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Effectiveness of peer-led sexuality education in reducing risky sexual behaviors among adolescents attending secondary schools in Masaka City, Uganda

Samuel Ssanyu Balamaga, Kizito Omona[1] and Juliet Ndibazza[1]

Faculty of Health Sciences, Uganda Martyrs University, Kampala, Uganda

ABSTRACT

Adolescents in Uganda continue to experience high levels of risky sexual behaviours despite existing school-based sexuality education programmes, with limited evidence on the effectiveness of peer-led approaches. This study examined the effectiveness of peer-led sexuality education on sexual behaviours among secondary school adolescents in Masaka City, Uganda. A two-arm cluster randomized controlled trial (cRCT), reported in accordance with CONSORT guidelines, was conducted among 912 students from eight secondary schools in Masaka City, Uganda. The intervention group received an eight-week peer-led sexuality education programme. Data were collected at baseline, post-intervention, and three-month follow-up. The intervention significantly increased sexual abstinence (aOR = 2.070; $p < 0.001$) and reduced multiple sexual partnerships (aOR = 0.460; $p < 0.001$), alcohol/drug use (aOR = 0.440; $p = 0.001$), and unprotected sex. Peer-led sexuality education is an effective strategy for improving adolescent sexual behaviours. Participants reported high levels of satisfaction with the intervention.

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KEYWORDS
Adolescents; peer-led sexuality education; randomized controlled trial; sexual behaviour; Uganda

Introduction

Background to the study

Adolescents constitute approximately 16% of the global population, the majority residing in low- and middle-income countries where access to quality sexual and reproductive health (SRH) information and services remains limited (WHO, 2020). Consequently, many adolescents are exposed to significant risks, including early sexual debut, multiple sexual partnerships, inconsistent condom use, and unmet contraceptive needs, contributing to high rates of sexually transmitted infections (STIs), unintended pregnancies, and unsafe abortions (Ngoc et al., 2020). Although comprehensive sexuality education (CSE) has been shown to improve knowledge, attitudes, and protective behaviours (UNESCO, 2024), its effectiveness is often constrained by implementation gaps such as inadequate teacher preparedness, limited emphasis on practical skills, and socio-cultural resistance to open discussions of sexuality (Myat et al., 2024; Shorey & Chua, 2023).

In Sub-Saharan Africa, these challenges are more pronounced, with persistently high levels of teenage pregnancy, early marriage, and HIV infections among adolescents (Chansa et al., 2024). In Uganda, despite the adoption of the National Sexuality Education Framework (MoES, 2018), adolescent SRH outcomes remain poor, characterised by early childbearing and widespread risky sexual behaviours (UBOS & ICF, 2022). Structural and socio-cultural barriers, including stigma, limited access to youth-friendly services, and restrictive norms, continue to hinder adolescents' ability to adopt safer practices (Guttmacher Institute, 2025; Nakkazi, 2019). Consequently, many school-based sexuality education programmes remain didactic and insufficiently engaging (Keogh et al., 2021). This study is grounded in Peer Education Theory, which

CONTACT Samuel Ssanyu Balamaga balamaga@yahoo.com; balamaga.samuel@stud.umu.ac.ug
[1] These authors contributed equally to this work.
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posits that adolescents are more likely to adopt health-promoting behaviours when information is delivered by peers who share similar experiences and social identities (Boozalis et al., 2020).

Through mechanisms such as observational learning, social reinforcement, and normative influence, peer educators enhance trust, relatability, and open communication, thereby promoting positive behaviour change (Boozalis et al., 2020; Namaganda et al., 2025). However, despite its theoretical relevance, empirical evidence on the effectiveness of peer-led sexuality education in Uganda, particularly in Masaka City, remains limited. This study, therefore, examined how peer-led approaches influence adolescents' sexual behaviours and related risks to inform policy and practice.

Peer-led sexuality education was selected because adolescents are more likely to adopt health-promoting behaviours when messages are delivered by peers who share similar experiences, social identities, and communication styles. Peer Education Theory suggests that peer educators influence behaviour through social modelling, normative influence, and reinforcement of protective behaviours. Unlike traditional teacher-led approaches, peer-led interventions may create a less judgmental environment that promotes discussion of sensitive topics and enhances self-efficacy and informed decision-making (Boozalis et al., 2020). However, peer-led approaches are intended to complement rather than replace comprehensive sexuality education principles (Sani et al., 2016; Zabor et al., 2020). The intervention was therefore designed to promote healthy relationships, informed decision-making, communication skills, prevention of STIs and pregnancy, and respect for individual rights.

