ORIGINAL ARTICLE

Promoting sexual and reproductive health in early adolescence in South Africa and Tanzania: Development of a theory- and evidence-based intervention programme

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Abstract

Aims: Action to prevent the spread of HIV among young people in Sub-Saharan Africa is needed urgently. In order to be effective, such action should be theory and evidence based and carefully adapted to local cultures and contexts. The present article describes the organization, theoretical basis, and methodological approach of a project that aims at developing and evaluating school-based interventions targeting adolescents aged 12–14 years.

Methods: Researchers from European and African universities have developed interventions that were conducted in three sites: Cape Town and Polokwane (South Africa) and Dar es Salaam (Tanzania). In each site the interventions were evaluated through large-scale field experiments with intervention schools and delayed intervention schools and with baseline and two follow-up data collections. Minimum sample sizes were estimated for each site based on local data and taking into account that the unit of allocation was schools and not individual students (the design effect). During the formative phase as well as within the field experiments, qualitative studies were also conducted. Discussion: The interventions were developed consistent with the Intervention Mapping approach, and the theoretical framework was based on a modified version of the Theory of Planned Behaviour. The limitations of Western social cognition models were recognized, and the theoretical framework has therefore been expanded in two directions: towards integrating cultural processes and towards taking societal factors and constraints into account. Conclusion: The project will throw light on the application of social cognition models as well as the usefulness of the Intervention Mapping approach to intervention development in sub-Saharan Africa.

Key Words: Adolescents, field experiment, health education, HIV/AIDS, Intervention Mapping, school, sexual behaviour, social cognition, South Africa, Tanzania

Background

In past decades there have been many efforts to reduce the spread of HIV/AIDS in Sub-Saharan Africa, including intervening with young people through the school system. Recent reviews of AIDS prevention programmes in Africa and in the developing world involving adolescents conclude that relatively few such programmes have been theory and evidence based, and that even fewer have been evaluated using experimental designs with random assignment [1–3]. The reviews suggest that some of the better-designed programmes had positive effects on AIDS-related knowledge and attitudes towards sexual risk reduction. Only a couple of programmes have been found to influence behaviours such as...
delayed sexual debut, reduced number of sexual partners, or increased condom use.

These observations are in line with early evaluations of HIV-preventive behavioural interventions in Western countries. For example, Fisher & Fisher [4] found few randomized controlled trials (RCTs), few programmes that were based on formal theory, and few programmes were shown to have favourable effects on sexual behaviour. Fisher & Fisher’s [4] conclusions were echoed by Oakley et al. [5] who identified only 20 randomized controlled trials among 65 outcome evaluations of sexual health interventions for young people. Among these 20 interventions, only three were judged to be effective, but only one included a follow-up measure of behaviour.

Recent reviews of sexuality and HIV education programmes have been more encouraging [6–9]. For instance, based on their meta-analysis of 56 prevention programmes, Johnson et al. [9] maintained that “overall, the results … support the conclusion that behavioural interventions for HIV prevention in adolescents are successful at reducing the risk for acquiring HIV, as measured by condom use, sexual frequency outcomes, communication with sexual partners, and objectively measured condom use and negotiation skills” (p. 385).

Kirby [8] went further and identified characteristics that distinguish between effective and ineffective school-based programmes. He found that effective programmes (a) focus explicitly on reducing one or more sexual risk behaviours, (b) are theory and evidence based, (c) provide and reinforce clear messages about sexual activity and condom or contraceptive use, (d) provide accurate information about the risks and consequences of teen sexual activity and about methods of risk reduction, (e) include activities that address the social context of sexual behaviour, (f) provide modelling and practice of communication, negotiation, and refusal skills, (g) use a variety of teaching methods designed to enhance active student participation and to personalize information, (h) incorporate behavioural goals, teaching methods, and materials that match the students’ age, sexual experience, and culture of the students, (i) lasted a sufficient length of time to complete important activities adequately, and (j) selected teachers or peers who believed in the programme they were implementing and then provided them with training (p. 53). Frost & Forrest [10] concluded that the effects proved to be stronger when targeting younger adolescents.

These reviews suggest that the school setting is frequently and successfully chosen as an arena for administering interventions related to sexuality and reproductive health, but that there is still an urgent need to develop and evaluate evidence- and research-based interventions targeting adolescents in developing countries’ contexts. The present article presents one such research effort.

