2013).
9 The similarity of injury profiles reported between this study and previous
10 studies, suggests that data collected by sports trainers within community clubs may be of adequate
11 quality for providing a general understanding of the profile of injuries.

12 There was an association between the type of injury and whether or not it was reported by sports
13 trainers.

14 For example, sports trainers reported a higher proportion of
15 severe than mild injuries, including those leading to four or more missed matches, those requiring
16 treatment from an external health professional and those caused by collisions (rather than by
17 overuse or overexertion). This is consistent with previous studies, in which a greater proportion of
18 the most severe injuries were reported by both club personnel and athletes (Junge and Dvorak, 2000,
19 Nilstad et al., 2012). Sports trainers also reported far fewer training than match injuries. While
20 previous research has shown that, in Australian football, there are less training than match injuries

1 overall (Gabbe et al., 2002, Braham et al., 2004), the numbers were much lower than expected.
2 Given that sports trainers are less likely to be present at training than matches (Donaldson et al.,
3 2004b, Casey et al., 2004), it is possible that inadequate staffing prevented sports trainers
4 from being able to record injuries at training. Another
5 possibility is that the majority of training injuries were not severe enough to reach the threshold of
6 reporting. These factors may have implications for decisions about the optimal injury definition for
7 community sport, with injuries sustained during matches and those requiring medical attention and
8 time-loss being more reliably reported by sports trainers.

9 Between sports trainers and players
10 there was some disagreement on the severity assessment and on the date of
11 return to football. These variables require knowledge of the prognosis of the injury which is often
12 only resolved several days or weeks after the initial injury. In this situation, sports trainers were
13 expected to update the injury record at a later date but evidently, this was not always achieved.
14 Fortunately, match reports published online provided an accurate secondary source of data for
15 determining the date of return to football. There was also disagreement on injury mechanism. This
16 may be attributable to sports trainers being unable to observe the injury occurring. Alternatively,
17 either the trainers or the follow-up interviewer may not have obtained a sufficiently detailed
18 description from players. There was also disagreement on the nature of injury in some cases. This
19 may have been related to incorrect diagnosis by trainers or the follow-up interviewer. However, it is
20 also possible that these diagnostic disagreements arose because assessments were completed at
21 different time points. Sports trainers usually provided an injury diagnosis shortly after the injury

1 occurred whereas phone interviews often took place up to a week later, during which time the injury
2 symptoms might have changed.

3 Only one previous study has evaluated the ability of sports trainers to collect injury data. Braham et
4 al (2003) assessed sports trainers' two-week recall of their injury reports but did not evaluate the
5 accuracy or reliability of their reports. Several other studies in community sport settings, including
6 adolescent soccer (Emery et al., 2005, Schiff et al., 2010) and adult Australian football (Gabbe et al.,
7 2002, Braham and Finch, 2004, Twomey et al., 2011), have evaluated some aspect of their injury
8 surveillance methods. However, none of these studies relied on sports trainers alone to collect injury
9 data. Instead they used health-care professionals (e.g. doctors, physiotherapists and athletic trainers)
10 (Gabbe et al., 2002, Emery et al., 2005, Schiff et al., 2010), paid data collectors (mainly sports science
11 students) (Twomey et al., 2011) or club-based volunteers, including parents (Braham and Finch,
12 2004, Emery et al., 2005, Schiff et al., 2010), coaches (Emery et al., 2005), team managers (Braham
13 and Finch, 2004) or club presidents (Braham and Finch, 2004). High injury capture rates were
14 reportedly achieved by health-care professionals (Gabbe et al., 2002), parents (Emery et al., 2005,
15 Schiff et al., 2010) and coaches (Emery et al., 2005, Schiff et al., 2010). A shortage of health care
16 professionals and consistent volunteers is a well-cited barrier to sports safety activities in community
17 sports settings and it would be unfeasible to rely on such individuals for ongoing surveillance (Finch
18 and Hennessy, 2000, Zazryn et al., 2004, Casey et al., 2004, Donaldson et al., 2012). Furthermore,
19 while parents and coaches may be able to capture a high number of injuries, their ability to provide
20 detailed injury data is likely to be limited due to a lack of specific medical knowledge. It is possible
21 that having a combination of personnel to share the responsibility of recording may be the most
22 feasible and reliable option for community sport. For example, injuries could initially be registered
23 by sports trainers, players or parents and then later diagnosed by a medical professional.