Beyond the sexual behaviours traditionally examined in adolescent SRH research, evidence suggests that other co-occurring risk behaviours may also influence adolescents' vulnerability to adverse sexual health outcomes (WHO, 2020). In particular, substance use has emerged as an important correlate of risky sexual behaviour and is increasingly recognised as a factor that may undermine adolescents' ability to make safe and informed sexual decisions (Mulyowa et al., 2025). An analysis of risky sexual behaviours revealed that substance use and sexual risk behaviours frequently co-occur during adolescence and are important public health concerns (Ngoc et al., 2020). Further evidence shows that adolescents who consume alcohol or use drugs are more likely to report early sexual debut, inconsistent condom use, and multiple sexual partnerships (Namaganda et al., 2025).

Evidence from a recent meta-analysis of 50 studies involving 465,595 adolescents and young adults found that alcohol consumption was significantly associated with early sexual initiation (OR = 1.96), inconsistent condom use (OR = 1.23), and multiple sexual partnerships (OR = 1.72) (Cho & Yang, 2023), suggesting that substance use may increase sexual risk through impaired judgement, reduced risk perception, and heightened impulsivity. Consequently, substance-associated sexual behaviour was included as a secondary outcome in the present study.

Study methods

Study design

This study employed a two-arm cluster randomised controlled trial (cRCT) involving eight secondary schools in Masaka City, Uganda. Schools were selected as the unit of randomisation to minimise contamination between participants. Baseline data were collected from all eligible participants before randomisation. Following baseline assessment, schools were stratified by ownership (public or private) and randomly assigned to either the intervention arm (four schools) or control arm (four schools) using a computer-generated random allocation sequence developed by an independent member of the research team. Individual students constituted the unit of analysis. Outcomes were measured at baseline (T0), immediately after the intervention (T1), and three months after intervention completion (T2). Baseline analyses demonstrated no statistically significant differences between study arms, supporting the success of the randomisation process.

A cluster-randomised controlled trial was used since it is a rigorous experimental design that minimises selection bias through random allocation and enables robust causal inference between intervention and outcomes (Zabor et al., 2020). A two-arm cluster RCT with twelve clusters was implemented across eight secondary schools, meeting methodological standards for cluster trials (Dreyhaupt et al., 2017). Blinding of participants and peer educators was not feasible because of the educational nature of the intervention. To minimise bias, standardised questionnaires, identical data collection procedures, cluster randomisation, and statistical adjustment for clustering were used. This cluster randomised controlled trial was reported in accordance with the Consolidated Standards of Reporting Trials (CONSORT) Statement, including the

