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INJURY PREVENTION

Injury reporting via SMS text messaging in community sport

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INJURY REPORTING VIA SMS TEXT MESSAGING IN COMMUNITY SPORT

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ABSTRACT

Background The use of text messaging or short message service (SMS) for injury reporting is a recent innovation in sport and has not yet been trialled at the community level. Considering the lack of personnel and resources in community sport, SMS may represent a viable option for ongoing injury surveillance. The aim of this study was to evaluate the feasibility of injury self-reporting via SMS in community Australian football.

Methods Four clubs were randomly selected from a possible 22 men's community Australian football clubs. Consenting players received an SMS after each football round asking whether they had been injured in the preceding week. Outcome variables included the number of SMS-reported injuries, players' response rates and response time. Poisson regression was used to evaluate any change in response rate over the season and the association between response rate and the number of reported injuries.

Results In the sample of 139 football players, 167 injuries were reported via SMS over the course of the season. The total response rate ranged from 90-98%. Of those participants who replied on the same day, 47% replied within five minutes. The number of reported injuries decreased as the season progressed but this was not significantly associated with a change in the response rate.

Conclusions The number of injuries reported via SMS was consistent with previous studies in community Australian football. Injury reporting via SMS yielded a high response rate and fast response time and should be considered a viable injury reporting method for community sports settings.

INTRODUCTION

Participation in organised sport is an important part of the overall strategy for physical activity promotion.¹ However, there is also a risk of injury associated with sport which has the potential to outweigh the health benefits of participation and could also act as a deterrent to future participants.^{2,3} Sports injuries are largely preventable^{4,5} but the development of relevant and effective preventive strategies for certain populations has been hampered by a lack of available injury data.⁶

Such challenges have been encountered within community sport.^{6,7} Previous research in this setting has incorporated a range of injury surveillance methods, including employing data collectors and enlisting medical personnel at clubs to record injuries.⁸⁻¹¹ These methods are labour-intensive and lack sustainability as an ongoing surveillance method in the under-resourced environment of community sport. Moreover, community sports participants often seek treatment from a range of health professionals outside of their clubs¹² which could make it difficult for club-based personnel to capture all injuries.

As an alternative to traditional injury registration methods, researchers have recently trialled text messaging or short message service (SMS) for self-reporting of injuries with considerable success. Studies have been conducted with elite Danish handballers,¹³ elite Norwegian soccer players¹⁴ and for leisure-time sports injuries in Danish school children.¹⁵ Text messaging for injury reporting has not yet been trialled within any community club sports. Considering the lack of personnel and resources for injury surveillance in community sport^{16,17} and the widespread mobile phone usage amongst Australian adults,¹⁸ this method has the potential to be convenient for both participants and researchers and may represent a feasible option for ongoing surveillance. The aim of this study was to evaluate the feasibility of injury self-reporting via SMS in terms of the number of injuries captured, the response rate and the response time. The study was carried out within community Australian football, a setting associated with a high frequency and rate of injuries.¹⁹

METHODS

Participants

Australian football players were recruited from four men's community football clubs (nine teams in total) in Victoria, Australia. Each club was randomly selected from a pool of 22 community Australian football clubs concurrently involved in a larger injury prevention project.²⁰ At a training session prior to the start of the football season, players from the four clubs were provided with information about the study and given the opportunity to ask questions before providing written informed consent. Participants were eligible for inclusion if they were aged 18+ years and planned to play football for their club throughout the entire 2012 football season (16-18 rounds). Ethics approval was obtained from the Monash University Human Research Ethics Committee.

Procedures

After providing consent, participants gave their mobile phone numbers and preferred days and times for receiving messages. Throughout the playing season, participants received a message on their personal mobile phone one to two days after each weekly match. The message read: "Please reply 'yes' or 'no' indicating whether you have experienced a new football injury in the last seven days". If a participant answered 'no' they were thanked with a return SMS and there was no further contact from the research team that week. If a participant replied 'yes', he received a follow-up phone call from the primary author (CE), a physiotherapist, to provide the details of his injury. If a participant did not respond to the initial SMS, he received another SMS two days and again four days after the initial attempt.