24 Irrespective of who collects the data, it is likely that that club-based injury reporting within the
25 context of community sport is, in itself, hard to achieve. Players may underreport injuries to

1 personnel within their clubs either to avoid missing matches (Nilstad et al., 2012) or because they
2 prefer to consult health professionals external to the club. Also, it has been reported that the nature
3 of community sports clubs is highly dynamic, with staffing and financing changing from one season
4 to the next (Donaldson et al., 2012). Hence, any injury recording procedures put in place at a club
5 are hard to maintain over time. Despite these challenges, there is still a strong argument for
6 conducting club-based injury reporting within community sports. In this study, almost half of all
7 injuries received attention from sports trainers alone and, if reliant only on reports from external
8 treatment sources such as sports medicine clinics and hospitals, these injuries would remain
9 undetected.

10 There may be limitations affecting the generalisability of our study findings. Firstly, because there is
11 no consensus regarding the definition of injury for Australian football at the non-elite level we
12 decided to use a broad injury definition. However, having a more precise injury definition may have
13 improved the consistency of reporting across clubs and between sports trainers and players. Further
14 to this, our use of the term “any new injury” in the injury definition may have led to a misconception
15 that recurrent injuries should not be reported. In future, if club-based personnel are to be used to
16 collect injury data for research purposes, it is vital that a more objective definition of injury be used.

17 Another limitation was that we only recruited 44% of all registered players. This was primarily due to
18 the absence of players from training on the night they were recruited (rather than their
19 unwillingness to participate) but it is possible that results may have differed had a more complete
20 sample been represented. Also, our study was conducted with a relatively small sample of clubs.

21 While future research in other sports and with larger samples would be worthwhile, the results do
22 provide a valuable snapshot of the potential variability in injury recording practices across clubs.

23 In relation to the diagnosis of players’ self-reported injuries, at times it was challenging for the
24 interviewer to elicit sufficient diagnostic information from players over the phone. We did attempt
25 to confirm our diagnoses through contact with treating external health-care practitioners
1 but unfortunately, there

were only nine cases in which this information was accessible, and hence this data source was subsequently excluded from the study.- Finally, there may have been a difference in the proportion of injuries reported by players and trainers because of the different reporting methods used. While players had the convenience of reporting their injuries via SMS, trainers were required to fill out more in-depth forms online. Had there been a consistent reporting method between trainers and players, they may have been more similarity in their reporting rates. In future research, it would also be useful to evaluate whether sports trainers have a preference for electronic or paper-based tools to record injuries and whether this influences data quality.

PERSPECTIVES

This study is the first to investigate the accuracy of injury data recorded by sports trainers in community sports settings. The profile of injuries reported by sports trainers was consistent with previous studies and there was a high level of completeness of injury records. However, sports trainers reported fewer injuries than were reported by players and there was significant variability across clubs. The types of injuries most likely to be reported by sports trainers

1 were those occurring during matches, those requiring medical attention and those leading to time-
2 loss from matches. The level of agreement between sports trainers and self-report by players ranged
3 from 'fair' to 'almost perfect' depending on the variable recorded. Those items requiring a greater
4 degree of diagnostic or prognostic information were most likely to differ. Injury data collected by
5 sports trainers within community clubs may be of adequate quality for providing a basic
6 understanding of the profile of injuries, particularly match injuries. However, the data are likely to
7 underestimate true injury frequencies and therefore should be interpreted with caution.

1 **ACKNOWLEDGMENTS**

2 The authors are grateful to all of the players, club personnel and health-care practitioners who
3 participated in this study, and thank Dr. Alex Donaldson (Centre for Healthy and Safe Sport,
4 University of Ballarat) for his contributions to this study. Thanks also to Professor Jill Cook
5 (Department of Physiotherapy, School of Primary Health Care, Monash University) and Professor
6 David Lloyd (Centre for Musculoskeletal Research, Griffith Health Institute, Griffith University) for
7 their contributions as chief investigators of the NoGAPS research project.

8

REFERENCES

Australian Bureau of Statistics. Children's Participation in Cultural and Leisure Activities, Australia.

<http://www.abs.gov.au/ausstats/abs@.nsf/Products/4901.0~Apr+2012~Main+Features~Sports+participation?OpenDocument> 2012a. Electronic Citation.[Last accessed 19 September 2013].