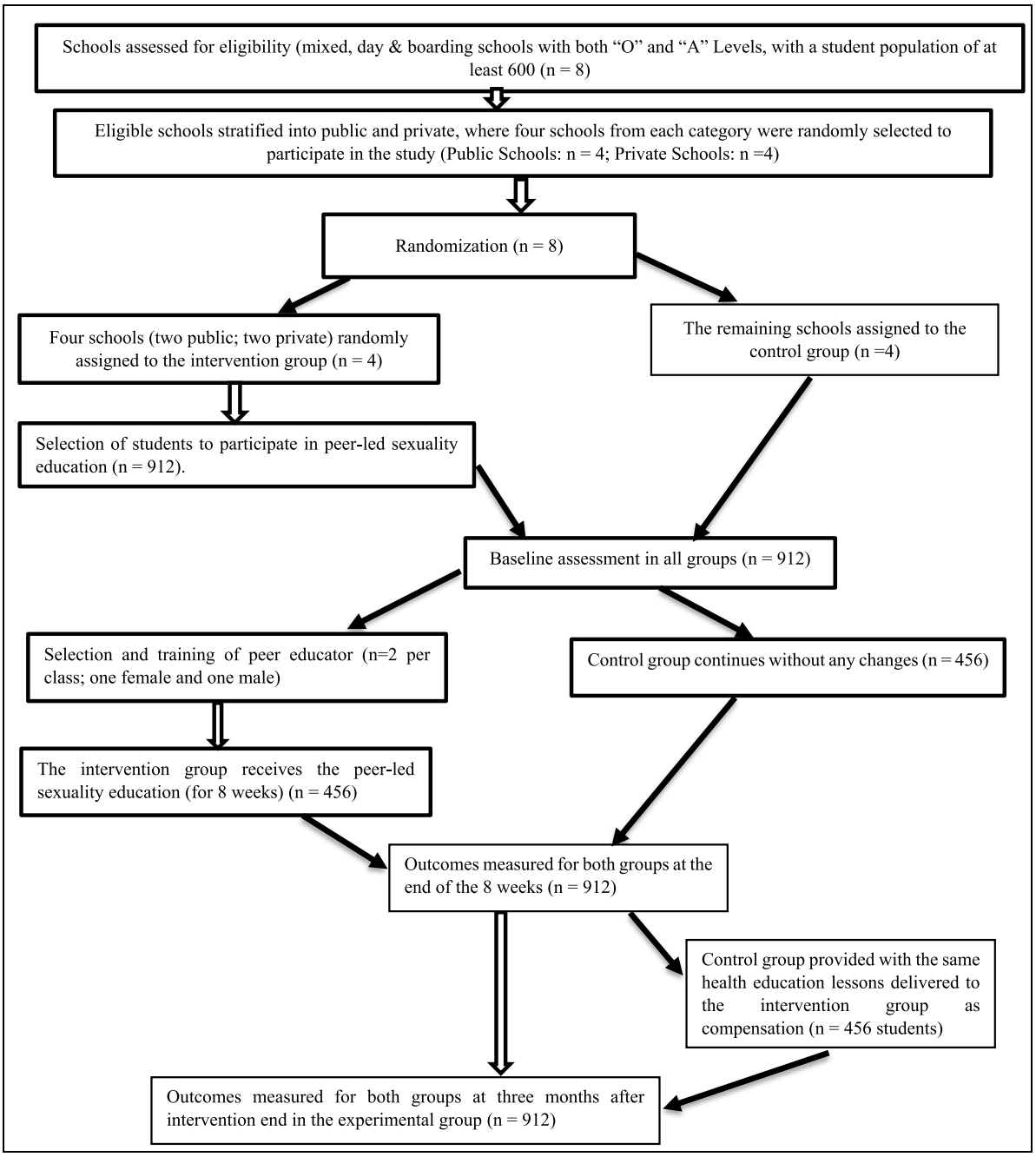


Figure 1. CONSORT flow diagram of participant recruitment, randomisation, follow-up and analysis. CONSORT flow diagram showing participant recruitment, cluster randomisation, follow-up, and analysis in the cluster-randomised controlled trial evaluating peer-led sexuality education among secondary school adolescents in Masaka City, Uganda.

CONSORT extension for cluster randomised trials, the CONSORT extension for non-pharmacologic interventions, and the CONSORT-C 2026 extension for paediatric randomised trials. The CONSORT flow diagram is presented in Figure 1.

Study area

The study was conducted in Masaka City, Southern Uganda, approximately 132 km from Kampala along the Kampala–Mbarara Highway. Established as a city in July 2020, Masaka covers 100 km^2 and comprises two divisions: Kimaanya-Kabonera and Nyendo-Mukungwe. According to the 2024 census, the city has 294,166

residents, including 70,697 adolescents aged 10–19 years, with 36,111 enroled in secondary schools (Masaka City Education Office, 2025). The area's economy is driven by agriculture (bananas, coffee, maize), trade in agricultural produce, tourism, and small-scale industries. Its strategic location and demographic profile make it an important setting for adolescent health research.

Study population

The study population for ascertaining the effect of peer-led sexuality education on the sexual behaviours and other sexual risks among adolescents attending secondary schools in Masaka City, Uganda, was the adolescent students aged 15–19 years attending the respective schools that participated in the study.

Recruitment of study participants

The study respondents were recruited at the respective schools and assigned to different clusters. Selection was done randomly, but confirmation to participate in the study was based on the inclusion and eligibility criteria.