The primary outcome was any football-related injury. Only injuries that had been sustained during official football training sessions or matches were recorded, as confirmed during follow-up interview.

The definition of injury was kept deliberately broad to allow players to report on all injuries rather than a subset.

Data analysis

Weekly SMS responses ('yes'/'no') were downloaded from the research team's mobile phone to an Excel® (Microsoft Office Excel 2010) spread sheet. All data were then exported to Stata® 12 (StataCorp 2011) for analysis. To determine whether the number of SMS-reported injuries changed over the course of the season, the correlation between number of injuries and round number was assessed using the Spearman correlation coefficient. Response rates were generated for each round of the season as i) the percentage of players responding to the initial SMS sent and ii) the percentage of players responding after all three reminder messages were sent (total response rate). The percentage of players requiring one or two SMS reminders was reported for each round. For a random sample of eight rounds, the time to reply to the initial SMS was calculated (rounded to the closest minute).

To establish whether the response rate changed over the course of the season a Poisson regression model was fitted with the number of responses as the outcome, the football round as the covariate of interest and the number of people messaged each round as the exposure. The reference category was designated as the round with the highest response rate (round one). To determine whether the response rate influenced the number of injuries reported, a second Poisson regression was fitted with the number of responses as the outcome, the number of injuries reported each round as the covariate of interest and the number of people messaged each round as the exposure. The reference category was designated as the lowest number of injuries reported in any round (n=2 injuries). The significance level for all analyses was set at $p < 0.05$. Rate ratios and 95% confidence intervals (CI) were reported for the Poisson regression models.

RESULTS

Of the 316 football players eligible from the four clubs, 44% (n=139) agreed to participate in the study. The mean (SD) age of participants was 25 (4) years and ranged from 18 to 38 years. Seventeen participants were lost to follow-up over the course of the season; two due to season-ending injuries, 10 due to quitting football and five for unknown reasons. Results obtained from these participants up until their drop-out date were included in all analyses. In total, 2516 text messages were sent to players across the whole season. The percentage of players requiring one SMS reminder ranged from 5-16% across rounds. The percentage requiring two SMS reminders ranged from 2-10% across rounds.

Number of injuries

One hundred and sixty-seven injuries were reported via SMS by the 139 players (Table 1). This equated to an incidence of 1.20 (95% CI 1.14-1.28, range 0-6) injuries per participant over the season. The number of injuries reported per round ranged from two to 16. For one club (n=18 players), their season ran from rounds one to 16 and for another club (n=54 players), data was collected for rounds three to 18 only.

Table 1. Number of injuries reported by SMS and response rates for each round

Round	Total SMS-reported injuries (n)	Total players sent SMS (n)	Response rate: 1 st SMS (95% CI)	Total response rate (95% CI)
1	11	85*	89% (81-95)	98% (92-100)
2	16	83*	84% (75-91)	96% (90-99)
3	14	138	88% (82-93)	97% (93-99)
4	15	136	93% (87-96)	96% (92-99)
5	12	133	94% (88-97)	97% (92-99)
6	10	132	91% (85-95)	97% (92-99)
7	7	130	92% (85-96)	96% (91-99)
8	13	133	93% (88-97)	94% (88-97)
9	11	133	92% (86-96)	95% (89-98)
10	7	127	92% (86-96)	97% (92-99)
11	5	129	88% (81-93)	95% (90-98)
12	13	129	91% (85-96)	92% (86-96)
13	8	122	85% (78-91)	93% (86-97)
14	4	120	84% (76-90)	90% (83-95)
15	6	119	88% (81-93)	93% (87-97)
16	2	123	85% (78-91)	93% (87-97)
17	4	105*	92% (86-97)	97% (92-99)
18	9	103*	84% (76-91)	97% (92-99)
Total	167	2180	-	-

* For rounds 1,2,17 & 18 data was collected for three out of four clubs only

NB. Players missing from football due to injury were not sent an SMS in that round

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2
3 Figure 1 shows the number of injuries reported each round. Only rounds three to 16, where a full
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5 sample was available, were included. There was a significant negative association between the
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7 number of injuries and the football round (Spearman correlation coefficient=-0.76, $p<0.01$), with the
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9 number of reported injuries decreasing as the season progressed.
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11
12 <Insert Figure 1 about here>
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14

