



'Football for Health'—a football-based health-promotion programme for children in South Africa: a parallel cohort study

Colin W Fuller,^{1,2} Astrid Junge,² Jeff DeCelles,³ James Donald,³ Ryan Jankelowitz,^{3,4} Jiri Dvorak²

¹Centre for Sports Medicine, University of Nottingham, Nottingham, UK

²FIFA-Medical Assessment and Research Centre, Zurich, Switzerland

³Grassroot Soccer Inc, Cape Town, South Africa

⁴University of Cape Town, Cape Town, South Africa

Correspondence to

Dr Colin W Fuller, Centre for Sports Medicine, University of Nottingham, Nottingham NG7 2UH, UK; colin.fuller@nottingham.ac.uk

Accepted 1 April 2010

ABSTRACT

Objectives To develop, implement and assess an interactive, football-based health education programme for children in South Africa.

Design Prospective cohort study with control group.

Setting Two schools in Khayelitsha township, South Africa.

Participants 370 children making up two intervention groups (Grade 6: 125; Grade 7: 131) and one control group (Grade 7: 114).

Intervention Eleven 90 min sessions, each divided into two 45 min halves of Play Football (football skills) and Play Fair (health issues), each session focused on one specific health risk factor.

Main outcome measures Health knowledge using a 20-item questionnaire; coaches' attitudes towards their training programme using a 10-item questionnaire and children's attitudes towards the health education programme using a six-item questionnaire.

Results Children in the Grade 7 intervention group showed significant ($p < 0.05$) increases in the proportion of correct responses for nine of the 20 health knowledge questions postintervention, and these increases were maintained at 3 months postintervention. The Grade 6 intervention group showed significant increases in the proportion of correct responses for 15 of the 20 health knowledge questions postintervention. The Grade 7 control group showed a significant increase in the proportion of correct responses to one of the 20 health knowledge questions post-Play Football sessions and nine of 20 questions post-Play Fair sessions. Over 90% of the children provided positive attitude responses to the health-education programme.

Conclusions The programme demonstrated that it was possible to implement a football-based health-education programme for children in Africa that achieved significant increases in health knowledge and that was also well received by participants.

INTRODUCTION

The World Health Organization¹ identified the major worldwide mortality risk factors as: high blood pressure and cholesterol; use of tobacco and alcohol; under- and overweight; low fruit and vegetable intake; physical inactivity; inadequate water and sanitation facilities; poor hygiene and unsafe sex. It has been estimated that, by 2020, preventable non-communicable diseases will be responsible for ~70% of deaths.¹ Moeti² summarised the difference between public perceptions and the reality of

this situation for low- and middle-income countries as 'heart disease, stroke, cancer, diabetes and other chronic diseases are often thought to be public health problems of significance only in high-income countries. In reality, only 20% of chronic disease deaths occur in high-income countries, while 80% occur in low- and middle-income countries' (p 2). Managing these health risks is complex because the specific risks affecting individual countries change with both time and the level of national development.³ While the prevalence of communicable diseases resulting from, for example, poor water supply and sewage treatment can often be reduced by improvements in the quality of a country's infrastructure, similar reductions for non-communicable diseases, such as obesity, cardiovascular disease and diabetes, can only be achieved through changes in individuals' health behaviours. Because¹ 'behavioural change first requires understanding' (p 103), the behaviour changes needed to achieve reductions in mortality from communicable and non-communicable diseases must be underpinned by improvements in the community's level of knowledge about the causes and prevention of these diseases. Nyamwaya⁴ suggested that effective interventions were those that prevented the spread of diseases through the development of appropriate knowledge, skills and attitudes towards health, while Dobbins *et al*⁵ suggested that long-term health gains would be achieved by developing routines during childhood that would endure through to adulthood. Although there is evidence that knowledge and behaviours developed during childhood are carried forward into adulthood,⁶ the World Health Organization¹ cautioned that, so far as making improvements in health knowledge was concerned, 'information on risks, risk factors and uncertainty are inherently difficult to communicate' (p 42).

A report by a United Nations Inter-agency Task Force⁷ concluded 'participation in sport has significant physical benefits, contributing to people's ability to lead long and healthy lives, improving well-being, extending life expectancy and reducing the likelihood of several major non-communicable diseases' (p 3). There is strong evidence⁸ for using exercise as a therapy for a wide range of diseases, such as hypertension, diabetes and heart disease. Although recommendations on the nature and level of the physical activity required to achieve health benefits vary,⁵ the



This paper is freely available online under the BMJ Journals unlocked scheme, see <http://bjsm.bmj.com/info/unlocked.dtl>

World Health Organization⁶ stated that for most people, many of the health benefits could be 'obtained through at least 30 min of cumulative moderate physical activity every day' (p 3). The United Nations Task Force⁷ identified additional benefits if the physical activity was undertaken in the form of sport, as participation in sport could increase levels of self-esteem, confidence, resilience, teamwork and discipline. The Task Force⁷ also concluded 'sport has a natural place in education, whether the approach used is formal, non-formal or informal' (p 8). Football is the most popular sport worldwide, so it is not surprising that many organisations have used football-based activities to raise awareness and address health problems around the world. However, these football-based activities have mainly focused on HIV/AIDS awareness, education and prevention,⁹⁻¹¹ and very few of the interventions¹² have been assessed for effectiveness.

The aims of this project were (1) to develop and implement an interactive, health education programme for children living in a township in Africa that contained information about the causes and prevention of communicable and non-communicable diseases; (2) to measure changes in children's health knowledge following implementation of the programme; and (3) to assess the acceptability of the programme by the participants.