Eligibility criteria for schools

To be eligible to participate in the study, the schools had to be fully registered/licensed by the Ministry of Education and Sports. In addition, they had to be mixed (having both male and female students), had both "O" and "A" Levels, and their proprietors and managers must have given institutional approval for the schools to participate in the study.

Eligibility criteria for students

Only adolescents aged 15–19 years, who offered written informed consent/assent (parent/guardian consented for the minors) were eligible to participate in the study. Those with cognitive and visual impairments were excluded from participating in the study. An RCT design allows the researcher to control the assignment of participants to the control or treatment group based on the assigned eligibility criteria (cut-off mark) (Maduakolam et al., 2022). Surveys were conducted at different stages (T_0, T_1, and T_2) to ascertain the different risky sexual behaviours among adolescents in secondary schools.

The intervention group

The intervention was implemented in four randomly selected secondary schools (two public and two private), comprising both lower and upper secondary levels (Forms 1–6).

The intervention

The intervention consisted of a structured peer-led comprehensive sexuality education programme delivered over eight weeks. The programme was informed by the Uganda National Sexuality Education Framework and evidence from effective school-based sexuality education interventions in sub-Saharan Africa. Educational content covered sexuality and human development, puberty, body image, self-awareness, healthy relationships, decision-making, communication skills, abstinence, prevention of sexually transmitted infections including HIV, prevention of unintended pregnancy, substance use and sexual risk, and other sexual behaviours associated with increased health risks.

Two peer educators (one male and one female) were selected by students in each intervention school. Peer educators underwent structured orientation and training on adolescent sexual and reproductive health, facilitation skills, confidentiality, safeguarding, communication techniques, and management of sensitive classroom discussions. Weekly preparatory meetings were conducted throughout implementation to reinforce content and maintain intervention fidelity.

Sessions were delivered weekly for eight consecutive weeks, each lasting approximately 60 minutes. Interactive teaching methods included short presentations, group discussions, question-and-answer sessions, peer-to-peer learning activities, role plays, and use of information, education, and communication materials. These approaches were intended to encourage participation, improve self-efficacy, and enhance adolescents' ability to make informed decisions regarding their sexual and reproductive health.

It is worth noting that while adolescents were not directly involved in developing the curriculum content, the intervention was adapted from the Uganda National Sexuality Education Framework and evidence-based school sexuality education programmes, and adolescent perspectives informed the selection of peer educators and participatory delivery approaches.

The control group

Just like the experimental group, the control group also comprised four randomly selected mixed (having male and female students) secondary schools, having both "O" and "A" level classes (from Form 1 to Form 6). Two of the schools were government schools, while the other two were private schools. After obtaining the post-intervention data, participants in the control group were provided with the same health education lessons delivered to the intervention group as compensation.

Research sample (sample size and sampling procedures)

The sample size was determined using the sample size formula for two proportions (cluster-randomised trials). The sample size for each arm was calculated using the following formula:

$$n = [(Z\alpha/2 + Z\beta)^2 \times (p1(1 - p1) + p2(1 - p2))/(p1 - p2)2] \; x \; DE$$

where:

- Zα/2: Z-score corresponding to the significance level ($\alpha = 0.05$, Z = 1.96).
- Zβ: Z-score corresponding to the power (1−β = 0.80, Z = 0.84).
- p1: Expected proportion of the outcome in the control group.
- p2: Expected proportion of the outcome in the intervention group.
- p1−p2 : Effect size.
- DE = 1 + (m−1) x ICC: Design effect, where m is the average cluster size and ICC is the intraclass correlation coefficient.

Set baseline and expected outcome proportions:

- p1: Proportion of risky behaviour in the control group (e.g. 30% or 0.3).
- p2: Proportion of risky behaviour in the intervention group (e.g. 20% or 0.2).

Effect size calculation:

- Difference (p1−p2): Expected improvement (e.g. 0.30−0.20 = 0.10).

Adjusted for cluster sampling:

- Estimate ICC [taken to be 0.05 based on a similar study in Nigeria by Akande et al. (2024).
- m: assumed to be 11 based on a similar study in Nigeria by Akande et al. (2024).
- DE = 1 + (11−1) x0.05 = 1.5.

