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## Effectiveness and implementation of the BokSmart Safe Six injury prevention programme

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2019

### **document version**

Publisher's PDF, also known as Version of record

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### **citation for published version (APA)**

Sewry, N. A. (2019). *Effectiveness and implementation of the BokSmart Safe Six injury prevention programme*. [PhD-Thesis - Research and graduation internal, Vrije Universiteit Amsterdam].

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## ACKNOWLEDGEMENTS

Many people ask me the question “So, how many years of PhD has been it now? The truth is, I think they often forget it is more than just the three years you register for a PhD, it’s your whole education that leads up to that, resulting in a large group of people I want to thank in getting me to where I am today.

Firstly, to the **Desmond Tutu Doctoral Programme, National Research Foundation** and the **South Africa Vrije Universiteit Strategic Alliance (SAVUSA)** thank you for affording me the opportunity to complete a joint PhD with VUmc.

To all my friends (school, university and other) for the constant support and questions regarding how the PhD was going, even when you never really knew what was going on, I have always appreciated the interest in my studies.

To the UCT rugby club, Ikeys, the times I have had with the management of the U20 team, have been unforgettable. The lessons I have learned from **Tom, Laura, Craig, Dave** and **Josh** (the best management team I’ve ever worked with) will stick with me forever. Tom, you led the team with a spirit unmatched, and taught me so much about myself and what I am capable of, and I thank you for this. #ABW

To the support staff at ESSM: **Ayesha, Lesa, Ashleen, Trevino** and **Nezaam**, you all make everything involved with studying at ESSM that much simpler.

To all the friends I made in The Netherlands: **Joske, Femke, Saulo, Caroline, Roland, Anne, Saskia, Ingrid, Nici, Stefan**. The lunch dates, SLH weekend away trip, SLH drinks and teaching me the Dutch ways of Sinterklaas and all things Dutch, it has been a great education in international living.

The completion of the cRCT was a huge undertaking (one that changed in day due to unforeseen circumstances), and therefore a huge thank you must go to all involved. To all the testers who worked for the project during those 18 weeks, you will never know how you saved my PhD by dedicating your afternoons to testing schools across the province. To the schools and coaches involved, thank you for your cooperation and enthusiasm with the project. For the other

chapters, thank you to the coaches and players who completed questionnaires and agreed to share their injury data with SA Rugby and my project. To the data collectors and medical staff at the youth weeks, thank you for your effort and brilliant data recording.

Thanks must also go to some special people at ESSM. I have been at ESSM for six years now and some very good friends have been made. To all the friends and colleagues from both ESSM and SSISA over the years, thank you for your friendship and good times. Then, to two very good friends of mine: **Sam** and **Marelise**. You two have been my pillars throughout this journey, and I cannot wait to see you two hand-in. Marelise, having someone go through the exact experiences I was, was the best. You were the one I could always call from Amsterdam if I was having a rough day, because I knew you would understand. Thank you both for everything along the way, I would not be here without your support throughout the years.

Now for the supervisors, I was lucky enough to have four supervisors (Mike, Willem, Evert and James), as well as two advisors (Clint and Wayne) and Jos who assisted on a paper.

**Jos** – thank you for your assistance in the statistical side, you added much value to our paper and taught me lots.

**Clint and Wayne** – SA Rugby and BokSmart have played a large role in my time at ESSM. Clint and Wayne are the reasons I have been able to complete this PhD. Clint, you have provided me with incredible opportunities such as working at the World Sevens Series in Port Elizabeth, whilst Wayne, I have learnt so much about research and implementing it from a stakeholders perspective. The two of you make a great team, and I am honoured to have been a part of that team. The access to the data, and the questions we have asked along the way through this PhD are largely owed to the both of you. My passion had always been for rugby, but working with both of you have made me realise just how big an impact research can make in rugby and how much further we still have to go in the area. Thank you for trusting me with this project Wayne, I know how much you have invested into the *Safe Six* and I have thoroughly enjoyed working with you.

**Mike** – my supervisor since I arrived in 2012, you have made me into the researcher I am today. You fought hard to get me onto the Desmond Tutu bursary, to ensure we had the funding to complete the cRCT, and never were these issues too big or small for you to solve. I told you from the moment I arrived at ESSM that I wanted to work in rugby, and the first thing you did was introduce me to Clint. You managed to get me extra work with SA Rugby and foster a relationship with BokSmart and SA Rugby for the future. Mike, you have helped me get to where I am today, and I could not have asked for a better supervisor throughout my time in Cape Town.