METHODS

Overall, this was a 3-year project, of which the main element was a 10-month, cohort study with intervention and control groups, that delivered an 11-week football-based health education programme entitled 'Football for Health': timelines for each stage of the project are shown in figure 1. Interventions of this type require careful planning at all stages, and in this respect the guidance provided by the Medical Research Council¹³ was taken into account at the planning stage. The detailed development, implementation and evaluation aspects of the Football for Health programme followed the 10-stage process proposed by the World Health Organization¹⁴ for AIDS health promotion programmes. These stages are detailed in the following subsections.

Establishing goals

The primary goal was to raise awareness of the causes and prevention strategies for communicable and non-communicable diseases. The aim was to develop 11 health messages based on the risk factors identified by the World Health Organization¹ that could be presented to children in a football-based setting.

Initial assessment

Two focus groups comprising doctors, researchers and representatives of government and non-government organisations in Africa were held in Zurich during April and June 2007 to discuss which 11 health messages should be included in the programme and in which African country the intervention should be implemented. The focus groups confirmed the current relevance of the specific risk factors identified by the World Health Organization, but recommended adding to the list 'use of bed nets' to prevent the spread of malaria and dengue fever and 'respect for girls and women' to reduce the spread of sexual diseases. At this stage, a number of countries in Africa were identified as possible locations for the intervention.

Targeting audiences

Final selection of the setting for the intervention was based on a compromise between the prevalence of communicable and non-communicable diseases in the area; the availability of a local organisation with sufficient experience to deliver a football-based health education programme; access to a suitable group of men and women who were fluent in the local language, were familiar with local customs and practices, and could be trained as instructors/coaches for the programme. An additional consideration was the availability of schools that could support the intervention but that had not been involved in other health interventions (see box 1).

Reaching objectives and performance targets

Based on results from a pilot study of 24 Grade 7 children, it was assumed that 60% of children, on average, would provide the correct response to a health question before the intervention. In this case, a sample size of ~110 children would be

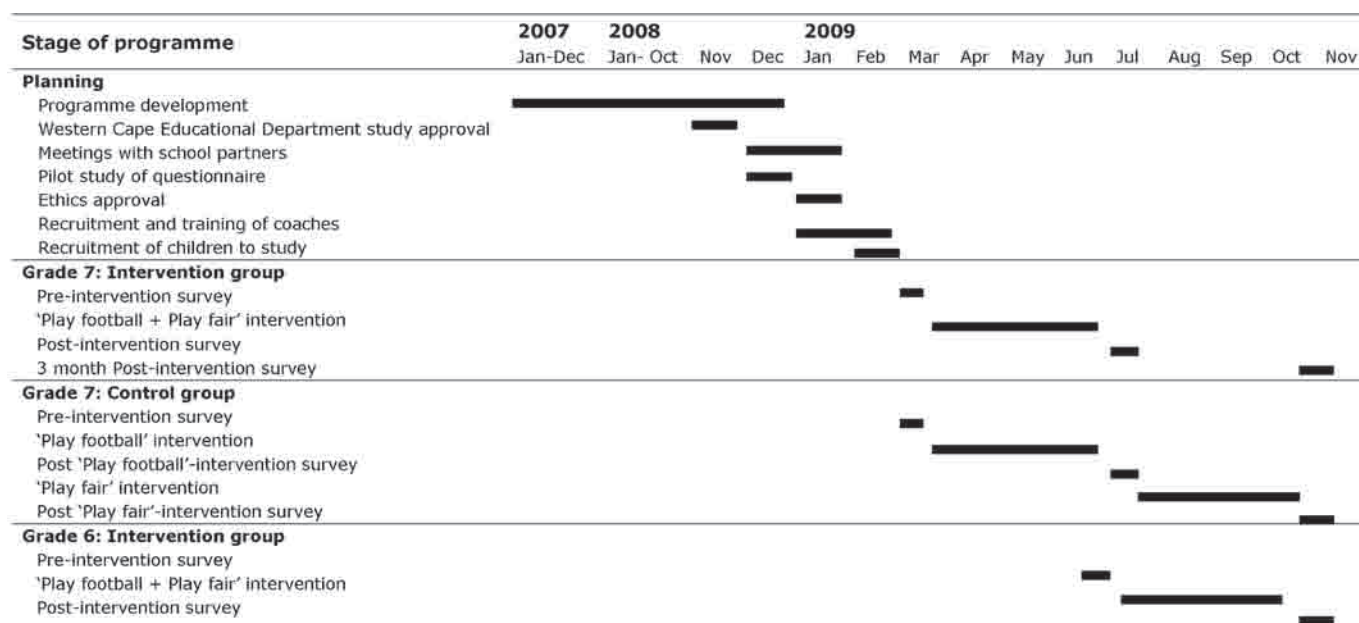


Figure 1 Timelines for the development and implementation of the Football for Health programme.

required to identify with 95% confidence and 90% power an increase in the proportion of correct responses to 80% after the intervention. Assuming an overall loss to follow-up of ~25%, the minimum initial sample size required in each group was ~150 children.

Developing strategies: messages and materials

The '11 for Health' messages were each framed and linked with a specific football skill (see table 1). Simple materials, such as footballs, cones, whistles, bed nets, were provided to support teaching during the sessions. A training manual entitled 'The 11 for Health—Coach's Guide' was prepared that provided detailed information about the implementation of each element of each session (see box 2).

Developing strategies: channels of communication, institutional networks and activities

Each of the 11 health messages was supported by an international footballer in the form of a short quotation linking the football skill and the health message. The Coach's Guide summarised the purpose of the programme and the coaches'

commitment to implementing the programme. FIFA's Medical Assessment and Research Centre (F-MARC) provided the overall strategy, direction and management of the Football for Health programme and Grassroot Soccer coaches implemented the programme on a day-to-day basis.