Parameters Input into the Formula:
$(Z\alpha/2 + Z\beta)^2 = (1.96 + 0.84)^2 = 7.84$
(p1(1−p1) = 0.3(1−0.3) = 0.21

$p2(1-p2)) = 0.2(1-0.2) = 0.16$
$(p1-p2)^2 = (0.3-0.2)^2 = 0.01$
$DE = 1 + (11-1)\ x0.05 = 1.5$

Substituting into the formula:
$n = [(Z\alpha/2 + Z\beta)^2\ x\ (p1(1-p1) + p2(1-p2))/(p1-p2)^2]\ x\ DE$
$= [7.84*(0.21 + 0.16)/0.01]*1.5$
$= 435.52 \approx 436.$

However, a round sample of 456 was used to ensure an equal number per class. Hence, the sample size for each arm was 456, giving the total sample size for the study to be 912 (456*2).

Start and end date recruitment period for the study

The recruitment of participants in the study started from 11/06/2025 to 01/09/2025.

Data collection procedures/methods/techniques

To ascertain the effect of peer-led school-based sexuality education on the sexual behaviour of adolescents (research objective 2), data were obtained through surveys, which were conducted at baseline (T_0), at endline (T_1), and at 3 months post-intervention completion (T_2). This way, the study was able to ascertain the changes or improvements in sexual behaviours of adolescents at the different intervals in order to ascertain whether the health education intervention had an effect on these behaviours in the experimental group or not. Data were collected using a structured self-administered questionnaire prepared by leveraging learnings from previous adolescent sexual health studies.

Data collection instruments/tools

Data was collected using a well-structured questionnaire, with largely closed-ended questions for obtaining clear responses. Gender was collected using the categories male and female, consistent with school registration records and routine demographic data collection practices in Uganda. Additional gender identity categories were not collected and this limitation is acknowledged in the discussion. The instrument included sections on socio-demographic characteristics, sexual behaviours, abstinence, condom use, multiple partnerships, transactional sex, cross-generational sex, exposure to sexual content, and substance-associated sexual behaviours. Content validity was assessed by three experts (CVI = 0.91), and reliability was confirmed during pilot testing (Cronbach's alpha = 0.781).

Data quality control measures

Data quality control measures were rigorously applied to ensure the validity and reliability of the findings. Validity, defined as the extent to which an instrument measures what it is intended to measure (Ahmed & Ishtiaq, 2021), was established using the Content Validity Index (CVI). Three experts independently rated the questionnaire items for relevance, yielding a high CVI of 0.91. Reliability, which reflects the consistency and dependability of the instrument, was assessed through a pilot test involving 30 students. The resulting Cronbach's alpha coefficient of 0.781 surpassed the acceptable benchmark of 0.70, confirming internal consistency (Bujang & Baharum, 2016).

Data analysis

Descriptive statistics (frequencies, proportions, means, and standard deviations) summarised baseline characteristics and outcome distributions across time points. Inferential analyses accounted for clustering at the school level to ensure valid estimates. Intervention effects were assessed using mixed-effects regression models, with schools as random effects and intervention, time, and covariates as fixed effects. For binary outcomes, logistic models produced adjusted odds ratios (aORs) with 95% confidence intervals. Generalised Estimating Equations (GEE)

provided population-averaged estimates, while a Difference-in-Differences approach evaluated changes between groups over time. All analyses adjusted for key covariates, used a 5% significance level, and followed the intention-to-treat principle.

Main outcome measures

The primary outcome measure was self-reported abstinence from sexual intercourse. The secondary outcome measures were self-reported sexual behaviours, namely: multiple sexual partners, commercial sex, cross-generational sex, and alcohol/drug abuse/use.

Satisfaction measure

Participant satisfaction was assessed using a brief post-session evaluation tool comprising three domains: satisfaction with content, facilitation, and participation. Participants rated each domain immediately following sessions. An end-of-course evaluation was also administered following programme completion.

Missing data

There was no missing data at baseline. Attrition was monitored throughout follow-up, and analyses were conducted according to the intention-to-treat principle. Available data were analysed within participants' originally assigned trial groups.

Participant flow

Participant flow through the study is presented in Figure 1. Eight secondary schools were randomised to the intervention ($n = 4$ schools; 456 participants) and control arms ($n = 4$ schools; 456 participants). Participant recruitment, allocation, follow-up, and analysis were conducted in accordance with CONSORT guidelines for cluster randomised trials.