15 **Response rate**

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18 The response rates to the first weekly SMS sent by researchers ranged from 84-94% across rounds
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20 (Table 1). After all three reminder messages for each round were sent (if necessary), total response
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22 rates increased and ranged from 90-98% (Table 1). The highest total response rate was achieved in
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24 the first round (98%) and the scatter plot in Figure 2 shows an apparent decline in the total response
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26 rate over the season. However, relative to round one, the decline was not significant (Figure 2).
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30 <Insert Figure 2 about here>
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34 Although Figure 3 shows an apparent positive association between the number of SMS-reported
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36 injuries and SMS response rates, the number of injuries reported did not significantly increase in
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38 association with the response rate (Figure 3).
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41 <Insert Figure 3 about here>
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44 **Time to respond**

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47 The number of messages sent by researchers and received from players was totalled across eight
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49 randomly-selected rounds. Eighty-nine per cent (95%CI 87-91%) of players replied to the first weekly
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51 SMS sent by researchers (Figure 4). Of those that replied to the first SMS, 97% (95%CI 96-98%)
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53 responded on the same day and of those that responded on same day, 47% (95%CI 43-50%)
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55 responded within 5 mins.
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<Insert Figure 4 about here>

DISCUSSION

The aim of this study was to investigate the use of injury self-reporting via SMS in community sport. There have been a diverse range of injury reporting methods used in community sport and, as such, there is yet to emerge an optimal technique for capturing the full extent of the injury problem in this setting.⁶ This study is the first to investigate using SMS to collect injury data in community sport and also the first in Australian football.

From the high total response rate of 90-98% and the fact that almost half of the participants responded within five minutes, it is evident that most participants found SMS a convenient method for reporting their injuries. Other studies using SMS for injury reporting have reported similarly high response rates.¹³⁻¹⁵ In their study of injuries in elite handballers, Moller et al¹³ reported a response rate of 85-90%, Nilstad et al¹⁴ achieved a response rate of 90% with their cohort of elite female soccer players and Jespersen et al's¹⁵ study of schoolchildren achieved an average weekly response rate of 96%.

As with any surveillance system a balance must be achieved between obtaining high quality injury data and ensuring that participants are not deterred by excessive data requests.²¹ Although there was a decline in the total response rate over the course of this season, this was non-significant, indicating that most participants were consistent in their willingness to respond over the six-month football season. No other studies have reported whether their SMS response rates changed over time. Future research may need to consider the optimal frequency for SMS requests and an optimal length of follow-up for injury studies of this kind.

The number of injuries reported by SMS (1.2 per player) was within the range reported by previous studies of adult community Australian footballers.^{22,23} In their study of footballers within the