**Willem** – you are the epitome of an accomplished researcher, and having you as a supervisor has been an honour. Thank you for all the effort you went to get me onto the bursary, it has been great fun being able to travel and learn from international researchers. Thank you for being the supervisor you are and teaching me about enjoying life to the fullest!

**Evert** – you have been an incredible source of reason with every step in this process. It's been great fun along the way: mountain biking, picnics at Cape Point Vineyards, SLH weekend away in The Netherlands. Thanks for helping me produce the best quality research I could.

**James** – three years ago you started a post-doc and landed up with two PhD students. Not sure if that was by choice, but regardless, you have been a remarkable supervisor with the most entertaining comments on drafts. I will never forget when you commented on my paper asking if I was writing for YOU magazine? You managed to bring humour to shocking writing, and encouragement when it felt like dire straits. Trips to the Creamery definitely made us gain weight, but was the best tradition ever instilled, and I will definitely be joining in celebrating future accomplishments. You have taught me about academics, research, life, and honestly, we have had a jol! Thank you for everything over the three years, it has been a privilege to be your student.

On a more personal note, **Jarred**, you have been by my side throughout my MSc and PhD. You might have been far away during the last 4 years, but you have been my support throughout it all. Thank you for understanding why I needed to do this and stay in Cape Town. I look forward to us finally moving to

the same city and seeing where it takes us. Thank you for your patience, we are finally at the finish line!

Finally, to the three people who have been there since the beginning of it all: **Chris, Mom** and **Dad**. First off to Chris, thanks for sort of knowing what I have been doing all this time, something along the lines of “Dr Rugby” as you like to refer to it as, it has been great having you be a part of it, always your little sister! To Mom and Dad, thank you for making this all possible, you have financially supported me all these years and I will be forever grateful. Dad, you are the reason I always knew I wanted to do my PhD, you have been the one who has shaped me into the academic I am. You prepared me for this my whole life without knowing it, and I love that we have that in common and discussing academic dilemmas with you is my favourite pastime. Mom, you have been my voice of reason all these years when things have gotten too much, you have always been there for me, and if I can ever be half the teacher you are, I will know I have succeeded.

**Personal Funding for this PhD was provided by:**

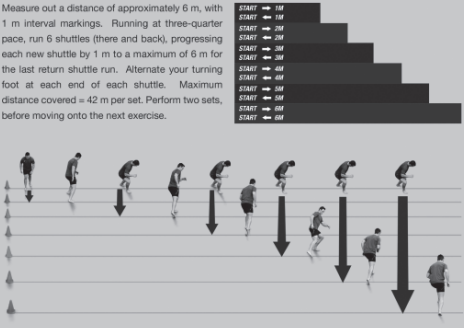

- National Research Foundation, through their Desmond Tutu Doctoral Training Programme and the South Africa Vrije Universiteit Strategic Alliance (SAVUSA)
- University of Cape Town
- Oppenheimer Memorial Trust
- Zuid-Afrika Huis Studiefonds

## ABOUT THE AUTHOR

I (Nicola Ann Sewry) was born in Grahamstown, South Africa in April 1991, and lived in the small town for the next 21 years. I attended Rhodes University for my undergraduate Bachelor of Sciences degree in Biochemistry and Human Kinetics and Ergonomics. My love for rugby began in the small town, attending the local school derby games with my father, and watching numerous SuperRugby matches on television. I finally moved to Cape Town in 2012 to begin my BSc (Med) Hons in Exercise Science (Biokinetics). My rugby research trajectory began when Prof Mike Lambert introduced me to Clint Readhead in 2012, and since then, working with SARU has been a dream come true. I began working with local club rugby teams from 2013, including the UCT Ikeys and Villagers Rugby Club, which contributed to much data collection along the way towards my MSc in Exercise Science in 2013-2014, and fun times learning about strength and conditioning and medical support. At the end of 2014, Prof Lambert approached me about the opportunity to do my PhD with the BokSmart *Safe Six* programme. I had always planned on doing my PhD, and was hoping it could remain in the rugby field and therefore, this project became a reality. The project evolved with Dr Wayne Viljoen, Clint Readhead, and finally, the VUmc collaboration with Prof Willem van Mechelen and Prof Evert Verhagen became a possibility.