Support services

Twenty-three coaches (13 male; 10 female) were recruited to the programme from the local community. Ten female/male coach-pairs were randomly established, of which five pairs were randomly assigned to the intervention group and five to the control group; two of the remaining male coaches were assigned to the intervention group and one to the control group to act as standby coaches in the case of absence. If not required to cover for a missing coach, the standby coaches supported, on a rotating basis, one of the coach pairs in their group. Each coach-pair was randomly assigned to work with ~20 children (mixed boys and girls). The project team supported the coaches at all stages of the study (see box 3).

Box 1 Football for Health: programme setting

Two similar schools situated 4 km apart within Khayelitsha township of Cape Town, South Africa were identified and recruited to the programme prior to the start of the school academic year: both schools were situated within the same education authority and followed the same teaching curriculum. Grade 7 children (male and female) at both schools were recruited to the main part of the study and formed the intervention and control groups. One school was randomly assigned as the intervention and the other as the control group. In addition, Grade 6 children (male and female) at the school identified as the intervention group were subsequently recruited to undertake the Football for Health programme in a separate cohort. The Western Cape Education Department approved delivery of the programme during school time and the University of Cape Town, Health Sciences Faculty, Research Ethics Committee provided ethics approval prior to the start of the intervention. Parents or guardians of the children provided consent before the children were accepted onto the programme.

Box 2 Football for Health: programme structure

To mirror the game of football, each session lasted 90 min and comprised two 45 min halves. In the first half (Play Football), children were coached in a specific football skill, and in the second half (Play Fair), they were introduced to facts about one of the diseases/health conditions together with information about how to prevent the occurrence of the condition. The typical structures of these were:

- ▶ Play football: Short review of the previous week's home-based football assignment; undertake five injury prevention warm up exercises; assign a praise partner for each participant; provide instruction on a football skill; present the coming week's home-based football assignment.
- ▶ Play fair: Short review of the previous week's home-based health assignment; present facts about the session's health message; provide an interactive, football-based activity linked to the session's health message; present the coming week's home-based health assignment; praise partners comment on positive actions and attitudes exhibited by the children during the session.

Table 1 '11 for Health' messages and linked football skills

Session	Health message	Football skill	Risk factors
1	Play football (physical exercise)	Playing football	High blood pressure, cholesterol, body mass index, physical inactivity
2	Respect girls and women	Passing	Unsafe sex
3	Protect yourself from HIV	Heading	Unsafe sex
4	Avoid drugs and alcohol	Dribbling	Use of alcohol, tobacco
5	Use treated bed nets	Shielding	Malaria
6	Wash your hands	Defending	Poor sanitation and hygiene
7	Drink clean water	Trapping	Contaminated water supply
8	Eat a balanced diet	Building fitness	Under and overweight, inadequate fruit and vegetable intake
9	Vaccinate yourself and your family	Shooting	Inadequate health protection
10	Take your prescribed medication	Goalkeeping	Inadequate health protection
11	Fair play	Teamwork	Family and social support

Monitoring and evaluation

Individual coaches recorded the children's attendances at each session, while independent assessors, who were not involved in the programme implementation and were blind to which was the control and which was the intervention group, collected preintervention and postintervention data (see box 4).

Establishing a schedule and budget

All aspects of the intervention were implemented from February to November 2009 within a normal school academic year; this period covered three school terms. Budgets were developed for both the implementation and data-collection aspects of the programme. Figure 1 provides a summary flow chart showing the stages of the intervention.

Reassessment

Following an assessment of the objective and subjective outcomes of the programme, recommendations were made for the future implementation and evaluation of the Football for Health programme.

Box 3 Football for Health: coach training

Each coach received a copy of the Coach's Guide. The coaches assigned to the intervention group underwent a 5-day training course covering both the Play Football and Play Fair aspects of the programme before delivering the Play Football programme. The coaches assigned to the control group initially received a 2-day training course covering the Play Football aspects, but they subsequently received a further 3-day training course covering the Play Fair aspects after they had completed the Play Football sessions: these coaches then implemented the Play Fair sessions for the children in the control group. During this crossover stage in the control group, the coaches assigned to the Grade 7 intervention group undertook a further full implementation of the programme (Play Football+Play Fair) with a group of Grade 6 children from the same school.

RESULTS

The mean ages of the coaches working with the intervention and control groups were 27.2 years (SD 6.3; range 19–38) and 27.8 years (SD 8.4; range 19–46), respectively. The overall percentages of correct responses given to the 20 health-related questions by the coaches in the intervention and control groups before and after the coaches' training course are presented in table 2. The percentage of positive ('agree'+ 'strongly agree') responses and the mean rating scores (individual responses weighted on a scale of 1–5) provided by the coaches in the two groups to the training course assessment questionnaire are shown in table 3.

The demographic data and the questionnaire results reported for the children relate only to those children who completed all the appropriate questionnaires (see figure 2). The percentages of children retained in each arm of the study were: Intervention, Grade 7: 70.1% (over three stages); Control, Grade 7: 70.8% (over three stages); Intervention, Grade 6: 86.8% (over two stages). Figure 2 includes the number of valid questionnaires completed and the number of dropouts at each assessment stage. The number of valid questionnaires completed and included in the study did not relate directly to the actual numbers of children participating in the Football for Health programme, as some children attended the sessions but were absent on one or more occasion when questionnaires were administered, or the participant code numbers on second/third questionnaires could not be matched with codes used on previous questionnaires. Overall, the mean attendance levels during the '11 for Health' sessions were: Intervention, Grade 7:

Table 2 Percentage of correct responses to the 20 health-related questions given by the coaches before and after their Football for Health training programmes

Coach group	Percentage of correct responses (%)		Z test; p value
	Pretraining	Post-training*	
Control	71.7	70.9	0.719
Intervention	75.4	95.4	<0.001

*Post-training results relate to the 5-day training programme (Play Football+Play Fair) for the intervention group and the initial 2-day training programme (Play Football) for coaches in the control group.