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3 Victorian Amateur Football Association (VAFA), Gabbe et al²² reported an incidence of 1.3 injuries
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5 per player over a season of 18 rounds. In that study, data was recorded by club-based medical
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7 personnel and their definition of injury encompassed injuries leading to time loss from training or
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9 matches and those requiring treatment. A later study, with a similar methodology, reported an
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11 incidence of only 0.7 injuries per player per season in community Australian football.²³ The authors
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13 used non-medical club personnel to collect data which may explain the lower injury incidence. While
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15 we used a broader definition of injury than either of these previous studies, it is worth noting that
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17 we recorded a similar or greater number of injuries using SMS. Another study using SMS for injury
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19 self-reporting in elite female soccer players reported similar patterns, with 90% of injuries reported
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21 by players via SMS and only 38% by club-based personnel.¹⁴
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26 A notable finding from this study was that the number of injuries reported by players decreased over
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28 the course of the season, but this was not associated with a change in the response rate. There are
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30 two possible alternate explanations for the decline in injury numbers. Firstly, previous studies using
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32 other data collection methods have also reported a decline in the occurrence of new injuries as the
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34 season progresses.^{23 24} This is because players are thought to become fitter and better adapted to
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36 the training and match loads over the course of the season.^{23 24} Another explanation for the decline
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38 in injury incidence is that participants may have become reluctant to report their injuries as the
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40 season progressed and, while they were still responding to the messages, they were not always
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42 responding reliably. It has been suggested previously that athletes may underreport their injuries in
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44 order to avoid missing matches.¹⁴ Although players were informed during the consenting process
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46 that their injury reports would not be shared between researchers and coaches, players may have
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48 still had some concerns about this.
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53 Traditionally, sports injury surveillance studies have been conducted using field-based data
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55 collectors. Compared to these methods there are several advantages to using SMS. Firstly, SMS is a
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57 paperless system. Responses can be automatically downloaded from phone to computer which
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3 eliminates the need for secondary data entry and the associated risk of transcription errors. An
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5 automated group messaging system can be set up which significantly reduces the time spent on data
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7 collection. Messages can also be sent and received on a highly frequent basis which limits the risk of
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9 recall bias by respondents, previously an issue in studies using injury self-reporting.^{25 26} Another
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11 major strength of SMS is the speed with which data can be obtained. When field-based personnel
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13 are used for injury surveillance, researchers often have to wait until the end of the season to receive
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15 compiled injury data. Using SMS, injuries can be reported as soon as they occur, enabling injury
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17 trends to be monitored in real time. This could be particularly useful in sport for evaluating players'
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19 immediate responses to changes in training loads or match conditions over the course of a season,
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21 providing the opportunity for timely intervention by coaches, trainers and medical personnel.
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25 There are some disadvantages to consider in relation to the use of SMS technology for injury
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27 reporting. In this study, more than 2500 text messages were sent during the course of the football
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29 season. We were able to minimise the associated costs of sending this volume of messages by using
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31 an unlimited text messaging plan, charged at AUD\$35 per month. However, although there were no
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33 complaints from our participants, it cannot be assumed that all participants would be willing to bear
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35 the costs of replying to messages. Finally, as with any electronic records, there may be concerns
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37 from participants about the privacy of their data. They may also be reluctant to provide their
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39 personal mobile phone numbers. It is therefore vital that processes are implemented to ensure all
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41 privacy requirements are met.
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45 There may be limitations affecting the generalizability of the study findings. Firstly, although an
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47 excellent response rate was achieved in this study, it is unknown whether or not such a high rate
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49 could be achieved with another age group. The mean age of participants was 25 years in this study
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51 and therefore, there was a clear advantage to using SMS with this population where there is almost
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53 universal mobile phone usage.¹⁸ Also, for pragmatic reasons, we did not ask participants any
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55 additional questions about training or match exposure. While this information would have been
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3 valuable for calculating exposure-adjusted injury rates, its inclusion may have led to a reduction in
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5 the response rate. Finally, future research should evaluate the validity of data captured by SMS
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7 compared to traditional forms of injury reporting in this population and whether or not detailed
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9 information on injury nature and mechanism can be obtained via SMS.
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12 The use of SMS for injury reporting is still in its infancy. While there have been a handful of studies
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14 outside of sport that have used SMS to monitor injury recovery,²⁷⁻²⁹ there have been no other
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16 studies outside of sport that have used SMS for injury surveillance. Thus there is great scope to
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18 expand the use of SMS surveillance outside of the field of sports injury. The method has been shown
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20 to be feasible, with a high response rate and fast response times but future research needs to
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22 address whether SMS can be used to obtain more detailed injury data and to evaluate the validity of
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24 such data.
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30 **What is already known on this topic?**

- 31 • There have been a diverse range of injury reporting methods used in community sport and
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33 there is currently no clear consensus on optimal injury surveillance methods for this setting.
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- 36 • Injury self-report via SMS has been shown to be effective in elite sports and in
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38 schoolchildren.
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43 **What this study adds**