**Aims**

In 2001 three African and four European universities started a joint project on the promotion of sexual and reproductive health among youth in South Africa and Tanzania: the SATZ project. The aim was to develop, implement, and evaluate a school-based health education programme involving sexual and reproductive health for students aged 12–14 years at each of the sites. A central aspect was to reduce the risk of being infected with HIV. The SATZ project objectives were:

1. to develop a research-based framework for cost-effective and culturally sensitive sexual and reproductive health interventions targeting adolescents. The school system constituted the primary setting;
2. to conduct and evaluate interventions at selected sites (one site in Tanzania and two sites in South Africa) in order to document and improve the efficacy and relevance of the interventions;
3. to test the usefulness of and, if necessary, change or expand on existing theoretical models for predicting sexual and reproductive behaviours.

In order to ensure a clear division of responsibility and effective collaboration, the project was organized around a number of major tasks. Below we will particularly pay attention to (i) situation analysis, (ii) intervention mapping, (iii) development of evaluation instruments, (iv) implementation of interventions and (v) the evaluation approach.

**Situation analysis**

A necessary and important first step when conducting evidence- and theory-based interventions is the collection, analysis, and interpretation of available data that may contribute to the planning and design of the intervention programme. If available data prove to be incomplete, inadequate, or of low quality, information gaps must be identified, and supplementary studies must be conducted. There are various terms that denote the gathering and analysis of information relevant to the planning of an intervention, for example Social Diagnosis, Situation Analysis, Needs Assessment, Social
Needs Assessment, and Social Reconnaissance [11–13]. There is some variation in approaches taken. A major distinction is between normative and needs assessments. The former refers to the current situation in a particular population or group in relation to a normative standard. The latter refers to a focus on the perceived or expressed needs, and is characteristic of a participatory or empowerment approach. Within the SATZ project both kinds of information and evidence were collected and analysed.

The purpose of the situation analysis or needs assessment within SATZ was mainly to improve our understanding of the school students comprising our target populations and the environmental contexts in which they enact sexual practices and which shape their everyday lifestyles. The situation analysis further identified personal and environmental determinants or correlates of safe and unsafe sexual practices, and documented factors that might hamper or encourage behaviour change. This guided the design of the intervention, as well as theory development. The situation analysis followed key recommendations from the WHO guideline “Coming of age” on how to conduct a situation analysis on adolescent sexual and reproductive health and rights [13].

Intervention Mapping distinguishes between five steps in the process of health promotion programme development:

1. specification of health promotion programme objectives;
2. selection of theory-based intervention strategies;
3. program design, production, and pre-test;
4. planning programme adoption and implementation;
5. planning programme evaluation (see Figure 1).

Intervention Mapping describes the path from recognition of a need or problem to the identification of a solution. Although Intervention Mapping is presented as a series of steps, Bartholomew et al. [12] see the planning process as iterative rather than linear. Programme planners move back and forth between tasks and steps. The process is also cumulative: Each step is based on previous steps, and inattention to a particular step may lead to mistakes and inadequate decisions.

**Intervention mapping step 1: Proximal programme objectives**

The Intervention Mapping in SATZ started as soon as the data from the needs assessment and situation analysis were collected and analysed. On the basis of these data, each team defined and selected the goals for the intervention programmes. Based on the general programme goals (promotion of condom use and delayed sexual debut), they derived specific programme objectives that stated what school students needed to learn to be able to perform the health promoting behaviour (e.g. skills to negotiate condom use), or what had to be changed in the organizational or community environment to enable such behaviour (e.g. making condoms available).

**Intervention mapping step 2: Theoretical methods and practical strategies**

In the second step, the teams identified theoretically based intervention methods that have proved effective in accomplishing the specified objectives, and they decided on practical strategies to make these methods operational. An intervention method is a technique derived from theory and research to realize a proximal programme objective (e.g. observational learning); a strategy is the practical application of that method (e.g. role-playing activities, videotaped role models). The feasibility and effectiveness of various practical intervention strategies were examined through needs assessment (e.g.
among teachers), contacts with other health promoters, collaboration with programme implementers and users (teachers, parents and learners), and from small-scale pilots. An important task was to identify conditions that might limit the effectiveness of our intervention methods and strategies. A method or strategy that has proved to be effective among a particular target group in a particular context is not necessarily effective among other populations or in other intervention contexts.