Australian Bureau of Statistics. Participation in Sport and Physical Recreation, Australia, 2011-12.

<http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/4177.0Main%20Features52011-12?opendocument&tabname=Summary&prodno=4177.0&issue=2011-12&num=&view=> 2012b. Electronic Citation.[Last accessed 19 September 2013].

Australian Football League. Youth Coaching Manual. Australian Football League.

http://www.afl.com.au/portals/0/afl_docs/development/coaching/youth_manual/AFLYouthCoachingManual2010_00.pdf 2010. Electronic Citation.[Last accessed 20 September 2011].

Australian Sports Injury Data Working Party. Australian Sports Injury Data Dictionary: guidelines for injury data collection and classification for the prevention and control of injury in sport and recreation. SportSafe Australia (Australian Sports Commission) and Sports Medicine Australia. <http://sma.org.au/wp-content/uploads/2009/12/datadictionary.pdf> 1998.

Electronic Citation.[Last accessed 2 May 2011].

Braham R, Finch C & McCrory P. Sports trainers have accurate but incomplete recall of injury details.

Br J Sports Med 2003;37:561.

Braham R, Finch C, McIntosh A & McCrory P. Community level Australian Football: a profile of injuries. J Sci Med Sport 2004;7:96-105.

Braham RA & Finch CF. The reliability of team-based primary data collectors for the collection of exposure and protective equipment use data in community sport. Br J Sports Med 2004;38:e15.

Casey M, Finch CF, Mahoney M & Townsend M. Sport safety policies and practices in two rural Victorian communities. J Sci Med Sport 2004;7:226-31.

- Cassell E, Kerr E & Clapperton A. Adult sports injury hospitalisations in 16 sports: the football codes, other team ball sports, team bat and stick sports and racquet sports. Victorian Injury Surveillance Unit, Monash Injury Research Institute.
- <http://www.monash.edu.au/miri/research/research-areas/home-sport-and-leisure-safety/visu/hazard/haz74.pdf> 2012. Electronic Citation.[Last accessed 16 September 2013].
- Donaldson A & Finch CF. Identifying context-specific competencies required by community Australian Football sports trainers. *Br J Sports Med* 2012;46:759-65.
- Donaldson A, Forero R & Finch C. The first aid policies and practices of community sports clubs in northern Sydney, Australia. *Health Promot J Austr* 2004a;15:155-61.
- Donaldson A, Forero R, Finch C & Hill T. A comparison of the sports safety policies and practices of community sports clubs during training and competition in northern Sydney, Australia. *Br J Sports Med* 2004b;38:60-63.
- Donaldson A, Leggett S & Finch CF. Sports policy development and implementation in context: Researching and understanding the perceptions of community end-users. *Int Rev Sociol Sport* 2012;47:745-760.
- Ekegren C, Donaldson A, Gabbe B, Sheehan L & Finch C. Sports trainers' attitudes towards injury surveillance in community Australian Football. *J Sci Med Sport* 2012;15:S129-S130.
- Ekegren CL, Gabbe BJ & Finch CF. Injury reporting via SMS text messaging in community sport. *Inj Prev* 2014;., doi: 10.1136/injuryprev-2013-041028.
- Emery CA, Meeuwisse WH & Hartmann SE. Evaluation of risk factors for injury in adolescent soccer: Implementation and validation of an injury surveillance system. *Am J Sports Med* 2005;33:1882-1891.
- Finch C, Gabbe B, Lloyd D, Cook J, Young W, Nicholson M, Seward H, Donaldson A & Doyle T. Towards a national sports safety strategy – addressing facilitators and barriers towards safety guideline uptake (the NoGAPS project). *Inj Prev* 2011;17:1-10.