Table 3 Coach assessment of the coaches' training course

Statement	Intervention group*		Control group*	
	Percentage positive responses	Score	Percentage positive responses	Score
Language used in the manual was easy to understand	100	4.4	73	3.9
Trainers' language on the course was easy to understand	90	4.5	82	4.1
Understood everything in the Football for Health manual	100	4.5	91	4.3
Trainer made it easy to understand the health messages	100	4.7	100	4.7
Trainer made it easy to teach the health messages	100	4.6	100	4.7
Training course was long enough	50	3.3	55	3.5
I was well prepared to implement the health messages	100	4.5	100	4.7
I was confident to implement the health messages	100	4.5	91	4.5
Overall rating of the training programme	100	4.9	100	4.6
Overall rating of the trainers	100	5.0	91	4.6
Mean value	94	4.5	88	4.4

A 'positive response' equates to a response of 'agree' or 'strongly agree.' 'Mean score' refers to the group's weighted mean response (five-point scale) to the statement.

*Post-training results relate to the 5-day training programme (Play Football+Play Fair) for the intervention group and the initial 2-day training programme (Play Football) for coaches in the control group.

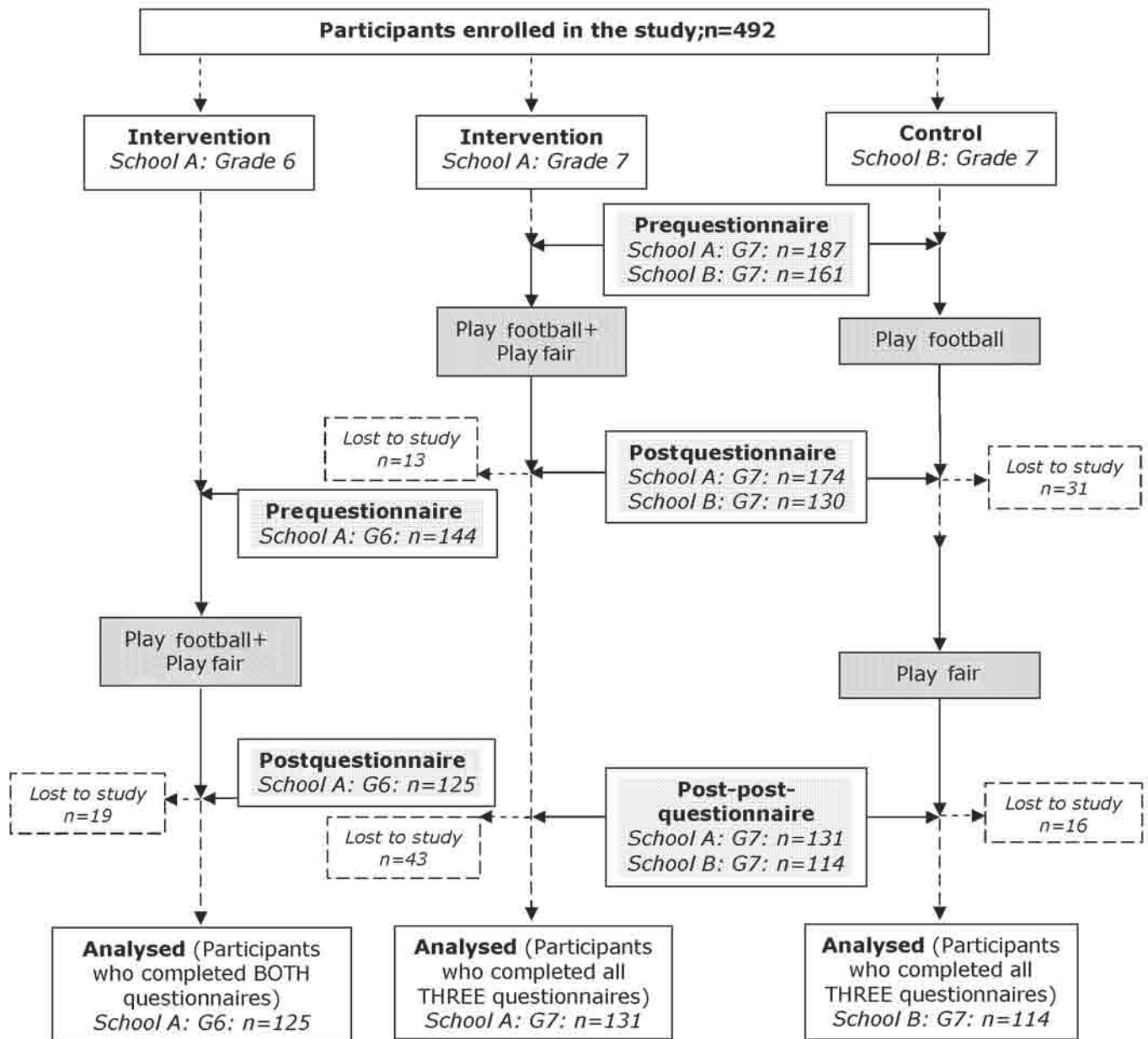


Figure 2 Flow chart of schools, questionnaires and children through the study.

89.5%; Control, Grade 7: 93.9% (Play Football: 94.3; Play Fair: 93.6) and Intervention, Grade 6: 93.4%.