**Intervention mapping step 3: Designing of the programme**

During this phase the teams worked on organizing the strategies into deliverable and coherent programmes and they produced and pilot tested programme components and materials. They decided on the programme structure, its scope (comprehensive sex education), its themes (e.g. falling in love), the sequence of strategies (e.g. lectures, group discussions, small-group assignments), its messages, and communication channels (e.g. print material, video, peer educators). In this phase, the teams’ major task was to convey programme intent to those who were going to work on texts, designs, and production, to make sure that the final programme products adequately incorporated theoretical underpinnings, and to pilot test programme components and materials in schools.

**Intervention mapping step 4: Anticipating and planning adoption and implementation**

A well-planned diffusion process is vital to ensure programme success. So, the first thing done at each
site, at the start of programme development, was to set up collaborative partnerships between the group planning the programme and its users. This is consistent with Schaalma et al. [15] who emphasized the importance of cooperation between researchers, teachers, school advisers, and policy-makers in the development of school programmes. In addition, health-promotion planners should develop a theory- and evidence-based strategy to promote programme adoption among, for instance, policy-makers and school administrators, and to facilitate sustained programme implementation by teachers. All project teams followed these recommendations as far as possible.

**Intervention mapping step 5: Planning process and effect evaluation**

The products of the previous steps provided a basis for the development of evaluation tools. The evaluation should be based on research methods and instruments that are useful for examining the fidelity and completeness of programme implementation and the impact of the programme on behavioural determinants, environmental conditions, behaviour, and, if possible, health and quality of life outcomes.

The three programmes turned out to have a lot in common. They were all school based and delivered by teachers, they focused on delay of first intercourse and condom use, and they aimed at influencing factors such as attitudes, social norms, and self-efficacy. Educational approaches such as active participation, role-playing, skills training, and small-group activities were utilized across all three sites. All programmes were linked to existing curricula that included teaching on biological aspects of puberty and sexuality. The programmes differed from each other with regard to educational materials, number of sessions, and in respect of their emphasis on topics such as gender roles, power and sexual relationships, violence, drug abuse, sexual decision-making, and self-esteem.

**Evaluation**

**General approach**

Although the development of an evaluation plan is part of the Intervention Mapping framework, the SATZ consortium chose to organize the development of the evaluation plan as a separate task. Consistent with the idea of methods triangulation, quantitative as well as qualitative approaches were used [16,17].

The general framework for the evaluation was separated into process-, outcome- and cost-effectiveness evaluation. *Process evaluation* is a trustworthy account of what is attempted, how, with whom, and why. It is an examination of the programme itself that documents what services the programme delivered. Process evaluation in SATZ consisted of different methods and documentation, and has given voice to the assessment of the intervention by the various stakeholders.

The *outcome evaluation* of this project was based on an experimental design with intervention and control schools at each site. A baseline survey and two follow-up data collections were conducted. Outcome evaluation refers to measurements and documentation of the benefits (intended or not) of the programme. It broadly answers the question “what outcomes were observed and what do these mean?”

The *evaluation of cost-effectiveness* has mainly focused on registration of working hours and resources spent on the intervention. It is a quantitative technique that involves identification, measurement, and valuation of the costs of an intervention against the associated outcomes. It answers the questions “how much did the intervention cost (monetary and other input resources such as time), and what were the outcomes (such as number of pupils reached)?”

**Field experiment**

A large-scale field experiment involving between 24 and 30 schools and 3,000–5,600 students in each of the three African sites has been conducted. Schools were matched on selected demographic characteristics and within each pair one school was randomly allocated to an intervention condition and the other to the comparison (delayed intervention) condition. One baseline data collection was carried out before any intervention had started in February–March 2004. The administration of the intervention took place over a period of 2–3 months, and a booster was administered at each site. One post-intervention data collection took place shortly after the intervention was completed, and a second post-intervention data collection took place approximately one year after the baseline. The design of the field experiment is shown in Figure 2.

When determining the minimum number of students and schools needed in order to obtain satisfactory statistical power, the design effect had to be taken into account. The design effect in this context is defined as the increase in the standard error of estimates that is caused by the fact that clusters (schools) are randomized instead of individuals. Technically the design effect is the ratio of the
squared standard error under the allocation of clusters condition divided by the square standard error when allocating individuals with the same number of units. The design effect varies across variables, and the design effect may also vary for the same variables across sites. Access to local data from previous studies was therefore crucial in order to estimate the design effect and the minimum number of units (schools and students) needed.