- 44 • A high response rate and fast response time was achieved using SMS for injury self-reporting
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46 in a sample of community Australian footballers.
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- 49 • Injury numbers declined throughout the football season but this was unrelated to a decline
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51 in the response rate.
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- 54 • Injury self-report via SMS represents a feasible surveillance method for community sport
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56 and potentially elsewhere.
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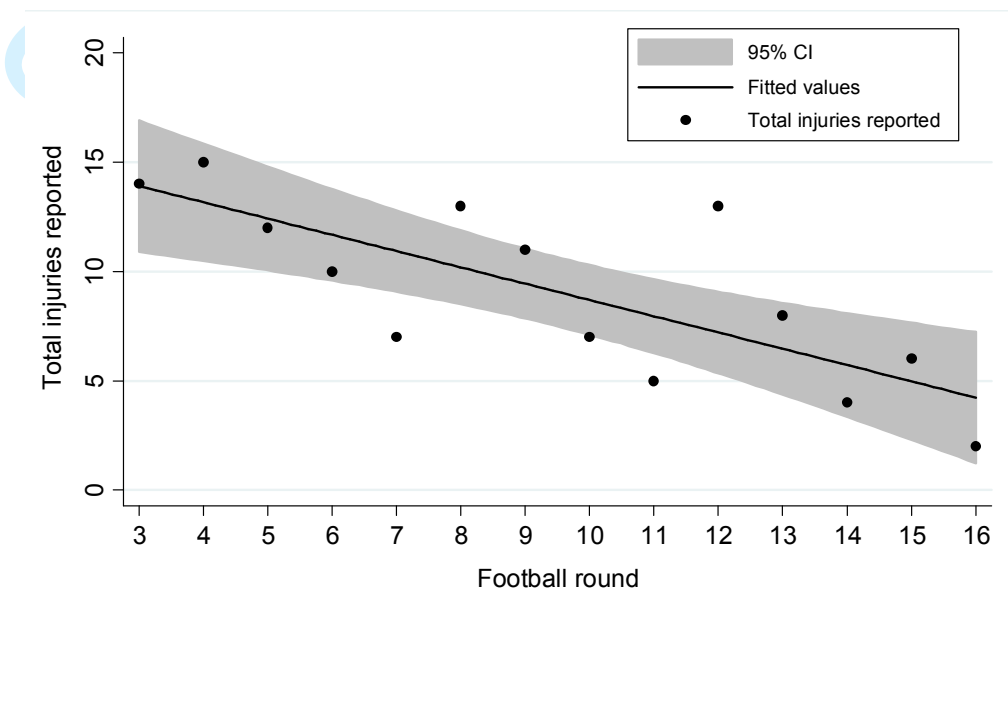
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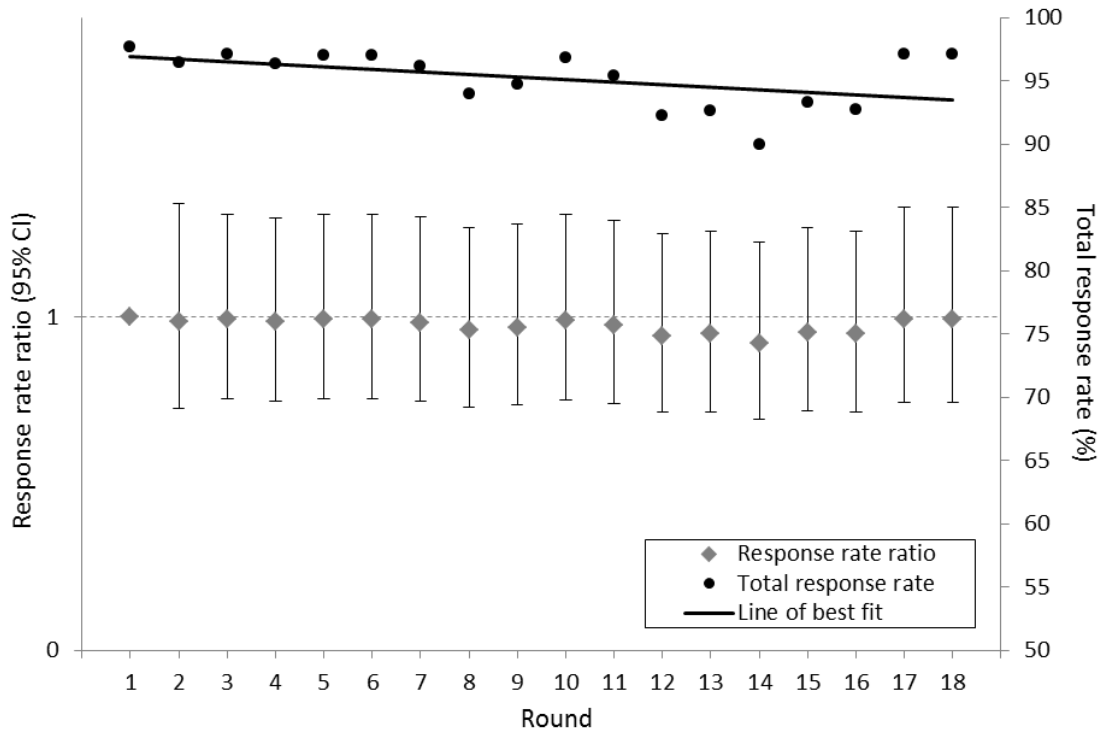
Figure 1. Number of injuries reported by players via SMS each round (rounds 3-16)