Data summarising the demographics of the children in each group are shown in table 4. There were no statistically significant differences between the numbers of boys and girls included in each group (Intervention, Grade 7: $p=0.293$; Control, Grade 7: $p=1.000$; Intervention, Grade 6: $p=0.788$), and there was no significant difference ($p=0.471$) between the mean ages of the children in the Intervention, Grade 7 and Control, Grade 7 Groups. There were significantly more ($p<0.001$) children living in shacks in the Intervention, Grade 7 Group than the Control, Grade 7 Group but there was no significant difference ($p=0.877$) in the numbers of co-occupants. There were no statistically significant differences in the demographic data for the children who completed all the questionnaires and those children who failed to complete one or more of the questionnaires and who were therefore not included in the study.

Responses to the health-related statements recorded on the database were independently checked for 67 (~7%) of the 985 questionnaires included in the study: overall accuracy was 99.7%. The percentage numbers of correct responses given to the 20 health-related statements by children in each group at each stage of the study are summarised in table 5. At the preintervention stage, there were 10 questions for which the Grade 7 control group scored higher than the Grade 7 intervention group, of which eight were significantly ($p<0.05$) different, and 10 questions for which the control group scored lower than the intervention group, of which four were significantly different. The Grade 6 intervention group scored higher than the Grade 7 intervention group at the preintervention stage for 11 questions, of which two were significant and lower for nine questions, of which seven were significant. Compared with preintervention levels, the Intervention, Grade 7 Group showed statistically significant increases in knowledge for

nine of the 20 health statements at the postintervention assessment and for 11 of the 20 statements at the 3-month follow-up assessment. The Control, Grade 7 Group on the other hand showed a statistically significant increase for only one of the 20 statements at the post-‘Play Football’ assessment but a statistically significant increase in nine of the 20 statements at the post-‘Play Fair’ assessment. The Intervention, Grade 6 Group showed statistically significant increases in health knowledge at the postintervention stage for 15 of the 20 questions. The Grade 7 children’s attitudes towards the question ‘football is just for boys’ are presented in table 6, and the Grade 6 and

Grade 7 children’s attitudes towards the Football for Health programme are presented in table 7.

DISCUSSION

The coach-pairs were randomly assigned to the intervention and control groups prior to the start of the coaches’ training programme and health knowledge assessment to avoid the possibility that coaches scoring highly on the preintervention health knowledge questionnaire may be preferentially allocated to the intervention group. The mean ages and health knowledge of coaches in the two groups were similar prior

Table 4 Demographic data for the children in the three groups at the start of the intervention

	Group/gender					
	Intervention, Grade 7		Control, Grade 7		Intervention, Grade 6	
	Boys	Girls	Boys	Girls	Boys	Girls
Number in group	59	72	57	57	64	61
Age (years)						
Mean	13.5	13.1	13.3	13.3	12.5	12.2
SD	0.9	0.8	0.9	1.0	1.1	0.9
Range	12 to 15	12 to 15	12 to 15	12 to 15	11 to 16	11 to 15
Accommodation (n (%))						
House	29 (49)	35 (49)	49 (86)	48 (84)	39 (61)	37 (61)
Shack	29 (49)	37 (51)	7 (12)	9 (16)	23 (36)	22 (36)
Other	1 (2)	0 (0)	1 (2)	0 (0)	2 (3)	2 (3)
No of co-occupants						
Mean	4.9	4.8	4.8	4.6	4.8	5.7
SD	1.9	1.7	2.3	2.0	2.4	2.7
Range	2–12	1–8	1–13	2–14	1–14	1–13
Favourite sport (n (%))						
Football	38 (64)	0 (0)	43 (75)	0 (0)	48 (75)	9 (15)
Netball	6 (10)	45 (63)	13 (23)	19 (33)	1 (2)	22 (36)

Table 5 Responses to 20 health knowledge questions by children in the three groups at the various stages of the programme

Session no and health statement	Group/stage of intervention/percentage of correct responses given (%)							
	Intervention: Grade 7 (n=131)			Control: Grade 7 (n=114)			Intervention: Grade 6 (n=125)	
	Pre	Post	3 months after post	Pre-‘Play Football’	Post-‘Play Football’	Post-‘Play Fair’	Pre	Post
1								
Playing football will help to keep me healthy	90.8	93.9	93.9	88.6	93.0	95.5	80.0	93.6+
I will probably live longer if I play sport	70.2	72.5	76.3	55.8	63.2	65.1	43.4	60.0#
2								
There is a rape telephone helpline for girls	90.0	91.6	95.4	96.4	93.8	97.4	91.1	95.2
There are trained police to help abused girls	82.3	74.6	74.0	73.0	73.7	76.3	70.4	79.2
3								
HIV and AIDS are the same thing	60.8	67.2	78.6+	56.6	53.5	77.7§	30.6	62.9§
Not having sex is the most effective way to avoid HIV/AIDS	69.2	56.5	65.6	44.6	57.5	55.9	60.5	66.9
4								
Tik is an addictive drug	86.2	85.3	89.3	42.1	82.5§	83.2§	84.0	77.6
Alcohol can cause depression	46.2	53.1	66.4§	62.3	57.0	62.8	52.8	68.0#
5								
Mosquitoes spread malaria	28.2	70.2§	80.9§	61.4	50.9	80.7§	53.6	73.6§
Malaria cannot kill people	38.0	55.8+	45.8	64.0	59.6	71.9	41.8	60.8+
6								
After washing, it is OK to dry my hands on my shirt	88.5	94.6	95.4*	72.6	80.7	95.6§	77.2	91.1+
How long should I wash my hands to remove germs?	29.5	80.2§	71.5§	32.7	29.8	65.5§	36.1	60.2§
7								
It is OK to drink water from the local river	65.6	87.8§	84.7§	86.0	86.0	92.0	75.8	90.4+
How long should water be boiled before it is safe to drink?	28.2	85.5§	74.0§	53.6	44.7	86.7§	54.9	75.8§
8								
Children may get fat eating too many sweets	35.7	22.1	23.7	28.9	39.8	23.9	6.4	29.6§
It is healthy to eat only pap and meat every day	69.2	79.4	77.7	87.7	79.8	82.3	56.1	80.6§
9								
A vaccination is a healthy food	12.4	24.2#	42.0§	6.1	9.6	27.2§	15.7	30.6+
I have to pay for vaccinations	14.6	36.9§	49.6§	13.3	9.8	39.8§	16.1	37.1§
10								
There is a cure for HIV	42.0	72.5§	60.0+	44.6	33.3	52.6	45.5	49.6
I can stop taking my medication as soon as I begin to feel better	56.2	82.3§	87.0§	75.2	64.6	93.0§	70.2	88.7§
Mean percentage of correct responses to all questions	55.2	69.3§	71.6§	57.3	58.1	71.3§	53.1	67.3§