Based on data from a local study \[18\], the Cape Town team used the Hayes & Bennett formula \[19\] to calculate the necessary sample sizes \[20\]. The required number of school pairs \(c\) for a matched pair design is given by:

\[
c = 2 + (z_{a/2} + z_B)^2 \frac{(p_0 - 1)(1 - p_0) + p_1(1 - p_1)}{n} + k_m^2 \frac{(p_0^2 + p_1^2)}{(p_0 - p_1)^2}
\]

where \(z_{a/2}\), \(z_B\) are the standard normal distribution values, \(p_0\), \(p_1\) are the “annual” incidence in the control and intervention schools, \(n\) is the number of students per school, and \(k_m\) is the coefficient of variation within the matched pairs.

Based on assumptions regarding incidence of sexual initiation from baseline to the second follow-up data collection (11%), effects of intervention (5.5 percentage points), coefficient of variation for the prevalence of sexually active students (0.15), mean number of sexually inactive students in the relevant grades per school (80), loss to follow up (20%), non-consenting (20%), power (0.80), and significance level \(\rho < 0.05\), the required number of schools turned out to be 11 pairs. Similar calculations were performed for increase in condom use and for decrease in unprotected sexual intercourse. In order to allow for loss of one or two pairs of schools, it was decided to include 13 pairs of schools in Cape Town. For Dar es Salaam and Polokwane, 12 and 15 pairs of schools were included in the study.

It is obvious that the overall research design includes several different more specific research designs. The baseline data collections constitute three separate cross-sectional surveys. After the follow-up data collections have been carried out, the comparison group data represent three separate panel surveys. When taking data from intervention schools into account, we are dealing also with three separate field experiments. Since efforts were made to ensure a high level of comparability of methods across sites, the study can also be regarded as a multi-site cross-sectional survey (baseline data), a multi-site panel survey (data from comparison schools), and a multi-site field experiment (all data combined).

**The comparability issue**

As far as comparability across sites is concerned, it is important to distinguish between the intervention component and the evaluation component. Cross-site comparability of interventions may easily be understood as implying standardization of interventions. If interventions were to be made as identical as possible, irrespective of the societal and cultural contexts, this would obviously be in conflict with the principles of health promotion as well as with the tenets of Intervention Mapping. Health promotion has been defined as the process of increasing individuals’ and communities’ control over factors that influence health and thereby providing opportunities for improving health \[21\]. It is consistent with the principles of health promotion to involve those who are meant to be targeted by an intervention in the planning and designing of such an
intervention. Furthermore, interventions that have not been properly adjusted and adapted to local circumstances are less likely to be effective.

Consequently, efforts were made not only to plan each intervention on the premises of the local culture and context, but also to involve school students, parents, teachers, and other local stakeholders in the intervention-planning process. SATZ may be regarded as consisting of three different interventions with a common purpose, but still with considerable flexibility in adapting the intervention to local circumstances. At a higher level of abstraction, however, the three interventions can be regarded as comparable in the sense that they are all products of a process guided by a common framework (Intervention Mapping) for designing such interventions.

Irrespective of similarities and differences as far as the intervention programme is concerned, there was considerable standardization of study design, methods, and procedures across sites. All sites have used a similar research design, a similar questionnaire adapted from an English-language standard version with translations and re-translations and careful examination of all discrepancies revealed, and standardized procedures for data collections, computerizing, and data cleaning. In addition, all problems with comparability were registered and documented in order to be used when interpreting findings from cross-site comparisons. This standardization makes it less likely that differences in programme effects as revealed by the present study can be attributed to differences in the evaluation design, instruments, or procedures.

**Theoretical framework**

Both SATZ’s needs assessments and evaluations heavily rely on a theoretical framework that includes social cognitions specified by Ajzen’s [22] Theory of Planned Behavior and Bandura’s [23,24] Social Cognitive Theory. Both theories have proved to provide useful change targets for sexual health promotion, especially the promotion of condom use [25–32]. This theoretical model (see Figure 3) assumes that behaviours, including sexual behaviours, are largely predicted by intentions, but with skills and environmental conditions (barriers) as important moderators. According to the model, behavioural intentions are seen as a function of three factors, namely attitudes towards the actual behaviour, social influences (such as descriptive and injunctive norms, social encouragement and pressure), and self-efficacy expectations (the degree to which a person is convinced that he or she is able to carry out the actual behaviour). The model also postulates feedback loops that imply that behaviour is not only a dependent variable, but also may influence interpersonal processes and personal factors [31]. The relationships of the larger societal and cultural context to the core factors covered by the model are among the foci of the project.

