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Players' and Coaches' knowledge and awareness of the BokSmart *Safe Six* Injury Prevention Programme

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Data Sharing Statement

All data is published, and therefore there is no additional data available. If raw data is requested, requests will be reviewed on a discretionary basis by BokSmart (who can be contacted via email through the corresponding author - swrnic009@myuct.ac.za).

Competing Interests Statement

None.

Abstract

Objectives

Rugby has a high injury incidence and therefore BokSmart introduced the *Safe Six* injury prevention programme in 2014 in an attempt to decrease this incidence. In 2015, BokSmart used a "targeted marketing approach" to increase the awareness and knowledge of the *Safe Six*. Therefore, the aim of this study was to determine the change in the knowledge of coaches and players of the *Safe Six* programme, compared to the launch year, following a "targeted marketing approach".

Design

Ecological cross sectional questionnaire study

Setting

The 2014 – 2016 South African rugby union youth week tournaments.

Participants

Questionnaires were completed by 4,502 players and coaches who attended any of the four youth week tournaments during 2014 – 2016.

Outcome Measures

Logistic regression (adjusted odds ratio, 95% CI) was performed in comparison to year prior to targeted marketing, separately for coaches and players, for changes in awareness and knowledge.

Results

The awareness of the *Safe Six* increased significantly for players in 2015 (1.74 times [1.49; 2.04]) and in 2016 (1.54 times [1.29; 1.84]). Similarly for coaches, there was a 3.55 times [1.23; 9.99] increase in 2015 and a 10.11 times [2.43; 42.08] increase in 2016 compared to 2014. Furthermore, a player was significantly more likely to be aware of the *Safe Six* if his coach was aware of the programme ($p<0.05$).

Conclusions

The knowledge and awareness of the BokSmart *Safe Six* of both players and coaches increased in 2015 and 2016 (compared to 2014) since the launch of the programme. Coaches, the Unions/SARU and social media were the largest contributors to knowledge in coaches and players. Whilst the "targeted marketing approach" was associated with an increase in awareness, future studies should determine if this translates into behavioural change.

Strengths and Limitations of the Study

- This study is novel as it looks at what sources South African coaches and players received their BokSmart injury prevention information from.
- The findings could help BokSmart and other nationwide injury prevention programmes target audiences more effectively.
- The number of repeat participants completing the survey in consecutive years is unknown and assumed to be minimal.
- The results are self-reported and not observed behaviour and should be interpreted with caution.

Introduction

Rugby union (hence referred to as "rugby") is a sport played globally and has a high risk of injury when compared to other sports.[1-3] Owing to this high risk, multiple nationwide injury prevention programmes have been designed and implemented in various countries, such as RugbySmart in New Zealand and Smart Rugby in Australia.[4, 5] In South Africa, the South African Rugby Union (SARU) developed and implemented BokSmart in an attempt to decrease the injury burden through research-based initiatives.[6]

The BokSmart injury prevention programme focuses its initiatives through mandatory biennial courses, which are DVD-facilitated workshops for all coaches and referees in South Africa.[7] RugbySmart also targets the coaches and referees, and has been associated with decreases in spinal cord injuries and overall injury rates in specifically targeted areas.[8, 9] There was also an increase in "safe" behaviours in the contact situations following the introduction of RugbySmart.[8] Similarly, the BokSmart programme has also been associated with improvements in injury prevention behaviours in players, which is hypothesised to lead to a decrease in injuries.[10, 11] Furthermore, BokSmart has been associated with a decrease in catastrophic injuries in junior rugby players in South Africa.[12] These studies all indicate that the coach-targeted approach for injury prevention in rugby is successful.[11] These studies were all quantitative and descriptive studies, which provide information regarding changes over time in injury rates, knowledge and awareness of the programme and allow for inferences to be made.

Following the success of the BokSmart programme, BokSmart further developed and implemented the *Safe Six* exercise-based injury prevention programme in the beginning of 2014. The BokSmart *Safe Six* programme is coach-targeted, and aimed at being implemented as a warm-up before training or competition.[13] Following the introduction in 2014, no explicit marketing was performed (deemed the "pre" marketing period), subsequently in 2015, prior to the annual SARU youth week tournaments, a "targeted marketing approach" was taken using emails to the respective youth week teams' coaches, provincial unions and SARU. As with all BokSmart programmes, whilst the *Safe Six* is coach-targeted, it is hypothesised that there will be knowledge transfer from the coaches to the players.

Thus, the aim of this study is to determine the change in the knowledge of coaches and players of the *Safe Six* programme, compared to the launch year, following a targeted marketing approach. And secondly, whether a coach-targeted intervention approach is associated with player knowledge and awareness of the *Safe Six* programme. Finally, this study explores the reasons why coaches and players use the *Safe Six* programme.

Methods

Participants

The players and coaches of all South African teams attending the SARU youth week tournaments in 2014, 2015 and 2016 were required to complete a questionnaire (not the same players every year, but all players at all tournaments every year). The youth week tournaments are an annual opportunity to showcase the talent of the best youth rugby players in South Africa's various provincial unions. The youth week tournaments included in this

study were the Under 13 Craven Week, U16 Grant Khomo Week, Under 18 Academy Week, Under 18 Craven Week, Under 18 Learners with Special Education Needs (LSEN) Week and Under 17 Sevens Tournament. The players and coaches were asked to complete the questionnaire independently at any point during the tournament and to return it to the tournament medical officer. Each coach and player gave written consent prior to the tournament and the study received ethical clearance from the Human Research Ethics Committee of the University of Cape Town.

BokSmart Safe Six Targeted Marketing

In 2014 BokSmart launched the *Safe Six* programme, but did not perform any explicit marketing; this is deemed the "pre" marketing period for the current study. In 2015, before the youth week tournaments, a targeted marketing approach was taken, using emails (including the full *Safe Six* programme) to the respective youth week coaches; i.e. provincial unions and SARU both provided informative material to all coaches attending the youth weeks. The social media accounts of SA Rugby Youth Weeks (10 172 Facebook and 1 959 Twitter followers, 2017) and BokSmart (4 060 Facebook and 2 996 Twitter followers, 2017) were used as platforms to market the *Safe Six* programme, and so the 2015 year is the "during" marketing period. The social media marketing included copies of the Safe Six posters (details regarding the exercises, repetitions and images) and links to YouTube instructional videos. In 2016, similarly to 2014, no specific marketing was made towards those attending the youth weeks and can be considered the "post" marketing period.

Questionnaire

The questionnaire was designed by BokSmart to determine the players' and coaches' knowledge, behaviour and awareness of the *Safe Six* injury prevention programme. The BokSmart *Safe Six* is targeted at the coach and therefore the questionnaire (supplementary material I) assesses knowledge and it's transfer to behaviour of the coaches, as well as the barriers and facilitators in this process. The questionnaire also assesses the fidelity of knowledge by requiring the participants to correctly name the exercises. Following this, the BokSmart coach-targeted approach would assume that this knowledge would transfer from the coach to the player, and therefore the questionnaire also assesses the knowledge and behaviour of the players.

Statistics

Descriptive statistics were performed on the tournaments, the participants, their roles and their responses. Logistic regression was performed to determine an adjusted odds ratio (aOR, with 95% CIs) (adjusting for team role and year) on various binary outcomes (yes or no). All analyses were performed using IBM SPSS Statistics 23 (2015). Statistical significance was accepted when the $p<0.05$.

Results

Over the three years of data collection a total of 4,502 participants completed the questionnaire from six different tournaments in three consecutive years. Of the participants, 92% were players, and the rest were coaches or of unknown role (Table 1).

Table 1: The team roles of participants who completed the questionnaire (n=4502).

Team Role	2014	2015	2016	*Total*
Coach	27	52	33	*112*
Player	1351	1715	1070	*4136*
Unknown	136	80	38	*254*
Total	**1514**	**1847**	**1141**	***4502***

For players, the awareness of the *Safe Six* increased significantly in 2015 (1.74 times [1.49; 2.04]) and in 2016 (1.54 times [1.29; 1.84]) compared to 2014. Similarly, for coaches, there was a 3.55 times [1.23; 9.99] increase in 2015 and a 10.11 times [2.43; 42.08] increase in 2016 compared to 2014. However, the difference between 2015 and 2016 for both coaches and players was not significant.

Table 2: Responses to the question "Have you ever heard of the BokSmart Safe Six?" (n=4257, blank=207).

	2014		2015		2016		*Total*	
Team Role	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	***No***	***Yes***
Coach	13	12	11	36	3	28	*27*	*76*
Player	946	341	1002	627	663	368	*2611*	*1336*
Total	**959**	**353**	**1013**	**663**	**666**	**396**	**2638**	**1412**
%	***73***	***27***	***60***	***40***	***63***	***37***	***65***	***35***

Furthermore, in 2015 players were 4.94 [2.78; 8.80] times more likely to be aware of the *Safe Six* if their respective coaches were aware of the programme (Table 3).

Table 3: The players' responses related to what their respective coaches answered to the question "Have you ever heard of the BokSmart Safe Six?" during 2015 (number of coaches = 47).

Coaches' Response	**Players' Response % (n)**		
	No	**Yes**	***Total***
No	20 (123)	2 (11)	*22 (134)*
Yes	46 (278)	32 (190)	*78 (468)*
Total	**66 (401)**	**34 (201)**	***100 (602)***

SARU (2014), provincial unions (2015) and social media/news (2016) were the largest sources of information of the *Safe Six* over the years for coaches (Figure 1). For players, the largest source of information regarding the *Safe Six* was through coaches, social media/news was the second largest and the provincial unions were also large contributors to the dissemination of knowledge.