All statistical tests refer to comparisons with the same group preintervention values: * $p \leq 0.05$, # $p \leq 0.01$, + $p \leq 0.005$, § $p \leq 0.001$.

Table 6 Responses to the statement 'football is just for boys' by children in the Grade 7 intervention and control groups at the various stages of the programme

Gender	Group/Stage of intervention											
	Intervention: Grade 7						Control: Grade 7					
	Preintervention		Postintervention		3 months after postintervention		Preintervention		Post-'Play Football'		Post-'Play Fair'	
	Percentage positive response	Mean score	Percentage positive response	Mean score	Percentage positive response	Mean score	Percentage positive response	Mean score	Percentage positive response	Mean score	Percentage positive response	Mean score
Boys	47	3.2	71†	4.0	76‡	4.2	80	4.1	76	4.2	93*	4.6
Girls	76	4.2	90*	4.6	90*	4.6	79	4.2	95*	4.8	91	4.6

A 'positive response' equates to a response of 'disagree' or 'strongly disagree.' 'Mean score' refers to the group's weighted mean response (five-point scale) to the statement. All statistical tests refer to comparisons with the same group preintervention values: * $p \leq 0.05$, † $p \leq 0.01$, ‡ $p \leq 0.001$.

Table 7 Children's attitudes towards the Football for Health programme at various stages of the intervention

Question	Group/time questionnaire implemented											
	Intervention: Grade 7						Control: Grade 7				Intervention: Grade 6	
	Postintervention		3 months after postintervention		Post-'Play Football'		Post-'Play Fair'		Postintervention			
	Percentage positive response	Mean score	Percentage positive response	Mean score	Percentage positive response	Mean score	Percentage positive response	Mean score	Percentage positive response	Mean score		
Sessions were easy to understand	96	4.8	98	4.8	90	4.5	97	4.7	78	4.1		
Learnt about health issues	96	4.7	95	4.6	83	4.3	86	4.4	80	4.2		
Attitude towards health issues changed	82	4.3	91	4.5	68	4.0	81	4.3	74	4.0		
Sessions were enjoyable	95	4.7	96	4.8	91	4.6	95	4.7	84	4.3		
Would recommend programme to friends	94	4.7	98	4.7	94	4.6	90	4.6	82	4.2		
Overall rating of the programme	92	4.7	89	4.5	93	4.6	96	4.7	94	4.7		
Mean value	93	4.7	94	4.6	87	4.4	91	4.6	82	4.2		

A 'positive response' equates to a response of 'agree' or 'strongly agree.' 'Mean score' refers to the group's weighted mean response (five-point scale) to the question.

to the start of the training programmes; however, while there was a significant gain in the health knowledge of coaches in the intervention group, no change was observed for the coaches in the control group after their 'Play Football' training programme. All coaches provided positive feedback on the training programmes, and although both groups indicated that a longer training programme would be beneficial, they believed they were well prepared and felt confident about implementing the '11 for Health' messages.

Children making up the three groups showed similar demographics apart from Grade 7 being on average ~1 year older than Grade 6 and a smaller proportion of children living in shacks in the Control, Grade 7 Group. It should be noted that a small number of children in each school grade were older than the majority of the other children in the grade because children remained within a teaching grade until they achieved the appropriate academic level of performance. Surprisingly, there were a number of differences in health knowledge between the Intervention and Control, Grade 7 Groups at the preintervention stage, but neither school exhibited a significantly higher overall level of health knowledge. The Intervention, Grade 7 group showed a high gain in health knowledge following implementation of the complete Football for Health programme and demonstrated knowledge retention at the 3-month follow-up. The level of knowledge about some health issues, for example vaccinations, showed a further increase at the 3-month follow-up stage. Although a specific reason to explain this could not be identified, anecdotal evidence suggests that the programme stimulated children to find out more about some issues postintervention. On the other hand the control group showed no change in health knowledge

following the 'Play Football' stage but a gain following implementation of the 'Play Fair' stage. The Intervention, Grade 6 Group showed significant gains in knowledge for more of the health statements than either of the Grade 7 Groups. This difference may be explained, at least in part, by lower preintervention levels of health knowledge for the Grade 6 children for some questions compared with the Grade 7 children. It is also possible that, because the intervention with the Grade 6 children followed directly after the Grade 7 intervention, the coaches were more confident and more skilled at presenting the programme as a result of their experiences with the first intervention.