Although some have questioned the utility of such theories for adolescent sexual behaviors – based on the presumption that adolescents engage in unplanned, impetuous sex – the empirical evidence suggests that these cognitions also predict adolescents’ sexual behaviour in both Western [29,30,33–35] and non-Western contexts [36–39].

Although many theories may contribute to the design of educational programmes (e.g. theories about risk communication, attitude change, and self-efficacy improvement), Social Cognitive Theory [40] was used as a point of departure for intervention design in the present project. Social Cognitive Theory provides a broad variety of theoretical constructs that are associated with behaviour and behaviour change, but its basic tenets are that behaviour interacts with personal factors and environments (reciprocal determinism), that behaviour is largely determined by people’s expectations and values regarding the outcomes of the behaviour (outcome expectations and expectancies), and people’s expectations concerning their self-efficacy and self-control as regards performing the behaviour. In addition, the theory emphasizes the importance of modelling or learning by observation as a learning mechanism, and it acknowledges that, in the process of behaviour change, people set individual goals, identify strategies to accomplish these goals, and monitor and evaluate the outcomes of their behaviour. Social Cognitive Theory has proved to be a useful and effective framework for designing sex-education programmes, including programmes targeting HIV prevention [4,7,8]. Many, however, have questioned the applicability of such a cognitive behavioural model in cultures and contexts like those of Sub-Saharan Africa [41], basically because of the importance of cultural factors and societal constraints regarding sexual risk reduction. In our view, this critique basically addresses the way that cognitive theories were used rather than the applicability of cognitive theory. In line with the tenets of Intervention Mapping, SATZ will use collaborative planning – including involvement of adolescents, teachers, and local curriculum developers – to decide on the applicability of social cognition theories in needs assessments and programme design. In addition, in the initial phase of SATZ, where empirical studies are systematically reviewed and new data
collections were carried out in order to shed light on young people’s sexual behaviour, social anthropologists played a key role, and qualitative research approaches were utilized. Also, contextual and social barriers to safe sexual practices were operationalized and included in the construction of instruments for quantitative data collections.

**Ethical aspects**

Ethical clearance for the SATZ project has been provided by the relevant ethical committee for medical and health research in Norway (since the study is coordinated by the University of Bergen, Norway) and by relevant ethical committees in each African site.

**Conclusions**

This article outlines a project on theory- and evidence-based development and evaluation of school-based HIV prevention programmes in South Africa and Tanzania. Besides the development of quality HIV-prevention materials, the primary aims of the project are to examine to what extent an Intervention Mapping approach to programme design can be carried out in non-Western contexts, and to study the applicability of social cognition models in Sub-Saharan cultures and contexts. A secondary objective of SATZ is to demonstrate the feasibility of randomized controlled trials in a developing countries context. To date there are very few examples of trials with a methodological sophistication such as SATZ in Sub-Saharan Africa, and even fewer examples of projects with a comprehensive evaluation approach. As such, the SATZ project may add to the body of evidence suggesting that theory- and evidence-based health-promotion programmes are most likely to be successful, and it may contribute to the ongoing discussion of the applicability of Western theories in non-Western contexts. But most of all, the project may demonstrate that it is feasible to conduct health interventions in developing countries’ contexts that are in accordance with the state-of-the-art quality criteria for health promotion.

**Notes**

1. The full title of the project is: “Promoting sexual and reproductive health. School-based HIV/AIDS prevention in sub-Saharan Africa”. Acronym: SATZ - South Africa and Tanzania. The SATZ study is funded by the EC INCO research programme (under the 5th Framework Programme). Contract number ICA4-CT-2002-10038. The partners and principal investigators include: University of Cape Town (Alan Flisher), Muhimbili University College of Health Sciences (Sylvia Kaaya), University of Limpopo (Hans Onya), Karolinska Institute (Minou Fuglesang), Maastricht University (Herman Schaalma), World Population Foundation (Jo Reinders), University of Oslo (Knut-Inge Klepp), University of Bergen (Leif Edvard Aarø – coordinator). See also the project homepage (http://www.uib.no/psyfa/hemil/satz/index.htm).

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