The participants were asked to name the exercises, and these were then assessed to be correct and tallied up. They were asked to correctly complete as many of the six exercises as they could. Table 4 therefore illustrates the number of the total participants that could correctly

name the exercises. The participants were asked to name as many as possible and therefore percentages were not possible to calculate due to incorrect answers and some answering more than others.

Table 4: The number of correct answers when the participants were asked to list as many of the BokSmart Safe Six exercises as they could remember in 2015 only.

Exercise	**Coach**	**Players**	***Total***
Six Meter Shuttle Run	22	321	*343*
Six Point Lunge	19	294	*313*
Buttsmart Six	14	257	*271*
Six-on-a-Side Push Up	16	247	*263*
Six Bok Lunge	18	223	*241*
Six Dynamic Reaches	17	139	*156*

In 2015 the reported usage of the *Safe Six* exercises was significantly higher for players than that of 2014 (aOR = 1.75 [1.36; 2.26]), but in 2016 there was no significant change compared to 2014(Table 6). For coaches, the usage was significantly higher in 2015, with a 4.14 times [1.15; 14.92] increase, however in 2016 there was no significant change when compared to 2014.

Table 5: Participants' responses to the question "In the last 6-8 weeks have you ever used the BokSmart Safe Six exercises?"(n=1,599, blank=48).

	2014 (%)		**2015 (%)**		**2016 (%)**		***Total* (%)**	
Team Role	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	***No***	***Yes***
Coach	2	2	1	4	1	5	*1*	*4*
Player	41	55	31	64	50	44	*39*	*56*
Total %	***43***	***57***	***32***	***68***	***51***	***49***	***40***	***60***

The largest number of participants reported using the Safe Six because it was "part of their team warm-up" (over all the years) (Figure 2).

Discussion

Overall there were significant changes in the awareness and knowledge of the coaches' and players' of the BokSmart *Safe Six* injury prevention programme. Furthermore, there was a significant relationship between the knowledge and awareness of coaches and their respective players. This finding supports BokSmart's coach-targeted approach.

Awareness of the *Safe Six* increased in 2015 and 2016 compared to 2014, in coaches and players following the targeted marketing period. The coaches' knowledge and awareness of the *Safe Six* was significantly higher than that of the players', which was to be expected because BokSmart as a whole and specifically the *Safe Six* is a coach-targeted programme.[7] Furthermore, when comparing the coaches' knowledge and awareness to their respective players' knowledge and awareness, there was a significant relationship in the marketing year, indicating that the coach-driven approach was effective in knowledge transfer to the players. This relationship, and the consequences of this relationship has been illustrated in other studies in rugby. In New Zealand, RugbySmart is a coach-targeted programme, which has been associated with an increase in injury preventing behaviours in players.[8] In South Africa, the BokSmart programme as a whole has also been associated with positive changes in injury prevention behaviours in the players.[10] Other more specific exercise-based injury prevention programmes have also been coach-targeted, with their results indicating a preventive effect (in certain areas, not overall injuries) for the players.[14, 15] This indicates that with their results a coach-targeted programme is effective in educating the coach, as well as getting coaches to implement the injury prevention measures.[14, 15] These programmes indicate that coach-targeted programmes have the desired effect on the players they are trying to reach. It must be noted that the percentage of repeat participants completing the questionnaire in subsequent years is assumed to be minimal (as with all studies using the SARU youth week rugby tournaments as the cohort).

However, when further analysing the fidelity of knowledge of the coaches and players of the *Safe Six*, their ability to name the exercises was poor, compared to the total number of participants. Therefore, if the *Safe Six* is a programme important to BokSmart, and is potentially effective in preventing injuries,[13] it is suggested that BokSmart continues to perform the marketing measures on an annual basis (more than just incorporated into the current BokSmart biennial courses)[7] to reach the target audiences and to increase the use of the programme.

As mentioned above, the *Safe Six* programme was designed as an injury prevention programme, but exploring the arguments as to why players and coaches implement the exercises is important to understand. The explanations for use of the *Safe Six* programme were predominantly for the warm-up in both the players and coaches, however, the second most popular explanation for players was injury prevention and for coaches was to improve performance. The programme was designed to be incorporated into the warm-up as an injury prevention programme, and therefore is being used as intended. However, there could also be a "misconception" between coaches that the *Safe Six* is a performance enhancement programme, instead of an injury prevention programme. It must be noted that a significant

number of both the coaches and players perceived the *Safe Six* to be easy to use (which was BokSmart's goal when designing the programme), which therefore did not hamper their experiences regarding the programme.

The source of information varied between coaches and players. The coaches reported receiving most of their information from social media/news. Coaches received communication from their respective provincial unions who are governed by SARU, and therefore this relationship was expected. Social media/news were especially targeted in the marketing period using mostly the Twitter and Facebook BokSmart accounts (2996 and 4065 followers respectively) (April 2017). For the players, most heard of the *Safe Six* from their coaches. The next popular source of hearing about the programme was from social media/news. This raises an interesting method of communicating for injury prevention awareness. The method was free and proved effective in reaching both the coaches and players. Social media and phone applications have become a new form of implementation for injury prevention programmes.[16, 17] In a review of phone-based injury prevention applications there were eighteen applications which claimed to have sports or health benefits. This indicates a shift towards the technology-based form of injury prevention methods.[16] Whilst these applications may not all have been based on scientific principles, they still attract attention.

Another study showed that an application focused on reducing ankle sprains had a low compliance once downloaded.[17] This suggests that technology-based reach can be high, but the uptake may be low. Therefore targeted efforts are required to ensure that the programme is used appropriately.[17] This principle could also be applied to the *Safe Six* where the reach and usage increased during the marketing period (possibly because of the social media exposure), and then decreased post-marketing. This is important knowledge for BokSmart and how they continue to disseminate knowledge regarding the *Safe Six* and future initiatives.

Limitations

This was a cross-sectional study and self-reported knowledge, usage, exposure and not observed behaviour, and therefore the results must be interpreted in this context.

Conclusion

The knowledge and awareness of the BokSmart *Safe Six* of both players and coaches increased in 2015 and 2016 (compared to 2014) since the launch of the programme, however, did slightly decrease during the post-marketing period. The coaches reported receiving their information regarding the *Safe Six* from the Unions/SARU and social media/news. The information for the players, came from the coaches and social media/news. Finally the reasons for using the programme were predominantly for the warm-up, injury prevention and for performance improvements. The information gathered in this study will help with designing targeted marketing for future programmes and for further promotion of the

BokSmart *Safe Six*. It also provides insight into the perceptions of the coaches and players regarding the *Safe Six* and therefore allows for BokSmart to make adjustments accordingly.

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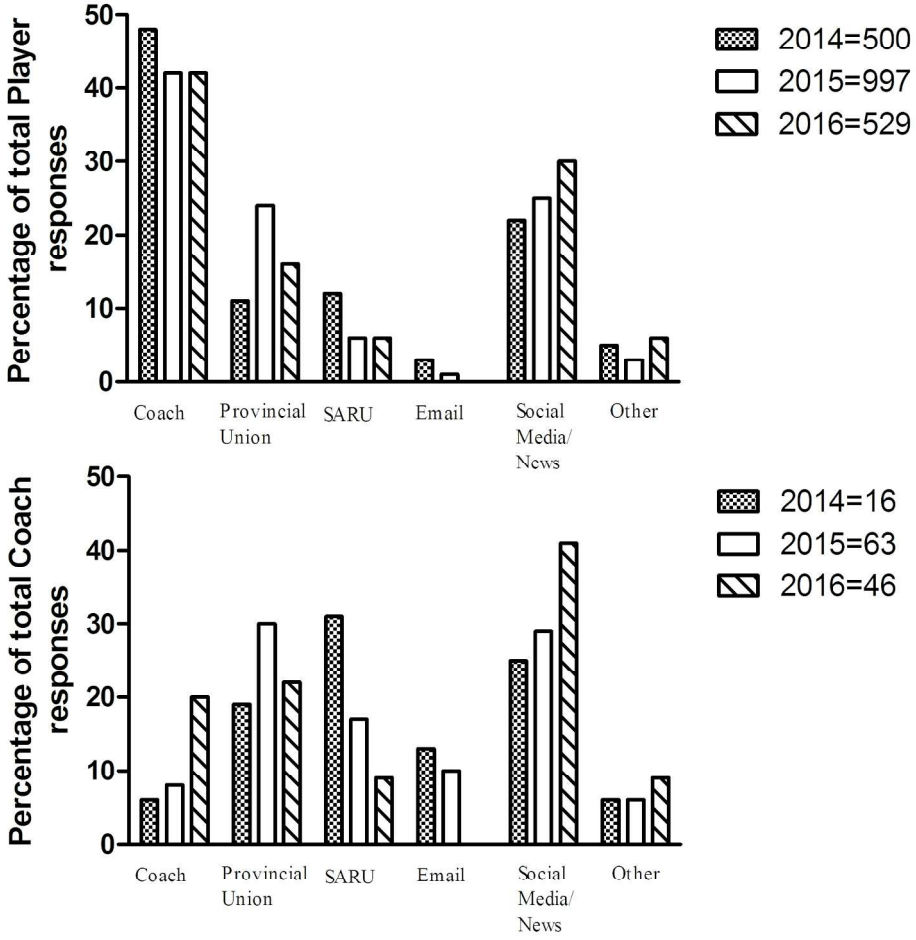
Contributors:

NS was granted access to the data and was involved in conceptualising the manuscript; she also conducted statistical analyses and wrote the initial drafts of the manuscript. JB and EV were also involved in the statistical analyses. All authors (EV, ML, WvM and JB) were involved in conceptualising and editing drafts of the paper, in the order that they appear on the author list.