For several of the health statements, correct responses were recorded by over 70% of the children at the preintervention stage; this meant that larger cohort sizes than those calculated would be required to identify significant differences at the postintervention stage. In future studies, these statements may need to be replaced by more demanding questions. It was disappointing that the level of knowledge related to 'HIV/AIDS' and 'respect for girls' did not change substantially in any of the groups following the intervention. There are several possible explanations; for example, preintervention knowledge levels were already high for these issues; children were possibly less attentive in these sessions, as they were regularly exposed to these issues from other sources; or the children found these subjects more difficult to deal with in mixed gender groups. There was also an unexpected large increase in knowledge recorded at the post-'Play Football' stage by the Control, Grade 7 Group in respect of the addictive nature of the substance known locally as 'Tik.' The reason for this could not be identified, but it should be noted that the preintervention knowledge

Box 4 Football for Health: programme evaluation

Project implementation and outcomes were assessed using three questionnaires: (1) questionnaire containing 20 health knowledge statements worded to anticipate a mixture of positive and negative responses, (2) course assessment questionnaires for the coaches' training course (10 statements) and the children's Football for Health programme (six statements). These questionnaires included positively and negatively worded statements that anticipated a mixture of positive and negative responses using a five-point Likert scale. Where appropriate, responses to questions were reversed for data-analysis purposes so that all responses could be combined to produce a unidirectional overall assessment. Differences between numbers in groups were assessed for statistical significance using a χ^2 test; differences in mean values using a t test; and differences in proportions of responses using a Z test.¹⁵ Significance levels for statistical tests were reported as $p \leq 0.05$, $p \leq 0.01$, $p \leq 0.005$ or $p \leq 0.001$. The schedule for implementing these questionnaires (figures 1, 2) was:

- ▶ Coaches: (1) health-knowledge questionnaire: pretraining and post-training course; (2) course assessment questionnaire: post-training course.
- ▶ Children: Intervention Group, Grade 7: (1) health-knowledge questionnaire: preintervention and postintervention (Play Football+Play Fair) and 3-month follow-up; (2) programme assessment questionnaire: postintervention and 3-month follow-up; (3) children were asked for their response to the statement 'football is just for boys' using a five-point Likert scale at the pre-, post- and 3-month post-intervention stages.
- ▶ Children: Control Group, Grade 7: (1) health-knowledge questionnaire: pre-'Play Football' and post-'Play Football' programme and post-'Play Fair' programme; (2) programme assessment questionnaire: post-'Play Football' and post-'Play Fair'; (3) children were asked for their response to the statement 'football is just for boys' using a five-point Likert scale at the pre-'Play Football' and post-'Play Football' and post-'Play Fair' intervention stages.
- ▶ Children: Intervention Group, Grade 6: (1) health-knowledge questionnaire: preintervention and postintervention (Play Football+Play Fair); (2) programme assessment questionnaire: postintervention.

Each of the children's questionnaires was presented to the children at their school by the same female facilitator, who was experienced working with children of this age and implementing questionnaires of this type. Questionnaires were written in English; however, the facilitator presented each question to the children in both English and Xhosa (the local language) before the children were asked to tick their response on the questionnaire.

level for this question in the control group was much lower than that observed in either of the other groups.

The children in all three groups provided positive feedback on the Football for Health programme. In particular, while response to the question 'Has your attitude towards health issues changed following the programme?' was positive in all groups following the programme, the responses were even more positive among children in the Intervention,

Grade 7 Group at the 3-month follow-up stage. This may have occurred because the children in this group had by this time had the opportunity to put into practice many of the health messages they had learnt during the programme. Although football and netball were the most popular sports for boys and girls respectively, the boys' and girls' attitudes towards football being an acceptable game for both sexes became more positive after the intervention, which was supportive of the decision to include both boys and girls in the same Football for Health programme. It must be appreciated when evaluating these views that children may have responded positively because they believed that this was the response expected or that they did not want to imply that their coach had done a poor job teaching them.

There were strengths and weaknesses associated with the implementation and evaluation of the Football for Health programme. Investigating the programme within a randomised control study format would have been the preferred research design; however, it was not feasible to randomly assign children to intervention and control groups, as this would have created unacceptable logistical and academic problems within the schools. Instead, the investigation was implemented using three separate but related cohorts: the Control, Grade 7 Group provided comparable data for the Intervention, Grade 7 Group and the Intervention, Grade 6 Group provided data about the intervention in a younger age group. The number of participants included in each group exceeded the minimum number identified by the sample size calculation; however, although schools were randomised, this number did not take into account that children within these schools were not randomised between the intervention and control groups. The largest loss to the project occurred in the Intervention, Grade 7 Group at the 3-month follow-up stage, which may have occurred because of the children's lack of contact with the programme for an extended period of time. The Football for Health programme achieved a high level of compliance in terms of attendance at the 11 sessions in all three groups, and this was reflected in the children's responses that they found the sessions enjoyable and would recommend the programme to their friends. The high compliance with the programme almost certainly reflects the programme's link to football and the widespread popularity of football among children in Africa. Retrospectively, it was felt that, when the health questionnaire was developed, too much emphasis was placed on trying to balance the number of positively and negatively worded statements. This created unnecessary difficulties for the facilitator who had to translate these statements into the local language without changing their meaning or format or influencing the children's responses. Additionally, statements structured in a negative or even a double negative format were perhaps inherently over-complex for children of this age in this setting. The questionnaires were completed in large school groups, which increased the burden on the facilitator and the length of time required to complete the questionnaires. It was again felt, in retrospect, that it may have been better to complete the questionnaires in smaller groups, although it is recognised that this approach would increase the organisational complexity of the process and would require more facilitators, which could in turn create problems of inconsistency between facilitators. While it would have been beneficial to assess changes in the children's level of physical activity and/or body mass following the intervention, it was felt that it would be extremely difficult to demonstrate that changes in these variables among children of this age were a direct result of the Football for Health programme.

What is already known on this topic

- ▶ Communicable and non-communicable diseases are major causes of mortality in low and middle income countries.
- ▶ Health knowledge underpins changes in health behaviours.
- ▶ Very few interventions aimed at increasing health knowledge among children are evaluated.