Results

Bio-data/demographic characteristics

A total of 912 adolescents aged 15–19 years attending the selected secondary schools in Masaka City participated in the study, the majority of whom, 501(54.9%) were aged 18–19 years. More than half, 538(59.0%) were female; close to three-quarters, 649(71.2%) were in day school. There was an equal representation (33.3%) of students per class. Close to a half, 445(48.8%) belonged to the Roman Catholic Religion (Table 1).

Effectiveness of peer-led sexuality education in reducing risky sexual behaviours

A strong and consistent intervention effect was observed across multiple sexual health outcomes, demonstrating the effectiveness of peer-led sexuality education in promoting protective behaviours and reducing risk among adolescents. Sexual abstinence increased substantially in the intervention group by 17.1 percentage points, compared to a decline of 2.2 points in the control group, yielding a robust Difference-in-Differences (DiD) estimate of +19.3 points. Similarly, condom non-use declined in both groups but showed greater improvement in the intervention arm (DiD: −4.5), alongside significant reductions in multiple sexual partnerships (DiD: −7.1) and alcohol or drug use (DiD: −7.8) (Table 2). These findings indicate meaningful behaviour change beyond secular trends.

Inferentially, baseline comparisons revealed no statistically significant differences between study arms ($p > 0.05$), confirming successful randomisation and strengthening internal validity (Table 3). Over the three-month follow-up, multilevel analysis further confirmed significant behavioural improvements. Adolescents were more likely to abstain from sex (aOR = 1.391; 95% CI: 1.140–1.700; $p = 0.001$) and significantly less likely to report multiple

Table 1. Bio data/demographic characteristics of study respondents.

Characteristics	Frequency ($N = 912$)	Percent (%)
Age in complete years		
15–17	411	45.1
18–19	501	54.9
Gender		
Male	374	41.0
Female	538	59.0
School section		
Boarding	263	28.8
Day	649	71.2
Class		
Senior 1–2	304	33.3
Senior 3–4	304	33.3
Senior 5–6	304	33.3
Religion		
Roman catholic	445	48.8
Protestant	156	17.1
Pentecostal	66	7.2
Muslim	221	24.2
Other	24	2.6

Table 2. Difference-in-differences (DiD) summary of the different outcomes.

Indicator	Interv T0 (%)	Interv T2 (%)	ΔInterv (pp)	Control T0 (%)	Control T2 (%)	ΔControl (pp)	DiD (pp)	Interpretation
Currently abstaining from sex (protective)	62.1	79.2	17.1	66.9	64.7	−2.2	19.3	Strong positive effect (↑ protective behaviour)
Did not use a condom at last sex (risk)	21.9	6.4	−15.5	20.4	9.4	−11	−4.5	Added improvement beyond control
Has multiple partners (2+) (risk)	15.5	5.5	−10	12.1	9.2	−2.9	−7.1	Clear reduction in partner concurrency
Currently uses alcohol/drugs (risk)	17.3	5.3	−12	15.4	11.2	−4.2	−7.8	Meaningful reduction in substance use
Transactional sex (risk)	14.9	15.8	0.9	12.5	14.3	1.8	−0.9	No positive intervention effect
Cross-generational sex (risk)	17.8	18.2	0.4	15.8	17.3	1.5	−1.1	No significant differential change

DiD = (Intervention T2−T0) − (Control T2−T0). Values in percentage points (pp).

partnerships (aOR = 0.491; $p < 0.001$), unprotected sex (aOR = 0.321; $p < 0.001$), and substance use (aOR = 0.640; $p = 0.002$) (Table 4).

Between-group comparisons reinforced these effects, with intervention participants more than twice as likely to abstain (aOR = 2.070; $p < 0.001$) and significantly less likely to engage in multiple partnerships (aOR = 0.460; $p < 0.001$) or substance use (aOR = 0.440; $p = 0.001$). However, no significant effects were observed for transactional or cross-generational sex (Table 5), suggesting that these behaviours may be influenced by deeper structural or socio-economic factors not easily modified within a short intervention period.