Figure 1: Coaches' and players' responses to the question "How did you come to hear about the BokSmart Safe Six?" (participants could choose multiple options).

Figure 2: The coaches' and players' who claimed to use the exercises, these are their responses to the question "Why did you use the BokSmart Safe Six exercises?" (participants could tick multiple options).



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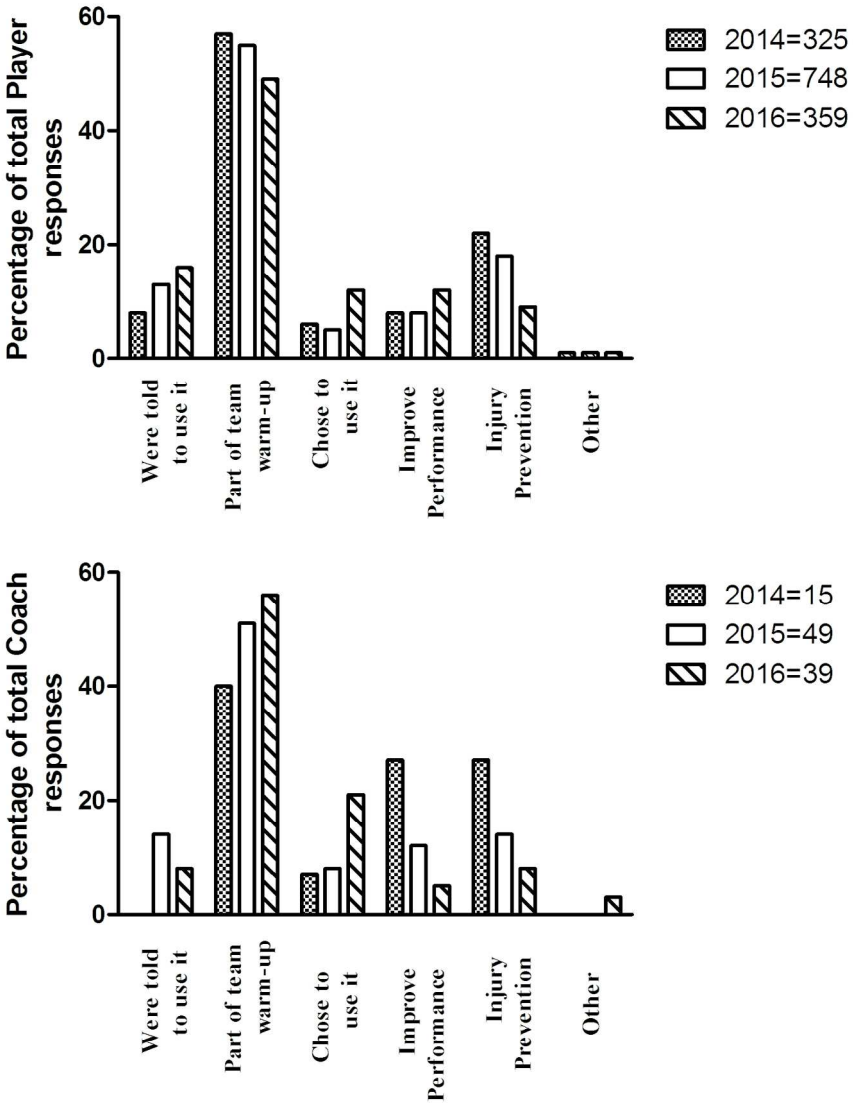
184x191mm (300 x 300 DPI)



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Methods

Participants

The players and coaches of all South African teams attending the SARU youth week tournaments in 2014, 2015 and 2016 were invited to complete a questionnaire (not the same

players every year, but all players at all tournaments every year). The youth week tournaments are an annual opportunity to showcase the talent of the best youth rugby players in South Africa's various provincial unions. The youth week tournaments included in this study were the Under 13 Craven Week, U16 Grant Khomo Week, Under 18 Academy Week, Under 18 Craven Week, Under 18 Learners with Special Education Needs (LSEN) Week and Under 17 Sevens Tournament. The players and coaches were asked to complete the questionnaire independently at any point during the tournament and to return it to the tournament medical officer. Hard copies of the questionnaire were distributed to the players and coaches and their hand written responses were transferred into Excel for data entry and then into SPSS for statistical analysis. Each coach, parent of a player under the age of 18 and player gave written consent prior to the tournament to be involved in the study and the study received ethical clearance from the Human Research Ethics Committee of the University of Cape Town (HREC 108/2017).

BokSmart Safe Six Targeted Marketing

In 2014 BokSmart launched the *Safe Six* programme, but did not perform any explicit marketing; this is deemed the "pre" marketing period for the current study. In 2015, before the youth week tournaments, a targeted marketing approach was taken, using emails (including the full *Safe Six* programme) to the respective youth week coaches; i.e. provincial unions and SARU both provided informative material to all coaches attending the youth weeks. The social media accounts of SA Rugby Youth Weeks (10 172 Facebook and 1 959 Twitter followers, 2017) and BokSmart (4 060 Facebook and 2 996 Twitter followers, 2017) were used as platforms to market the *Safe Six* programme, and so the 2015 year is the "during" marketing period. The social media marketing included copies of the Safe Six posters (details regarding the exercises, repetitions and images) and links to YouTube instructional videos. This targeted marketing took place during the ten weeks leading up to all the tournaments in 2015. In 2016, similarly to 2014, no specific marketing was made towards those attending the youth weeks and can be considered the "post" marketing period.

Questionnaire

The questionnaire was designed by BokSmart to determine the players' and coaches' knowledge, behaviour and awareness of the *Safe Six* injury prevention programme. The BokSmart *Safe Six* is targeted at the coach and therefore the questionnaire (supplementary material I) assesses knowledge (of the BokSmart *Safe Six*) and its transfer to behaviour (reported usage of the BokSmart *Safe Six*) of the coaches, as well as the barriers and facilitators in this process. The questionnaire also assesses the fidelity of knowledge by requiring the participants to correctly name the exercises included in the BokSmart *Safe Six* programme. Following this, the BokSmart coach-targeted approach would assume that this knowledge of the programme would transfer from the coach to the player, and therefore, the questionnaire also assesses the knowledge and behaviour of the players regarding the BokSmart *Safe Six*.

Statistics

Descriptive statistics were performed on the tournaments, the participants, their roles and their responses. Logistic regression was performed to determine an adjusted odds ratio (aOR,

with 95% CIs) (adjusting for team role and year) on various binary outcomes (yes or no). All analyses were performed using IBM SPSS Statistics 23 (2015). Statistical significance was accepted when the $p<0.05$.

Results

Over the three years of data collection a total of 4,502 participants completed the questionnaire from six different tournaments in three consecutive years. Of the participants, 92% were players, and the rest were coaches or of unknown role (Table 1).

Table 1: The team roles of participants who completed the questionnaire (n=4502).

Team Role	**2014**	**2015**	**2016**	***Total***
Coach	27	52	33	*112*
Player	1351	1715	1070	*4136*
Unknown	136	80	38	*254*
Total	**1514**	**1847**	**1141**	***4502***

For players, the awareness of the *Safe Six* increased significantly in 2015 (1.74 times [1.49; 2.04]) and in 2016 (1.54 times [1.29; 1.84]) compared to 2014 (Table 2). Similarly, for coaches, there was a 3.55 times [1.23; 9.99] increase in 2015 and a 10.11 times [2.43; 42.08] increase in 2016 compared to 2014. However, the difference between 2015 and 2016 for both coaches and players was not significant.

Table 2: Responses to the question "Have you ever heard of the BokSmart Safe Six?" (n=4050, unknown role=245, blank=207).

	2014		**2015**		**2016**		***Total***	
Team Role	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	***No***	***Yes***
Coach n (%)	13 (52)	12 (48)	11 (23)	36 (77)	3 (10)	28 (90)	*27 (26)*	*76 (74)*
Player n (%)	946 (73)	341 (27)	1002 (62)	627 (38)	663 (64)	368 (36)	*2611 (66)*	*1336 (34)*
Total	**959 (73)**	**353 (27)**	**1013 (60)**	**663 (40)**	**666 (63)**	**396 (37)**	**2638 (65)**	**1412 (35)**

Furthermore, in 2015 players were 4.94 [2.78; 8.80] times more likely to be aware of the *Safe Six* if their respective coaches were aware of the programme (Table 3).

Table 3: The players' responses related to what their respective coaches answered to the question "Have you ever heard of the BokSmart Safe Six?" during 2015 (number of coaches = 47).

Coaches' Response	**Players' Response % (n)**		
	No	**Yes**	***Total***
No	20 (123)	2 (11)	*22 (134)*
Yes	46 (278)	32 (190)	*78 (468)*
Total	**66 (401)**	**34 (201)**	***100 (602)***

SARU (2014), provincial unions (2015) and social media/news (2016) were the largest sources of information of the *Safe Six* over the years for coaches (Figure 1). For players, the largest source of information regarding the *Safe Six* was through coaches, social media/news was the second largest and the provincial unions were also large contributors to the dissemination of knowledge.