What this study adds

- ▶ A football-based interactive education programme designed to improve the health knowledge of children aged between 11 and 15 years in a township in South Africa significantly increased the children's knowledge about a range of health issues.
- ▶ The programme received positive feedback from the coaches and children taking part in the programme.

Many of the social and cultural ideals held by FIFA,¹⁶ such as fair play, health and respect for all, are recognised by the United Nations⁷ as principles necessary for social development. In addition, the United Nations⁷ stated, 'sport and physical activity provide one of the most cost-effective forms of preventive medicine, with the potential to dramatically cut healthcare costs' (p 3). Results from this study demonstrated that it was possible to implement an education programme for children containing valuable health messages linked to football and to achieve significant improvements in knowledge about a number of health issues: importantly, the knowledge gained was retained beyond the end of the programme. It is important, however, to confirm that the positive outcomes obtained in this study can be replicated in other settings and to assess other ways of implementing the programme so that it can be disseminated widely in a sustainable format. The immediate aims, therefore, are to follow-up this study by assessing outcomes from the Football for Health programme in other Southern Africa countries with larger cohorts of children using (1) a similar organisational structure and (2) a national Football Association to implement the programme.

Acknowledgements The authors would like to acknowledge the valuable contributions made by many people and organisations at various stages of the project. E Chagonda (Zimbabwe), C Deutsch (USA), K Grimm (Switzerland), SMboup (Senegal), S Motaung (South Africa), F Muli-Musiime (Kenya), C O'Brien (USA), M Odendall (France), M Schweltnus (South Africa), J Sekajugo (Uganda), D Serwadda (Uganda), M Smalley (Kenya), R Steffen (Switzerland) and Y Zerguini (Algeria) during the initial focus groups in Zurich. K Friedrich, X Magqwaka, G Mondl and interns from Grassroot Soccer during the implementation of the programme in

Khayelitsha. Most importantly, the Football for Health coaches whose enthusiasm and commitment contributed enormously to the success of the programme: G Baartman, P Dingiso, S Dladla, M Lutuli, D Madondile, L Maflika, T Makay, N Mathiso, N Mkhontwana, H Mkita, N Sibeko, L Sidzumo, N Matiwane, Z Malgas, S Mbaleki, M Mdeleleni, X Mondliwa, S Nhokombi, N Tuali, N Guzula, V Shumane, H Mselele, A Rodo. Impact Consulting and L Dlamini for collecting the evaluation data. In particular, the authors would like to thank the headmasters, teachers and children of Chuma and Intshayelelo Schools in Khayelitsha, without whose support the project could not have been implemented.

Funding This study was supported by a research grant from Fédération Internationale de Football Association.

Competing interests None.

Contributors JDv, CWF and AJ developed the concept and designed the intervention. CWF is guarantor for the paper. JDe and CWF developed the teaching curriculum. JDe, JDo, RJ and CWF developed the implementation strategy. CWF, AJ and JDe developed the assessment strategy. CWF, AJ and JDv analysed and reviewed the results. CWF drafted the manuscript. All authors reviewed the results and contributed to a critical review of the manuscript. All authors approved the final version.

Ethics approval Ethics approval was provided by the University of Cape Town, Cape Town, South Africa.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

1. **World Health Organization.** *The World Health Report 2002: reducing risks, promoting healthy life.* Geneva: WHO, 2002.
2. **Moeti M.** Noncommunicable diseases: an overview of Africa's new silent killers. *WHO African Health Monitor* 2008;**8**:2–5.
3. **World Health Organization.** *Global health risks.* Geneva: WHO, 2009.
4. **Nyamwaya D.** Health promotion: a tool for fostering comprehensive health development agendas in the African Region. *WHO African Health Monitor* 2008;**8**:24–7.
5. **Dobbins M, DeCorby K, Robeson P, et al.** School-based activity programs for promoting physical activity and fitness in children and adolescents aged 6–18 (Review). *Cochrane Library* 2009;**3**:CD007651.
6. **World Health Organization.** *Health and development through physical activity and sport.* Geneva: WHO, 2003.
7. **United Nations Inter-agency Task Force on Sport for Development and Peace.** *Sport for development and peace: towards achieving the millennium development goals.* Geneva: United Nations, 2003.
8. **Pedersen BK, Saltin B.** Evidence for prescribing exercise as therapy in chronic disease. *Scand J Med Sci Sports* 2006;**16**(Suppl 1):3–63.
9. **UNAIDS.** Activities to increase awareness of the impact of HIV/AIDS on young people and young people's impact on the course of the epidemic. In: *Force for change—World AIDS campaign with young people. A report of activities.* Geneva: UNAIDS, 1999:30–51.
10. **MercyCorps.** *Commitment to practice: a playbook for practitioners in HIV, youth and sport.* Portland: MercyCorps, 2007.
11. **Unicef.** One Passion. <http://www.unicef.org/football/why/index.html> (Accessed 18 January 2010).
12. **Priest N, Armstrong R, Doyle J, et al.** Interventions implemented through sporting organisations for increasing participation in sport. *Cochrane Database Syst Rev* 2008;**3**:CD004812.
13. **Medical Research Council.** *A framework for development and evaluation of RCTs for complex interventions to improve health.* London: Medical Research Council, 2000.
14. **World Health Organization.** *Guide to planning health promotion for AIDS prevention and control.* Geneva: WHO, 1989.
15. **Kirkwood BR, Sterne JAC.** *Essential medical statistics.* Oxford: Blackwell Science, 2003.
16. **Fédération Internationale de Football Association.** About FIFA. <http://www.fifa.com/aboutfifa/index.html> (Accessed 11 January 2010).