- Finch C & Hennessy M. The safety practices of sporting clubs/centres in the City of Hume. *J Sci Med Sport* 2000;3:9-16.
- Finch C, Ozanne-Smith J & Williams F *The feasibility of improved data collection methodologies for sports injuries*. Melbourne: Monash University Accident Research Centre, 1995. (Report no. 69).
- Finch CF. Getting sports injury prevention on to public health agendas - addressing the shortfalls in current information sources. *Br J Sports Med* 2012;46:70-4.
- Finch CF, Gabbe BJ, White P, Lloyd D, Twomey D, Donaldson A, Elliott B & Cook J. Priorities for investment in injury prevention in community Australian football *Clin J Sport Med* 2013;23:430-438.
- Gabbe B, Finch C, Wajswelner H & Benell K. Australian football: injury profile at the community level. *J Sci Med Sport* 2002;5:149-160.
- Junge A & Dvorak J. Influence of definition and data collection on the incidence of injuries in football. *Am J Sports Med* 2000;28:s40-s46.
- Landis JR & Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977;33:159-174.
- McManus A, Stevenson M, Finch C, Elliott B, Hamer P, Lower A & Bulsara M. Incidence and risk factors for injury in non-elite Australian Football. *J Sci Med Sport* 2004;7:384-391.
- Mitchell R, Finch C & Boufous S. Counting organised sport injury cases: evidence of incomplete capture from routine hospital collections. *J Sci Med Sport* 2010;13:304-308.
- Mummery W, Schofield G & Spence J. The epidemiology of medically attended sport and recreational injuries in Queensland. *J Sci Med Sport* 2002;5:307-320.
- National Center for Injury Prevention and Control. CDC Injury Research Agenda, 2009-2018. US Department of Health and Human Services, Centers for Disease Control and Prevention. <http://www.cdc.gov/ncipc> 2009. Electronic Citation.[Last accessed 23 September 2013].

- Nilstad A, Bahr R & Andersen T. Text messaging as a new method for injury registration in sports: A methodological study in elite female football. *Scand J Med Sci Sports* 2012; doi: 10.1111/j.1600-0838.2012.01471.x.
- Schiff MA, Mack CD, Polissar NL, Levy MR, Dow SP & O'Kane JW. Soccer injuries in female youth players: comparison of injury surveillance by certified athletic trainers and internet. *J Athl Train* 2010;45:238-242.
- Shawdon A & Brukner P. Injury profile of amateur Australian rules footballers. *J Sci Med Sport* 1994;26:59-61.
- Sheehan L *Sports injury surveillance project. Final report to Sport and Recreation Victoria April 2011*. South Melbourne: Sports Medicine Australia (Victorian Branch), 2011.
- Sports Medicine Australia. Smartplay Resources: Recommended Forms
<http://www.smartplay.com.au/Content/Pub/ContentMenuDetail.asp?lngContentMenuID=2&Cat=43> 2012a. Electronic Citation.[Last accessed 11 December 2013].
- Sports Medicine Australia. Track sports injuries at your club with Sports Injury Tracker website.
Sports Medicine Australia.
<http://www.smartplay.com.au/Content/Pub/ContentDetail.asp?lngContentID=439> 2012b. Electronic Citation.[Last accessed 1 August 2013].
- Twomey DM, Finch CF, Doyle TL, Elliott BC & Lloyd DG. Level of agreement between field-based data collectors in a large scale injury prevention randomised controlled trial. *J Sci Med Sport* 2011;14:121-5.
- Yard E. *Using surveillance for sports injury epidemiology*. PhD thesis. Ohio: Ohio State University; 2009.
- Zazryn T, Finch C & Garnham A. Is safety a priority for football clubs? *Sport Health* 2004;21:19-24, 27.

Table 1. Injury variables recorded in Sports Injury Tracker (Sports Medicine Australia, 2012a)

-
1. Date of injury
 2. Type of activity at time of injury
(*e.g. match/training*)
 3. Reason for presentation
(*e.g. new/recurrent/exacerbated injury*)
 4. Mechanism of injury
(*e.g. struck by other player/etc.*)
 5. Body region injured
(*e.g. shoulder/thigh/ etc.*)
 6. Nature of injury
(*e.g. abrasion/fracture/etc.*)
 7. Initial treatment
(*e.g. none/ crutches/ etc.*)
 8. Action taken
(*e.g. immediate return/etc.*)
 9. Referral
(*e.g. no referral/ physio/etc.*)
 10. Provisional severity assessment
(*mild/moderate/severe*)
 11. Treating person
(*e.g. Medical practitioner/etc.*)
 12. Return to football date
-

Table 2. Injuries reported by players via SMS, by sports trainers via Sports Injury Tracker and by both (breakdown by club)