The participants were asked to name the six exercises, this was open-ended and retrospectively coded correct or not. The correct answers were tallied and the results are shown in Table 4. It was not possible to calculate percentages because of incorrect answers and some players answering more than others. The overall finding was that the players had a poor ability to name the exercises, and these were then assessed to be correct and tallied up. Multiple participants could name some of the six exercises, but not all of them, and different combinations of the exercises. Table 4 therefore illustrates the number of the total participants that could correctly name specific exercises. Percentages were not possible to calculate due to incorrect answers and some answering more than others. This result showed poor ability to name the exercises.

Table 4: The number of correct answers when the participants were asked to list as many of the BokSmart Safe Six exercises as they could remember in 2015 only.

Exercise	**Coach**	**Players**	***Total***
Six Meter Shuttle Run	22	321	*343*
Six Point Lunge	19	294	*313*
Buttsmart Six	14	257	*271*
Six-on-a-Side Push Up	16	247	*263*
Six Bok Lunge	18	223	*241*
Six Dynamic Reaches	17	139	*156*

In 2015 the reported usage of the *Safe Six* exercises was significantly higher for players than that of 2014 (aOR = 1.75 [1.36; 2.26]), but in 2016 there was no significant change compared to 2014 (Table 5). For coaches, the usage was significantly higher in 2015, with a 4.14 times [1.15; 14.92] increase, however in 2016 there was no significant change when compared to 2014. If a participant had answered "no" to "have they ever heard of the BokSmart Safe Six" they were screened to not be included in this question, however if they left that question blank, they could be included.

Table 5: Participants' responses to the question "In the last 6-8 weeks have you ever used the BokSmart Safe Six exercises?"(n=1,599, blank=48).

	2014		**2015**		**2016**		***Total***	
Team Role	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	***No***	***Yes***
Coach n (%)	8 (50)	8 (50)	7 (19)	29 (81)	6 (21)	22 (79)	*21 (26)*	*59 (74)*
Player n (%)	146 (43)	195 (57)	224 (32)	466 (68)	233 (53)	207 (47)	*603 (41)*	*868 (59)*
Total n (%)	154 (43)	203 (57)	231 (32)	495 (68)	239 (51)	229 (49)	*624 (40)*	*927 (60)*

The largest number of participants reported using the Safe Six because it was “part of their team warm-up” (over all the years) (Figure 2).

Discussion

Overall there were significant changes in the awareness and knowledge of the coaches' and players' of the BokSmart *Safe Six* injury prevention programme. Furthermore, there was a significant relationship between the knowledge and awareness of coaches and their respective players. This finding supports BokSmart's coach-targeted approach.

Awareness of the *Safe Six* increased in 2015 and 2016 compared to 2014, in coaches and players following the targeted marketing period. The coaches' knowledge and awareness of the *Safe Six* was significantly higher than that of the players', which was to be expected because BokSmart as a whole and specifically the *Safe Six* is a coach-targeted programme.[7] Furthermore, when comparing the coaches' knowledge and awareness to their respective players' knowledge and awareness, there was a significant relationship in the marketing year, indicating that the coach-driven approach was effective in knowledge transfer to the players. Furthermore, when considering the reported use of the exercises, in 2016 more than half of the players reported not using the exercises, whereas the majority of coaches reported that they did use the exercises. Whilst the question might over-estimate the implementation of the exercises, either the coaches are showing social desirability bias or the knowledge transfer from coach to player appears to have decreased. If it is the latter, at least the exercises are still being implemented. This relationship, and the consequences of this relationship has been illustrated in other studies in rugby. In New Zealand, RugbySmart is a coach-targeted programme, which has been associated with an increase in injury preventing behaviours in players.[8] In South Africa, the BokSmart programme as a whole has also been associated with positive changes in injury prevention behaviours in the players.[10] Other more specific exercise-based injury prevention programmes have also been coach-targeted, with their results indicating a preventive effect (in certain areas, not overall injuries) for the players.[14, 15] These programmes indicate that coach-targeted programmes have the desired effect on the players they are trying to reach.

However, when further analysing the fidelity of knowledge of the coaches and players of the *Safe Six*, their ability to name the exercises was poor, compared to the total number of participants. Therefore, if the *Safe Six* is a programme important to BokSmart, and is potentially effective in preventing injuries,[13] it is suggested that BokSmart continues to perform the marketing measures on an annual basis (more than just incorporated into the current BokSmart biennial courses)[7] to reach the target audiences and to increase the use of the programme.

As mentioned above, the *Safe Six* programme was designed as an injury prevention programme, but exploring the arguments as to why players and coaches implement the exercises is important to understand. The explanations for use of the *Safe Six* programme were predominantly for the warm-up in both the players and coaches, however, the second most popular explanation for players was injury prevention and for coaches was to improve performance. The programme was designed to be incorporated into the warm-up as an injury prevention programme, and therefore is being used as intended. However, there could also be a "misconception" between coaches that the *Safe Six* is a performance enhancement

programme, instead of an injury prevention programme. It must be noted that a significant number of both the coaches and players perceived the *Safe Six* to be easy to use (which was BokSmart's goal when designing the programme), which therefore did not hamper their experiences regarding the programme.

The source of information varied between coaches and players. The coaches reported receiving most of their information from social media/news. Coaches received communication from their respective provincial unions who are governed by SARU, and therefore this relationship was expected. Social media/news were especially targeted in the marketing period using mostly the Twitter and Facebook BokSmart accounts (2996 and 4065 followers respectively) (April 2017). For the players, most heard of the *Safe Six* from their coaches. The next popular source of hearing about the programme was from social media/news. This raises an interesting method of communicating for injury prevention awareness. The method was free and proved effective in reaching both the coaches and players. Social media and phone applications have become a new form of implementation for injury prevention programmes.[16, 17] In a review of phone-based injury prevention applications there were eighteen applications which claimed to have sports or health benefits. [16] Such findings indicate a shift towards the technology-based form of injury prevention methods. Whilst these applications may not all have been based on scientific principles, they still attract attention.

While technology-based reach can high, full utilization may be low. For example, an application focused on reducing ankle sprains had a low compliance once downloaded.[17] Therefore targeted efforts are required to ensure that the programme is used appropriately.[17] This principle could also be applied to the *Safe Six* where the reach and usage increased during the marketing period (possibly because of the social media exposure), and then decreased post-marketing. This is important knowledge for BokSmart and how they continue to disseminate knowledge regarding the *Safe Six* and future initiatives.

Limitations

This was a cross-sectional study with self-reported knowledge, usage and exposure. Therefore the results must be interpreted in this context. 44% of players could not be linked to a coach to determine the player/coach knowledge transfer, and this must be considered when interpreting those results. It must be noted that the percentage of repeat players completing the questionnaire in subsequent years is assumed to be minimal (as with all studies using the SARU youth week rugby tournaments as the cohort), however the coaches have never been assessed and there could be more repeat participants.[18-22]

Conclusion

The knowledge and awareness of the BokSmart *Safe Six* of both players and coaches increased in 2015 and 2016 (compared to 2014) since the launch of the programme, however, did slightly decrease during the post-marketing period. The coaches reported receiving their

information regarding the *Safe Six* from the Unions/SARU and social media/news. The information for the players, came from the coaches and social media/news. Reported usage of the programme increased in 2015 (i.e. the marketing period), but decreased to the pre-marketing levels in 2016. Finally the reasons for using the programme were predominantly for the warm-up, injury prevention and for performance improvements. The information gathered in this study will help with designing targeted marketing for future programmes and for further promotion of the BokSmart *Safe Six*. It also provides insight into the perceptions of the coaches and players regarding the *Safe Six* and therefore allows for BokSmart to make adjustments accordingly.

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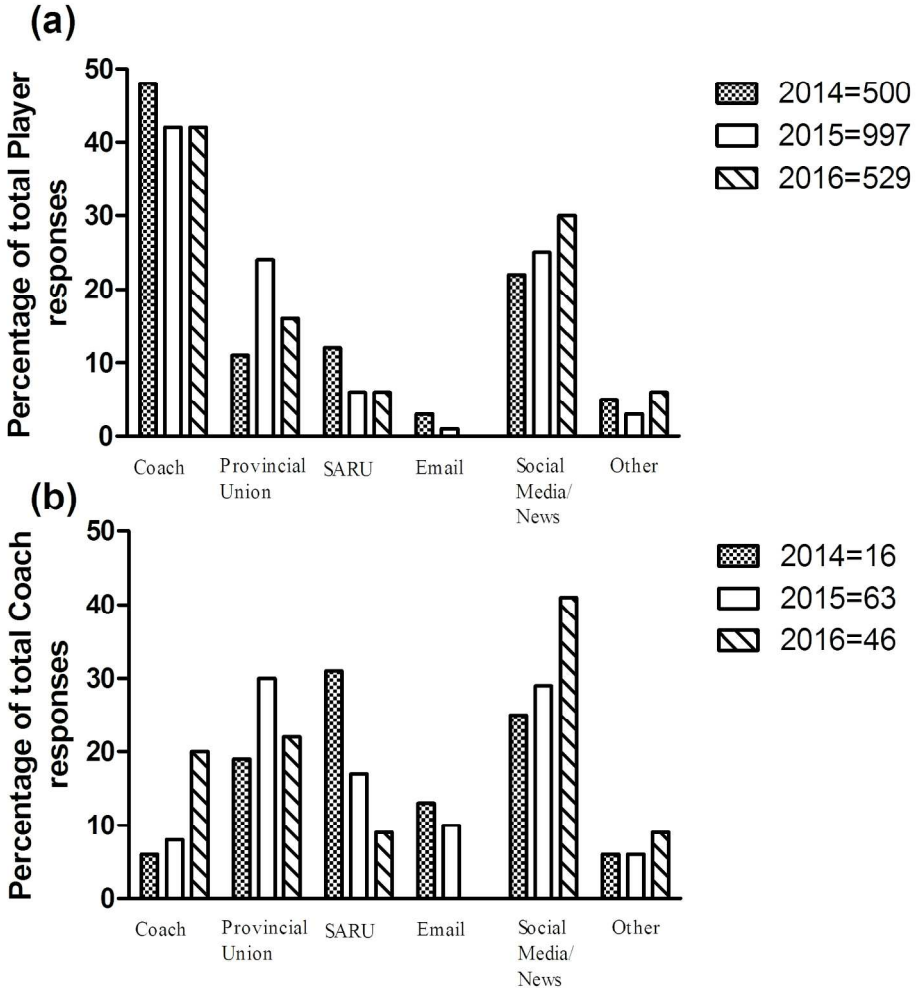
Contributors:

NS was granted access to the data and was involved in conceptualising the manuscript; she also conducted statistical analyses and wrote the initial drafts of the manuscript. JB and EV were also involved in the statistical analyses. All authors (EV, ML, WvM and JB) were involved in conceptualising and editing drafts of the paper, in the order that they appear on the author list.

Figure 1a): Players' responses to the question "How did you come to hear about the BokSmart Safe Six?" (participants could choose multiple options). b) Coaches' responses to the question "How did you come to hear about the BokSmart Safe Six?" (participants could choose multiple options).

Figure 2a): Players' who claimed to use the exercises, these are their responses to the question "Why did you use the BokSmart Safe Six exercises?" (participants could tick multiple options). b) Coaches' who claimed to use the exercises, these are their responses to the question "Why did you use the BokSmart Safe Six exercises?" (participants could tick multiple options).



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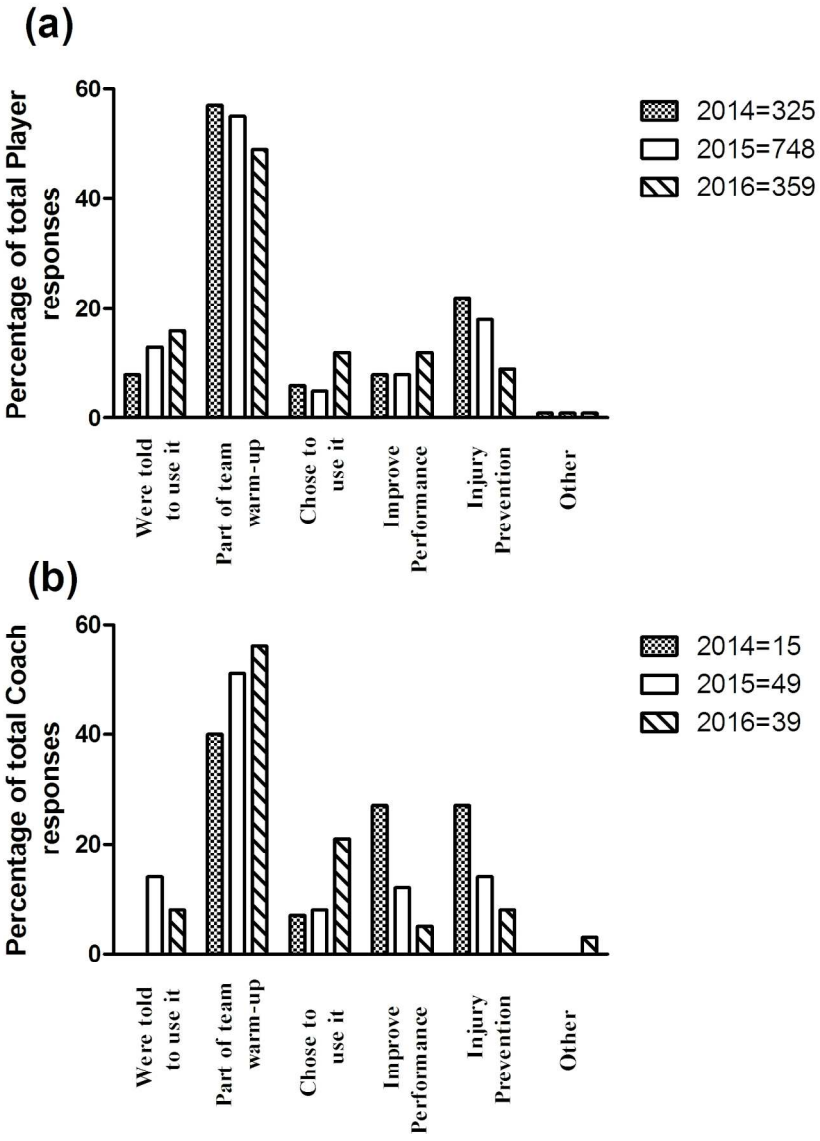
184x194mm (300 x 300 DPI)



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154x205mm (300 x 300 DPI)

SARU MEDICAL DEPARTMENT SURVEY 2016

SARU YOUTH WEEK TOURNAMENTS

Team:	Province:

☐U13 ☐U16 ☐LSEN ☐U18 Academy Week ☐U18 Craven Week

BokSmart Safe Six Questionnaire

Please tick the box or circle the number that best matches your answer. Where required also provide a very brief and to the point comment in the space provided! This questionnaire needs to be completed by ALL SARU Youth week players and team coaches.

Please indicate your current role by ticking or circling the correct box i.e. whether you are the team coach, manager or a player

☐ Team Coach ☐ Team Manager ☐ Player (☐ Forward ☐ Backline)

Questions

1. Have you ever heard of the 'BokSmart Safe Six'? YES ☐ NO ☐

*If you answered **YES** to **Question 1**, then please continue with **Question 2***
*If you answered **NO** to **Question 1**, then go to **Question 9***

2. How did you come to hear about the 'BokSmart Safe Six'? (tick all boxes that are applicable)

☐ Twitter ☐ Website ☐ Facebook ☐ Coach ☐ Provincial Union ☐ News article ☐ Poster ☐ Email ☐ SARU ☐ Other (specify below)

3. Can you name any of the 'BokSmart Safe Six' exercises? YES ☐ NO ☐

*If you answered **YES** to **Question 3**, then please list as many of these as you can remember in the space provided below*

1.	3.	5.
2.	4.	6.

4. In the last 6-8 weeks, have you ever used the 'BokSmart Safe Six' exercises? YES ☐ NO ☐

*If you answered **YES** to **Question 4**, then please continue with **Question 5** below.*
*If you answered **NO** to **Question 4**, then please go to **Question 8**.*

5. Why did you use the 'BokSmart Safe Six' exercises? (tick all boxes that are applicable)

☐ Were told to use it ☐ Part of team warm-up ☐ Chose to use it ☐ Improve performance ☐ Injury prevention ☐ Other (specify below)

6. For how many weeks and on average, how many times per week did you use the 'BokSmart Safe Six' exercises?

NUMBER OF WEEKS
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 or more weeks

AVERAGE DAYS PER WEEK
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

7. Did you find the 'BokSmart Safe Six' exercises easy to perform? YES ☐ NO ☐

8. Why did you NOT use the 'BokSmart Safe Six' exercises?

9. Would you be interested in knowing more about the 'BokSmart Safe Six'? YES ☐ NO ☐

THANK YOU FOR YOUR HELP

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

Pg Number		Item No	Recommendation
1	**Title and abstract**	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
3			(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
	Introduction		
5	Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
5	Objectives	3	State specific objectives, including any prespecified hypotheses
	Methods		
5-6	Study design	4	Present key elements of study design early in the paper
5-6	Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
5-6	Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants
6	Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
6	Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
	Bias	9	Describe any efforts to address potential sources of bias
5	Study size	10	Explain how the study size was arrived at
	Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
6	Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding
			(*b*) Describe any methods used to examine subgroups and interactions
			(*c*) Explain how missing data were addressed
			(*d*) If applicable, describe analytical methods taking account of sampling strategy
			(*e*) Describe any sensitivity analyses
	Results		
7	Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
			(b) Give reasons for non-participation at each stage
			(c) Consider use of a flow diagram
7	Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
			(b) Indicate number of participants with missing data for each variable of interest
7-8	Outcome data	15*	Report numbers of outcome events or summary measures
7-8	Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included

			(*b*) Report category boundaries when continuous variables were categorized
			(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
	Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
	Discussion		
9-10	Key results	18	Summarise key results with reference to study objectives
10	Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
9-10	Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
9-10	Generalisability	21	Discuss the generalisability (external validity) of the study results
	Other information		
2	Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Players' and Coaches' knowledge and awareness of the BokSmart Safe Six Injury Prevention Programme: an ecological cross sectional questionnaire study

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Players' and Coaches' knowledge and awareness of the BokSmart *Safe Six* Injury Prevention Programme: an ecological cross sectional questionnaire study

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Data Sharing Statement

All data is published, and therefore there is no additional data available. If raw data is requested, requests will be reviewed on a discretionary basis by BokSmart (who can be contacted via email through the corresponding author – e.verhagen@vumc.nl).

Competing Interests Statement

None.