# APPENDICES

## Appendix I

Exercise	Aim of Exercise	Illustration
<p><b>Shuttle runs:</b> Measure out a distance of approximately 6 m with 1 m interval markings. Running at three-quarter pace, run six shuttles (there and back), progressing each new shuttle by 1 m to a maximum of 6 m for the last return shuttle alternate your turning foot at each end of each shuttle. Maximum distance covered = 42 m per set. Perform two sets.</p>	<p>Hip, knee and ankle stability</p>	<p><b>1. THE 'SIX'-METER SHUTTLE-RUN</b> <i>(BENEFITS FOR DYNAMIC HIP, ANKLE AND KNEE STABILITY)</i></p> <p>Measure out a distance of approximately 6 m, with 1 m interval markings. Running at three-quarter pace, run 6 shuttles (there and back), progressing each new shuttle by 1 m to a maximum of 6 m for the last return shuttle run. Alternate your turning foot at each end of each shuttle. Maximum distance covered = 42 m per set. Perform two sets, before moving onto the next exercise.</p> 
<p><b>Multi-directional lunges:</b> Starting in the middle, with hands on hips, and leading with your left foot, lunge towards the L1 position, drop down and hold this position briefly, then push back to the start. Next, lunge to the L2 position drop down and hold briefly then push back. Continue this pattern up to the L6 position with the left foot leading. Keep shoulders and hips square to the front. Once completed with the left foot, then lead with the right foot, and follow the R1 – R6 movement pattern. Keep the back foot or non-leading foot planted or fixed throughout.</p>	<p>Hip, pelvis, knee and ankle strength and stability</p>	<p><b>2. THE 'SIX'-POINT LUNGE</b> <i>(BENEFITS FOR HIP, PELVIS, KNEE AND ANKLE, STRENGTH AND STABILITY)</i></p> <p>Starting in the middle, with hands on hips, and leading with your left foot, lunge towards the L1 position, drop down and hold this position briefly, then push back to the start. Next, lunge to the L2 position, drop down, hold briefly then push back. Continue this pattern up to the L6 position with the left foot leading. Keep shoulders and hips square to the front. Once completed with the left foot, then lead with the right foot, and follow the R1 – R6 movement pattern. Keep the back foot or non-leading foot planted or fixed throughout</p> <p>LEFT LEG LEAD (L1-L2-L3-L4-L5-L6)      RIGHT LEG LEAD (R1-R2-R3-R4-R5-R6)</p> 



**Nordic hamstring curls:**

Get into the kneeling position with arms folded across the chest. Have a partner hold your lower legs in place by applying downward pressure to your ankles. Tighten your glutes and hamstrings and do not bend forward in the hips. Keeping your back stiff and straight throughout, gradually lean forward and resist the falling down movement as long as possible. When you can no longer resist your fall, catch yourself and fall down into a press-up position. Push yourself back up to where you can tighten the hamstrings and glutes to actively lift and bring yourself back to the start position. Repeat six times.

Glutes, lower back, hamstrings and core strength and stability

**3. THE BUTT-SMART 'SIX'**

(BENEFITS FOR GLUTES, LOWER BACK, HAMSTRINGS AND CORE, STRENGTH AND STABILITY)

Get into a kneeling position with arms folded across the chest. Have a partner hold your lower legs in place by applying downward pressure onto your ankles. Tighten your Glutes and Hamstrings and do not bend forward in the hips. Keeping your back stiff and straight throughout, gradually lean forward and resist the falling down movement as long as possible. When you can no longer resist your fall, catch yourself, and fall down into a press-up position. Push yourself back up to where you can tighten the Hamstrings and Glutes to actively lift and bring yourself back to the start position. Repeat six times.

**Push-up with rotation:**

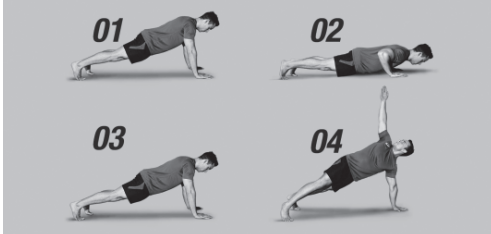
Complete a push-up with the hands placed slightly wider than the shoulders. Maintain a straight body without arching or bending in the lower back. At the end of the push-up, balance on one arm, twist and rotate the upper-body and leading arm slowly away from the supported side with the hand pointing towards the sky. Alternate between left and right sides. Perform twelve reps, six on each side.

Shoulder, spine control and core strength and stability

**4. THE 'SIX'-ON-A-SIDE PUSH-UP AND TWIST**

(BENEFITS FOR SHOULDER, SPINAL CONTROL AND CORE, STRENGTH AND STABILITY)

Complete a push-up with the hands placed slightly wider than the shoulders. Maintain a straight body without arching or bending in the lower back. At the end of the push-up, balance on one arm, twist and rotate the upper-body and leading arm slowly away from the supported side with the hand pointing towards the sky. Alternate between left and right sides. Perform 12 reps, 6 on each side.