	Total injuries (n)	Injury reported by sports trainers only (%)	Injury reported by players only (via SMS) (%)	Same injury reported by both sports trainers and players (%)
Club 1* (3 teams, 54 players)	76	9	82	9
Club 2 (2 teams, 26 players)	30	13	63	23
Club 3 (2 teams, 41 players)	73	42	29	29
Club 4 (2 teams, 18 players)	31	3	71	26
Total	210	20.5	59.0	20.5

n=number of injuries; % are proportion of total injuries for each club; *injury data recorded by senior coach at this club

Table 3. Profile of injuries reported by either source and the proportion of these reported by sports trainers

	Total injuries (n)*	Reported by sports trainers (n, %)
Activity at time injury		
Match	189	81, 43%
Training	15	1, 7%
Other (overuse)	5	2, 40%
Severity (time loss)		
No matches missed	110	37, 34%
1 match missed	39	20, 52%
2-3 matches missed	34	16, 47%
≥4 matches missed	25	12, 48%
Medical attention		
Sports trainer only	91	27, 30%
Sports trainer + other health professional	102	57, 56%
None	3	2, 66%
Mechanism of injury		
Collision with other player/referee	79	36, 46%
Overexertion (e.g. muscle tear)	34	9, 27%
Overuse	20	8, 40%
Struck by other player	12	7, 58%
Twisting to pass or accelerate	12	5, 42%
Fall from height/awkward landing	11	5, 45%
Fall/stumble on same level	8	3, 38%
Struck by ball	8	5, 63%
Other	27	9, 34%
Body region injured		
Thigh	38	13, 34%
Knee	30	11, 37%
Shoulder	25	8, 32%
Ankle	25	9, 36%
Lower leg	24	3, 13%
Hand and fingers	17	9, 53%
Face (excludes eye)	13	8, 61%
Head (excludes face)	11	6, 54%
Lower back	10	6, 60%
Pelvis	10	6, 60%
Neck	8	2, 25%

Other	23	8, 35%
Nature of injury		
Bruise/contusion	64	19, 29%
Strain (e.g. muscle tear)	49	19, 39%
Sprain (e.g. ligament tear)	41	16, 40%
Fracture (including suspected)	17	10, 58%
Inflammation/swelling	15	6, 40%
Dislocation/subluxation	12	4, 34%
Open wound/laceration cut	9	6, 66%
Concussion	8	4, 50%
Other	15	6, 40%
Top 3 specific diagnoses		
Ankle sprain	16	5, 31%
Hamstring strain	15	6, 40%
Concussion	8	4, 50%
Total injuries	210 [†]	86 [‡] , 41%

* where disagreements arose between sources on injury classification (see Table 4), sources of best evidence were used, e.g. disagreements on date of injury and severity were resolved using match records, disagreements on nature of injury were resolved using body part and mechanism variables to determine the most likely correct diagnosis ; [†] where injury total is <210, data were missing; where injury total is >210, multiple categories were assigned to a single injury; [‡]where injury total is <86, data were missing; where injury total is >86, multiple categories were assigned to a single injury.

Table 4. Agreement between sports trainers and players

Variables	Percentage agreement between sports trainers and players (n=43 injuries)	Kappa (95%CI)
Date of injury	91%	0.90 (0.87,0.95)
Activity at time of injury (<i>e.g. match/training</i>)	100%	1.00 (1.00,1.00)
Mechanism of injury (<i>E.g. struck by other player/etc.</i>)	48%	0.34 (0.25,0.48)
Body region injured (<i>E.g. shoulder/thigh/ etc.</i>)	86%	0.85 (0.84,0.90)
Nature of injury (<i>E.g. abrasion/ fracture/etc.</i>)	60%	0.52 (0.44,0.66)
Provisional severity assessment (<i>mild/moderate/severe</i>)	70%	0.53 (0.29,0.71)
Return to football date	35%	0.32 (0.27,0.37)

Figure 1. Injuries reported by players via SMS, by sports trainers via Sports Injury Tracker and by both

n=number of injuries; % is proportion of total injuries (n=210)

Figure 1 legend. Figure one shows the proportion of injuries reported by players via SMS, by sports trainers via sports Injury Tracker and by both. Fifty-nine per cent of the 210 injuries were reported by players via SMS only 20.5% were reported by sports trainers only and 20.5% of injuries were reported by both players and sports trainers.