Abstract

Objectives

Rugby has a high injury incidence and therefore BokSmart introduced the *Safe Six* injury prevention programme in 2014 in an attempt to decrease this incidence. In 2015, BokSmart used a "targeted marketing approach" to increase the awareness and knowledge of the *Safe Six*. Therefore, the aim of this study was to determine the change in the knowledge of coaches and players of the *Safe Six* programme, compared to the launch year, following a "targeted marketing approach".

Design

Ecological cross sectional questionnaire study

Setting

The 2014 – 2016 South African rugby union youth week tournaments.

Participants

Questionnaires were completed by 4,502 players and coaches who attended any of the four youth week tournaments during 2014 – 2016.

Outcome Measures

Logistic regression (adjusted odds ratio, 95% CI) was performed in comparison to year prior to targeted marketing, separately for coaches and players, for changes in awareness and knowledge.

Results

The awareness of the *Safe Six* increased significantly for players in 2015 (1.74 times [1.49; 2.04]) and in 2016 (1.54 times [1.29; 1.84]). Similarly for coaches, there was a 3.55 times [1.23; 9.99] increase in 2015 and a 10.11 times [2.43; 42.08] increase in 2016 compared to 2014. Furthermore, a player was significantly more likely to be aware of the *Safe Six* if his coach was aware of the programme ($p<0.05$).

Conclusions

The knowledge and awareness of the BokSmart *Safe Six* of both players and coaches increased in 2015 and 2016 (compared to 2014) since the launch of the programme. Coaches, the Unions/SARU and social media were the largest contributors to knowledge in coaches and players. Whilst the "targeted marketing approach" was associated with an increase in awareness, future studies should determine if this translates into behavioural change.

Strengths and Limitations of the Study

- This study is novel as it looks at what sources South African coaches and players received their BokSmart injury prevention information from.
- The findings could help BokSmart and other nationwide injury prevention programmes target audiences more effectively.
- The number of repeat participants completing the survey in consecutive years is unknown and assumed to be minimal.
- The results are self-reported and not observed behaviour and should be interpreted with caution.

Introduction

Rugby union (hence referred to as "rugby") is a sport played globally and has a high risk of injury when compared to other sports.[1-3] Owing to this high risk, multiple nationwide injury prevention programmes have been designed and implemented in various countries, such as RugbySmart in New Zealand and Smart Rugby in Australia.[4, 5] In South Africa, the South African Rugby Union (SARU) developed and implemented BokSmart in an attempt to decrease the injury burden through research-based initiatives.[6]

The BokSmart injury prevention programme focuses its initiatives through mandatory biennial courses, which are DVD-facilitated workshops for all coaches and referees in South Africa.[7] RugbySmart also targets the coaches and referees, and has been associated with decreases in spinal cord injuries and overall injury rates in specifically targeted areas.[8, 9] There was also an increase in "safe" behaviours in the contact situations following the introduction of RugbySmart.[8] Similarly, the BokSmart programme has also been associated with improvements in injury prevention behaviours in players, which is hypothesised to lead to a decrease in injuries.[10, 11] Furthermore, BokSmart has been associated with a decrease in catastrophic injuries in junior rugby players in South Africa.[12] These studies all indicate that the coach-targeted approach for injury prevention in rugby is successful.[11] These studies were all quantitative and descriptive studies, which provide information regarding changes over time in injury rates, knowledge and awareness of the programme and allow for inferences to be made.

Following the success of the BokSmart programme, BokSmart further developed and implemented the *Safe Six* exercise-based injury prevention programme in the beginning of 2014 (http://boksmart.sarugby.co.za/content/safe-six). The BokSmart *Safe Six* programme is coach-targeted, and aimed at being implemented as a warm-up before training or competition.[13] The *Safe Six* was developed using clinical knowledge and research to address the most commonly occurring injuries in rugby union, and was designed to be implemented by rugby players of all ages. Following the introduction in 2014, no explicit marketing was performed (deemed the "pre" marketing period). Subsequently in 2015, prior to the annual SARU youth week tournaments, a "targeted marketing approach" was taken using emails to the respective youth week teams' coaches, provincial unions and SARU. As with all BokSmart programmes, whilst the *Safe Six* is coach-targeted, it is hypothesised that there will be knowledge transfer from the coaches to the players.

This study had three aims. Firstly, to determine the change in the knowledge of coaches and players of the *Safe Six* programme, compared to the launch year, following a targeted marketing approach. Secondly, to evaluate whether a coach-targeted intervention approach is associated with player knowledge and awareness of the *Safe Six* programme. Finally, to explore the reasons why coaches and players use the *Safe Six* programme.

Methods

Participants

The players and coaches of all South African teams attending the SARU youth week tournaments in 2014, 2015 and 2016 were invited to complete a questionnaire (not the same

players every year, but all players at all tournaments every year). The youth week tournaments are an annual opportunity to showcase the talent of the best youth rugby players in South Africa's various provincial unions. The youth week tournaments included in this study were the Under 13 Craven Week, U16 Grant Khomo Week, Under 18 Academy Week, Under 18 Craven Week, Under 18 Learners with Special Education Needs (LSEN) Week and Under 17 Sevens Tournament. The players and coaches were asked to complete the questionnaire independently at any point during the tournament and to return it to the tournament medical officer. Hard copies of the questionnaire were distributed to the players and coaches and their hand written responses were transferred into Excel for data entry and then into SPSS for statistical analysis. Each coach, parent of a player under the age of 18 and player gave written consent prior to the tournament to be involved in the study and the study received ethical clearance from the Human Research Ethics Committee of the University of Cape Town (HREC 108/2017).

BokSmart Safe Six Targeted Marketing

In 2014 BokSmart launched the *Safe Six* programme, but did not perform any explicit marketing; this is deemed the "pre" marketing period for the current study. In 2015, before the youth week tournaments, a targeted marketing approach was taken, using emails (including the full *Safe Six* programme) to the respective youth week coaches; i.e. provincial unions and SARU both provided informative material to all coaches attending the youth weeks. The social media accounts of SA Rugby Youth Weeks (10 172 Facebook and 1 959 Twitter followers, 2017) and BokSmart (4 060 Facebook and 2 996 Twitter followers, 2017) were used as platforms to market the *Safe Six* programme, and so the 2015 year is the "during" marketing period. The social media marketing included copies of the Safe Six posters (details regarding the exercises, repetitions and images) and links to YouTube instructional videos. This targeted marketing took place during the ten weeks leading up to all the tournaments in 2015. In 2016, similarly to 2014, no specific marketing was made towards those attending the youth weeks and can be considered the "post" marketing period.

Questionnaire

The questionnaire was designed by BokSmart to determine the players' and coaches' knowledge, behaviour and awareness of the *Safe Six* injury prevention programme. The BokSmart *Safe Six* is targeted at the coach and therefore the questionnaire (supplementary material I) assesses knowledge (of the BokSmart *Safe Six*) and its transfer to behaviour (reported usage of the BokSmart *Safe Six*) of the coaches, as well as the barriers and facilitators in this process. The questionnaire also assesses the fidelity of knowledge by requiring the participants to correctly name the exercises included in the BokSmart *Safe Six* programme. Following this, the BokSmart coach-targeted approach would assume that this knowledge of the programme would transfer from the coach to the player, and therefore, the questionnaire also assesses the knowledge and behaviour of the players regarding the BokSmart *Safe Six*.

Statistics

Descriptive statistics were performed on the tournaments, the participants, their roles and their responses. Logistic regression was performed to determine an adjusted odds ratio (aOR,

with 95% CIs) (adjusting for team role and year) on various binary outcomes (yes or no). All analyses were performed using IBM SPSS Statistics 23 (2015). Statistical significance was accepted when the $p<0.05$.

Results

Over the three years of data collection a total of 4,502 participants completed the questionnaire from six different tournaments in three consecutive years. Of the participants, 92% were players, and the rest were coaches or of unknown role (Table 1).

Table 1: The team roles of participants who completed the questionnaire (n=4502).

Team Role	**2014**	**2015**	**2016**	***Total***
Coach	27	52	33	*112*
Player	1351	1715	1070	*4136*
Unknown	136	80	38	*254*
Total	**1514**	**1847**	**1141**	***4502***

For players, the awareness of the *Safe Six* increased significantly in 2015 (1.74 times [1.49; 2.04]) and in 2016 (1.54 times [1.29; 1.84]) compared to 2014 (Table 2). Similarly, for coaches, there was a 3.55 times [1.23; 9.99] increase in 2015 and a 10.11 times [2.43; 42.08] increase in 2016 compared to 2014. However, the difference between 2015 and 2016 for both coaches and players was not significant.

Table 2: Responses to the question "Have you ever heard of the BokSmart Safe Six?" (n=4050, unknown role=245, blank=207).

	2014		**2015**		**2016**		***Total***	
Team Role	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	***No***	***Yes***
Coach n (%)	13 (52)	12 (48)	11 (23)	36 (77)	3 (10)	28 (90)	*27 (26)*	*76 (74)*
Player n (%)	946 (73)	341 (27)	1002 (62)	627 (38)	663 (64)	368 (36)	*2611 (66)*	*1336 (34)*
Total	**959 (73)**	**353 (27)**	**1013 (60)**	**663 (40)**	**666 (63)**	**396 (37)**	**2638 (65)**	**1412 (35)**

Furthermore, in 2015 players were 4.94 [2.78; 8.80] times more likely to be aware of the *Safe Six* if their respective coaches were aware of the programme (Table 3).

Table 3: The players' responses related to what their respective coaches answered to the question "Have you ever heard of the BokSmart Safe Six?" during 2015 (number of coaches = 47).