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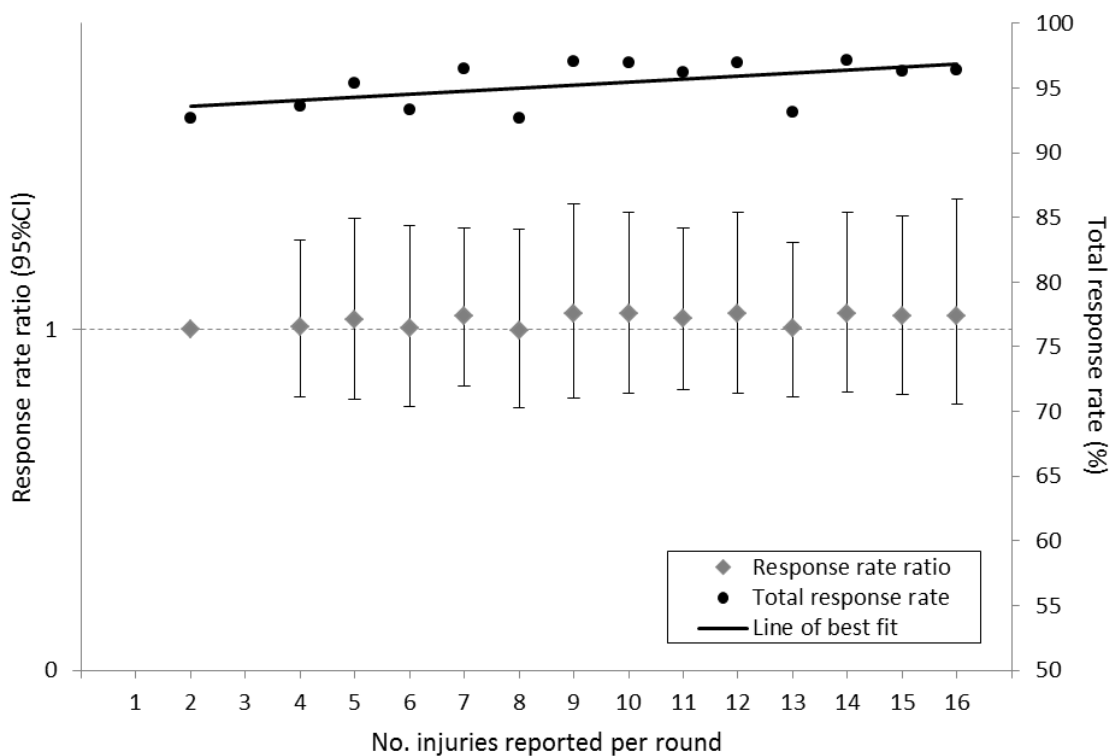
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Figure 2. Total response rates and response rate ratios derived through Poisson regression for rounds 1-18



NB. Round one designated as reference category for Poisson regression

Figure 3. Total response rates and response rate ratios derived through Poisson regression for the number of injuries reported per round



NB. Reference category for Poisson regression designated as n=2 injuries; there were no rounds in which the number of injuries reported was equal to 1 or 3.

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Figure 4. Day and time of response to first SMS sent (totals across 8 randomly sampled rounds)