**Lunge (with knee lift):**

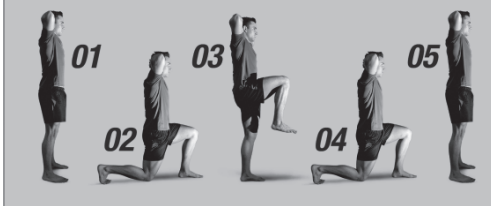
Stand upright with the hands held behind the head. With your hips level and back straight, lunge forward with the left leg. At the end of the lunge, push up with the front left leg, and bring your back right leg through while lifting the right knee. Hold this position briefly and with control, reverse the movement back to the start. Alternate between left and right leading legs. Perform twelve reps, six on each leg.

Hip, pelvis, knee and ankle strength and stability

**5. THE 'SIX'-BOK LUNGE**

(BENEFITS FOR HIP, PELVIS, KNEE AND ANKLE, STRENGTH AND STABILITY)

Stand upright with the hands held behind the head. With your hips level and back straight, lunge forward with the left leg. At the end of the lunge, push up with the front left leg, and bring your back right leg through while lifting the right knee. Hold this position briefly and with control, reverse the movement back to the start. Alternate between left and right leading legs. Perform 12 reps, 6 on each leg.




**Dynamic reaches:**

Balance on the left leg while keeping this left leg slightly bent at the knee. Lean slowly forward, reaching as far as you can with both arms and not losing balance, chest facing the ground at all times. At the same time as leaning forward, lift the back right leg to form a straight line with the upper body, while keeping the hips square to the ground. Hold the position for six seconds. Alternate left and right legs between reps. Perform six reps, three on each side.

Shoulder, hip, spine, pelvis, lower back, knee and ankle stability, balance and control

**6. 'SIX' DYNAMIC REACHES**  
*(BENEFITS FOR SHOULDER, HIP, SPINE, PELVIS, LOWER BACK, KNEE AND ANKLE, STABILITY, BALANCE AND CONTROL.)*

Balance on the left leg while keeping this left leg slightly bent at the knee. Lean slowly forward, reaching as far as you can with both arms and not losing balance; chest facing the ground at all times. At the same time as leaning forward, lift the back right leg up to form a straight line with the upper body, while keeping the hips square to the ground. Hold this position for six seconds. Alternate left and right legs between reps. Perform 6 reps, 3 on each side.



Appendix II

**BokSmart**  
National Rugby Safety Programme  
YOUTH WEEKS INJURY SURVEILLANCE DATA CAPTURE FORM



1. PERSONAL DETAILS

Surname:	Date of birth (dd/mm/yyyy):
Full names:	Date of injury (dd/mm/yyyy):
Known as (nickname):	I.D. Number:
	Gender:
Height (cm):	Weight (kg):
	Age (yrs/months):
Club/school/team name:	
Provincial Union:	Estimated Date of Return from injury (dd/mm/yyyy):
Do you have medical insurance?	Number of days missed due to injury:
Did the player consult with a medical professional regarding their injury?	
<p><i>I understand that the information obtained from the injury report will be treated confidentially with my right to privacy assured. I also understand that should the information be used for a statistical analysis or a scientific report, my identity will not be disclosed in the report.</i></p>	
Player signature	Date:

Appendices

Team	Age Group	Pitch conditions	Weather conditions*	Mechanism of injury	Type of injury
School Club	Junior (<U13)	Option1: Soft Firm Hard	Hot Dry Light rain Heavy rain Overcast Cold Windy Other	Acceleration Bitten Cleaned Cleaning Collapsed scrum Collision Deceleration Double tackle (high) Double tackle (regulation)	Concussion Spinal cord injury Broken bone/fracture Joint injury Ligament sprain Muscle strain Muscle cramp Tendon injury Bruise/contusion Skin abrasion Laceration Other injury Unsure/do not know
U16 Elite squad	U13	Option2: Very hard	Body location Head/face (elaborate)	Elbowed Gouged Head butt Jumping Kicked	New injury Old or previous injury Protective gear*
U17 Elite squad	U15	Option3: Uneven	Neck/cervical Sternum/ribs	Kneed Landing Lunge Not supported	Mouth guard Shoulder pads Headgear Shin-pads Strapping Other
U18 Elite squad	U16	Option4: Slippery	Upper back Stomach Low back Sacrum/pelvis	Popped scrum Punched Rucked Scrum engagement Sidestep	Injury definition
U19 Elite squad	U17	Option5: Even	Shoulder/collarbone Upper arm	Other	Time loss injury
U20 Elite squad	U18	Option6: Muddy	Forearm Wrist Hand/finger/thumb Hip/ groin	Slipped	Medical attention injury
U21 Elite squad	U19	Option7: Slippery	Front of thigh	Tackled from behind (high) Tackled from behind (regulation)	Estimated severity
U22 Elite squad	U20	Option8: Solid footing	Back of thigh Knee Lower leg Ankle	Tackled front-on (high) Tackled side-on (regulation) Tackled side-on (high) Tackling from behind (high) Tackling from behind (regulation)	Slight (0-1 days missed) Minimal (2-3 days missed) Mild (4-7 days missed) Moderate (8-28 days missed) Severe (>28 days missed)
U23 Elite squad	U21	Option9: Warm-up	Injury event	Tackling front-on (high) Tackling side-on (regulation) Tackling side-on (high)	Career-ending Non-fatal catastrophic Fatal
SA U18 squad	U22	Option10: Cool-down	Scrum Lineout Open play Tackle Ball Carry Ruck	Was the injury a result of foul play? Yes/No Elaborate:	Did the referee take any action? Yes/No
SA U21 squad	U23	Option11: Match	Stage of season		
SA U23 squad	U24	Option12: Weight training			
Provincial amateur squad	U25	Option13: Fitness conditioning			
SA Amateur squad	U26	Option14: Rugby skills (non-contact)			
Emerging Boks	U27	Option15: Rugby skills (semi-contact)			
SA (A) squad	U28	Option16: Rugby skills (full-contact)			
Springboks	U29	Option17: Other			
Emerging Women's 7's squad	U30	Option18: Time in match when injury occurred			
Women's provincial U20 squad	U31	Option19: Warm-up			
Women's provincial seniors	U32	Option20: 1st Quarter			
Women's Bok squad	U33	Option21: 2nd Quarter			
Provincial 7's squad	U34	Option22: 3rd Quarter			
Emerging 7's squad	U35	Option23: 4th Quarter			
National 7's squad	U36	Option24: Cool-down			
Super League A	U37	Option25: Post-injury decision			
Super League B	U38	Option26: Continued			
Premier League A	U39	Option27: Discontinued, forced			
Premier League B	U40	Option28: Discontinued, precautionary			
Division 1	U41	Option29: Discontinued, blood			
Division 2	U42	Option30: Stage of season			
Division 3	U43	Option31: Off-season			
Division 4	U44	Option32: Pre-season			
Division 5	U45	Option33: In-season			
N/A	U46	Option34: Synthetic			
	U47	Option35: Sand			
	U48	Option36: Gravel			
	U49	Option37: Other			

## Appendix III



## SARU MEDICAL DEPARTMENT SURVEY 2014

### SARU YOUTH WEEK TOURNAMENTS

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'?

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. Are you using 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 are you using the 'BokSmart Safe Six' exercises?

6. How many times per week are you using the 'BokSmart Safe Six' exercises?

1  2  3  4  5  6  7

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

8. Why are you NOT using the 'BokSmart Safe Six' exercises?

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

Today's Date \_\_\_\_/\_\_\_\_/2014

THANK YOU FOR YOUR HELP

# A

## PHD PORTFOLIO

### VU University Medical Centre Amsterdam

PhD Student: Nicola Ann Sewry  
 PhD Period: January 2015 – March 2018  
 PhD Supervisors: Prof Willem van Mechelen (Amsterdam UMC)  
 Prof Mike Lambert (UCT)  
 Prof Evert Verhagen (Amsterdam UMC)  
 Dr James Brown (Stellenbosch University)

	Year	Workload (ECTS)
<b>Mandatory Courses</b>		
Research Integrity, Epigeum	2017	2
IOC World Congress on Injury and Illness Prevention	2017	2
<b>Elective Mandatory Courses</b>		
Clinical Epidemiology, University of Utrecht	2018	6
Rugby Research Journal Club, UCT	2016	1
Rugby Science Network Colloquia, UCT/Bath Univeristy	2015	2
APH Kick-Off Meeting, APH	2016	1
APH Annual Meeting, APH	2017	1
<b>Elective Courses</b>		
Supervision: Honours Student (Bea Du Toit), UCT	2016	2
Supervision: MPhil Physiotherapy Student (Jose Cox), UCT	2016 - 2018	3
Exercise Science and Sports Medicine Journal Club, UCT	2016	1
South African Sports Medicine Association Congress, SASMA	2015	2
Rugby Science Network Colloquia, Bath University	2016	1
Functional Movement Screening, Gray Cook	2016	3
Basic Life Support, St Johns	2016	1
First Aid Level 2, St Johns	2015	2