Coaches' Response	**Players' Response % (n)**		
	No	**Yes**	***Total***
No	20 (123)	2 (11)	*22 (134)*
Yes	46 (278)	32 (190)	*78 (468)*
Total	**66 (401)**	**34 (201)**	***100 (602)***

SARU (2014), provincial unions (2015) and social media/news (2016) were the largest sources of information of the *Safe Six* over the years for coaches (Figure 1). For players, the largest source of information regarding the *Safe Six* was through coaches, social media/news was the second largest and the provincial unions were also large contributors to the dissemination of knowledge.

The overall finding was that the players had a poor ability to name the exercises. Multiple participants could name some of the six exercises, but not all of them, and different combinations of the exercises (Table 4).

Table 4: The number of correct answers when the participants were asked to list as many of the BokSmart Safe Six exercises as they could remember in 2015 only.

Exercise	**Coach**	**Players**	***Total***
Six Meter Shuttle Run	22	321	*343*
Six Point Lunge	19	294	*313*
Buttsmart Six	14	257	*271*
Six-on-a-Side Push Up	16	247	*263*
Six Bok Lunge	18	223	*241*
Six Dynamic Reaches	17	139	*156*

In 2015 the reported usage of the *Safe Six* exercises was significantly higher for players than that of 2014 (aOR = 1.75 [1.36; 2.26]), but in 2016 there was no significant change compared to 2014 (Table 5). For coaches, the usage was significantly higher in 2015, with a 4.14 times [1.15; 14.92] increase, however in 2016 there was no significant change when compared to 2014. If a participant had answered "no" to "have they ever heard of the BokSmart Safe Six" they were screened to not be included in this question, however if they left that question blank, they could be included.

Table 5: Participants' responses to the question "In the last 6-8 weeks have you ever used the BokSmart Safe Six exercises?"(n=1,599, blank=48).

	2014		**2015**		**2016**		***Total***	
Team Role	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	***No***	***Yes***
Coach n (%)	8 (50)	8 (50)	7 (19)	29 (81)	6 (21)	22 (79)	*21 (26)*	*59 (74)*
Player n (%)	146 (43)	195 (57)	224 (32)	466 (68)	233 (53)	207 (47)	*603 (41)*	*868 (59)*
Total n (%)	154 (43)	203 (57)	231 (32)	495 (68)	239 (51)	229 (49)	*624 (40)*	*927 (60)*

The largest number of participants reported using the Safe Six because it was "part of their team warm-up" (over all the years) (Figure 2).

Discussion

Overall there were significant changes in the awareness and knowledge of the coaches' and players' of the BokSmart *Safe Six* injury prevention programme. Furthermore, there was a significant relationship between the knowledge and awareness of coaches and their respective players. This finding supports BokSmart's coach-targeted approach.

Awareness of the *Safe Six* increased in 2015 and 2016 compared to 2014, in coaches and players following the targeted marketing period. The coaches' knowledge and awareness of the *Safe Six* was significantly higher than that of the players', which was to be expected because BokSmart as a whole and specifically the *Safe Six* is a coach-targeted programme.[7] Furthermore, when comparing the coaches' knowledge and awareness to their respective players' knowledge and awareness, there was a significant relationship in the marketing year, indicating that the coach-driven approach was effective in knowledge transfer to the players. Furthermore, when considering the reported use of the exercises, in 2016 more than half of the players reported not using the exercises, whereas the majority of coaches reported that they did use the exercises. Whilst the question might over-estimate the implementation of the exercises, either the coaches are showing social desirability bias or the knowledge transfer from coach to player appears to have decreased. If it is the latter, at least the exercises are still being implemented. This relationship, and the consequences of this relationship has been illustrated in other studies in rugby. In New Zealand, RugbySmart is a coach-targeted programme, which has been associated with an increase in injury preventing behaviours in players.[8] In South Africa, the BokSmart programme as a whole has also been associated with positive changes in injury prevention behaviours in the players.[10] Other more specific exercise-based injury prevention programmes have also been coach-targeted, with their results indicating a preventive effect (in certain areas, not overall injuries) for the players.[14, 15] These programmes indicate that coach-targeted programmes have the desired effect on the players they are trying to reach.

However, when further analysing the fidelity of knowledge of the coaches and players of the *Safe Six*, their ability to name the exercises was poor, compared to the total number of participants. Therefore, if the *Safe Six* is a programme important to BokSmart, and is potentially effective in preventing injuries,[13] it is suggested that BokSmart continues to perform the marketing measures on an annual basis (more than just incorporated into the current BokSmart biennial courses)[7] to reach the target audiences and to increase the use of the programme.

As mentioned above, the *Safe Six* programme was designed as an injury prevention programme, but exploring the arguments as to why players and coaches implement the exercises is important to understand. The explanations for use of the *Safe Six* programme were predominantly for the warm-up in both the players and coaches, however, the second most popular explanation for players was injury prevention and for coaches was to improve performance. The programme was designed to be incorporated into the warm-up as an injury prevention programme, and therefore is being used as intended. However, there could also be a "misconception" between coaches that the *Safe Six* is a performance enhancement

programme, instead of an injury prevention programme. It must be noted that a significant number of both the coaches and players perceived the *Safe Six* to be easy to use (which was BokSmart's goal when designing the programme), which therefore did not hamper their experiences regarding the programme.

The source of information varied between coaches and players. The coaches reported receiving most of their information from social media/news. Coaches received communication from their respective provincial unions who are governed by SARU, and therefore this relationship was expected. Social media/news were especially targeted in the marketing period using mostly the Twitter and Facebook BokSmart accounts (2996 and 4065 followers respectively) (April 2017). For the players, most heard of the *Safe Six* from their coaches. The next popular source of hearing about the programme was from social media/news. This raises an interesting method of communicating for injury prevention awareness. The method was free and proved effective in reaching both the coaches and players. Social media and phone applications have become a new form of implementation for injury prevention programmes.[16, 17] In a review of phone-based injury prevention applications there were eighteen applications which claimed to have sports or health benefits. [16] Such findings indicate a shift towards the technology-based form of injury prevention methods. Whilst these applications may not all have been based on scientific principles, they still attract attention.

While technology-based reach can high, full utilization may be low. For example, an application focused on reducing ankle sprains had a low compliance once downloaded.[17] Therefore targeted efforts are required to ensure that the programme is used appropriately.[17] This principle could also be applied to the *Safe Six* where the reach and usage increased during the marketing period (possibly because of the social media exposure), and then decreased post-marketing. This is important knowledge for BokSmart and how they continue to disseminate knowledge regarding the *Safe Six* and future initiatives.

Limitations

This was a cross-sectional study with self-reported knowledge, usage and exposure. Therefore the results must be interpreted in this context. 44% of players could not be linked to a coach to determine the player/coach knowledge transfer, and this must be considered when interpreting those results. It must be noted that the percentage of repeat players completing the questionnaire in subsequent years is assumed to be minimal (as with all studies using the SARU youth week rugby tournaments as the cohort), however the coaches have never been assessed and there could be more repeat participants.[18-22]

Conclusion

The knowledge and awareness of the BokSmart *Safe Six* of both players and coaches increased in 2015 and 2016 (compared to 2014) since the launch of the programme, however, did slightly decrease during the post-marketing period. The coaches reported receiving their

information regarding the *Safe Six* from the Unions/SARU and social media/news. The information for the players, came from the coaches and social media/news. Reported usage of the programme increased in 2015 (i.e. the marketing period), but decreased to the pre-marketing levels in 2016. Finally the reasons for using the programme were predominantly for the warm-up, injury prevention and for performance improvements. The information gathered in this study will help with designing targeted marketing for future programmes and for further promotion of the BokSmart *Safe Six*. It also provides insight into the perceptions of the coaches and players regarding the *Safe Six* and therefore allows for BokSmart to make adjustments accordingly.

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Contributors:

NS was granted access to the data and was involved in conceptualising the manuscript; she also conducted statistical analyses and wrote the initial drafts of the manuscript. JB and EV were also involved in the statistical analyses. All authors (EV, ML, WvM and JB) were involved in conceptualising and editing drafts of the paper, in the order that they appear on the author list.

Figure 1a): Players' responses to the question "How did you come to hear about the BokSmart Safe Six?" (participants could choose multiple options). b) Coaches' responses to the question "How did you come to hear about the BokSmart Safe Six?" (participants could choose multiple options).

Figure 2a): Players' who claimed to use the exercises, these are their responses to the question "Why did you use the BokSmart Safe Six exercises?" (participants could tick multiple options). b) Coaches' who claimed to use the exercises, these are their responses to the question "Why did you use the BokSmart Safe Six exercises?" (participants could tick multiple options).

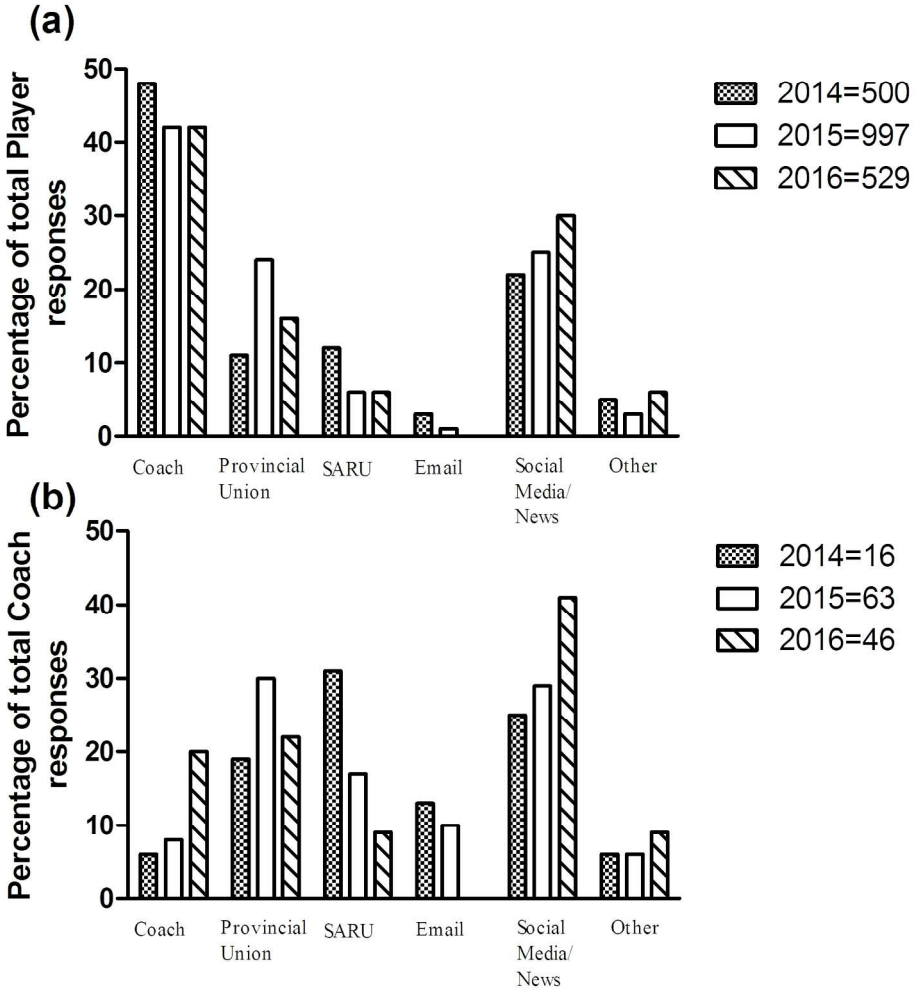

Figure 1a): Players' responses to the question "How did you come to hear about the BokSmart Safe Six?" (participants could choose multiple options). b) Coaches' responses to the question "How did you come to hear about the BokSmart Safe Six?" (participants could choose multiple options).

184x194mm (300 x 300 DPI)

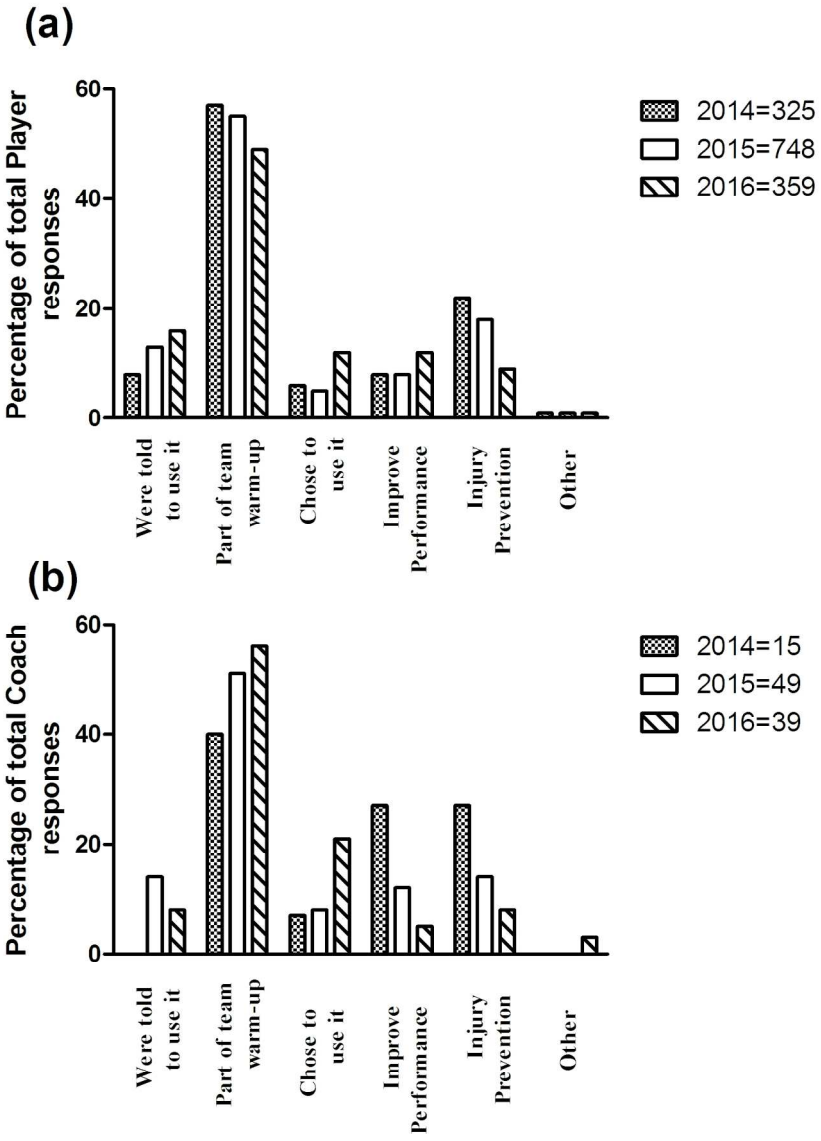

Figure 2a): Players' who claimed to use the exercises, these are their responses to the question "Why did you use the BokSmart Safe Six exercises?" (participants could tick multiple options). b) Coaches' who claimed to use the exercises, these are their responses to the question "Why did you use the BokSmart Safe Six exercises?" (participants could tick multiple options).

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SARU MEDICAL DEPARTMENT SURVEY 2016

SARU YOUTH WEEK TOURNAMENTS

☐U13 ☐U16 ☐LSEN ☐U18 Academy Week ☐U18 Craven Week

Team:	Province:

BokSmart Safe Six Questionnaire

Please tick the box or circle the number that best matches your answer. Where required also provide a very brief and to the point comment in the space provided! This questionnaire needs to be completed by ALL SARU Youth week players and team coaches.

Please indicate your current role by ticking or circling the correct box i.e. whether you are the team coach, manager or a player

☐ Team Coach ☐ Team Manager ☐ Player (☐ Forward ☐ Backline)

Questions

1. Have you ever heard of the 'BokSmart Safe Six'? YES ☐ NO ☐

*If you answered **YES** to **Question 1**, then please continue with **Question 2***
*If you answered **NO** to **Question 1**, then go to **Question 9***

2. How did you come to hear about the 'BokSmart Safe Six'? (tick all boxes that are applicable)

☐ Twitter ☐ Website ☐ Facebook ☐ Coach ☐ Provincial Union ☐ News article ☐ Poster ☐ Email ☐ SARU ☐ Other (specify below)

3. Can you name any of the 'BokSmart Safe Six' exercises? YES ☐ NO ☐

*If you answered **YES** to **Question 3**, then please list as many of these as you can remember in the space provided below*

1.	3.	5.
2.	4.	6.

4. In the last 6-8 weeks, have you ever used the 'BokSmart Safe Six' exercises? YES ☐ NO ☐

*If you answered **YES** to **Question 4**, then please continue with **Question 5** below.*
*If you answered **NO** to **Question 4**, then please go to **Question 8**.*

5. Why did you use the 'BokSmart Safe Six' exercises? (tick all boxes that are applicable)

☐ Were told to use it ☐ Part of team warm-up ☐ Chose to use it ☐ Improve performance ☐ Injury prevention ☐ Other (specify below)

6. For how many weeks and on average, how many times per week did you use the 'BokSmart Safe Six' exercises?

NUMBER OF WEEKS
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 or more weeks

AVERAGE DAYS PER WEEK
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7

7. Did you find the 'BokSmart Safe Six' exercises easy to perform? YES ☐ NO ☐

8. Why did you NOT use the 'BokSmart Safe Six' exercises?

9. Would you be interested in knowing more about the 'BokSmart Safe Six'? YES ☐ NO ☐

THANK YOU FOR YOUR HELP

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

Pg Number		Item No	Recommendation
1	**Title and abstract**	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
3			(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
	Introduction		
5	Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
5	Objectives	3	State specific objectives, including any prespecified hypotheses
	Methods		
5-6	Study design	4	Present key elements of study design early in the paper
5-6	Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
5-6	Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants
6	Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
6	Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
	Bias	9	Describe any efforts to address potential sources of bias
5	Study size	10	Explain how the study size was arrived at
	Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
6	Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding
			(*b*) Describe any methods used to examine subgroups and interactions
			(*c*) Explain how missing data were addressed
			(*d*) If applicable, describe analytical methods taking account of sampling strategy
			(*e*) Describe any sensitivity analyses
	Results		
7	Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
			(b) Give reasons for non-participation at each stage
			(c) Consider use of a flow diagram
7	Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
			(b) Indicate number of participants with missing data for each variable of interest
7-8	Outcome data	15*	Report numbers of outcome events or summary measures
7-8	Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included

			(*b*) Report category boundaries when continuous variables were categorized
			(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
	Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
	Discussion		
9-10	Key results	18	Summarise key results with reference to study objectives
10	Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
9-10	Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
9-10	Generalisability	21	Discuss the generalisability (external validity) of the study results
	Other information		
2	Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.