Student satisfaction with sexuality education sessions

Overall, satisfaction with the sessions was exceptionally high across both groups, with 98–100% of participants rating content, delivery, and participation as satisfactory. The control group consistently reported slightly higher satisfaction, though differences were minimal (0–2 percentage points). Most sessions, including those on introduction, human development, sexual behaviours, safe practices, and prevention, achieved near-universal approval. However, Session 6 showed a slight dip (98–99%), while Session 7 (sexual behaviours associated with increased health risks) recorded notably lower satisfaction in the intervention group (content: 85%; delivery: 89.9%). Despite this, satisfaction rebounded in Session 8, suggesting sustained participant engagement and positive perceptions of the programme content and delivery (Table 6).

Overall, the findings provide strong evidence that peer-led sexuality education can effectively influence key sexual behaviours among adolescents. High levels of participant satisfaction suggest that the intervention was positively received by adolescents. However, satisfaction represents only one aspect of intervention experience and should not be interpreted as a direct measure of acceptability or feasibility.

Table 3. Difference in statistical findings between the groups at baseline.

Outcome	Intervention *n* (%)	Control *n* (%)	aOR	95% CI	*p*-value
Currently abstaining from sex	283 (62.1)	305 (66.9)	0.810	0.620–1.060	0.130
Multiple sexual partners (≥2)	87 (19.1)	85 (18.6)	1.030	0.740–1.430	0.880
Did not use a condom at last sex	100 (21.9)	93 (20.4)	1.100	0.800–1.510	0.560
Alcohol or drug use	79 (17.3)	70 (15.4)	1.160	0.810–1.640	0.410
Transactional sex	68 (14.9)	57 (12.5)	1.227	0.840–1.792	0.336
Cross-generational sex	81 (17.8)	72 (15.8)	1.152	0.814–1.631	0.478

Table 4. Changes in key sexual behaviours between baseline and 3-months postintervention.

Outcome	Baseline *n* (%)	T2 *n* (%)	aOR	95% CI	*p*-value
Currently abstaining from sex	590 (64.7)	656 (71.9)	1.391	1.140–1.700	0.001
Multiple sexual partners (≥2)	172 (18.9)	130 (14.3)	0.720	0.560–0.930	0.011
Did not use a condom at last sex	193 (21.2)	72 (7.9)	0.321	0.240–0.440	<0.001
Alcohol or drug use	149 (16.3)	101 (11.1)	0.640	0.480–0.850	0.002
Transactional sex	125 (13.7)	136 (14.9)	0.906	0.697–1.178	0.504
Cross-generational sex	153 (16.8)	162 (17.8)	0.933	0.732–1.190	0.621

Table 5. Difference in statistical findings between the groups at 3 months post intervention.

Outcome	Intervention *n* (%)	Control *n* (%)	aOR	95% CI	*p*-value
Currently abstaining from sex	361 (79.2)	295 (64.7)	2.070	**1.540–2.790**	**<0.001**
Multiple sexual partners (≥2)	44 (9.6)	86 (18.9)	0.460	**0.310–0.680**	**<0.001**
Did not use condom at last sex	29 (6.4)	43 (9.4)	0.650	0.400–1.060	0.084
Alcohol or drug use	24 (5.3)	51 (11.2)	0.440	**0.270–0.730**	**0.001**
Transactional sex	72 (15.8)	65 (14.3)	1.128	0.784–1.623	0.578
Cross-generational sex	83 (18.2)	79 (17.3)	1.062	0.756–1.491	0.795

Students' post-intervention evaluation

Overall, students reported very high satisfaction across both groups, with slightly higher ratings in the intervention group (97%) compared to the control group (96%). In seven of the eight sessions, the intervention group demonstrated higher satisfaction, indicating improved perceived quality and relevance. Most sessions achieved near-universal approval, particularly introduction, safe sexual practices, and HIV/STI education (98–100%). However, satisfaction declined in Session 7 (sexual behaviours associated with increased health risks), which recorded the lowest ratings in both groups. Notably, satisfaction rebounded in the final session. Overall, dissatisfaction levels remained minimal, indicating a generally positive participant experience with the intervention programme (Table 7).

Discussion

Effectiveness of peer-led sexuality education in reducing risky sexual behaviours

The present study demonstrates a strong and consistent positive effect of peer-led sexuality education in improving adolescents' sexual behaviours. Significant increases in abstinence, alongside reductions in inconsistent condom use, multiple partnerships, and substance use, confirm the effectiveness of participatory, school-based interventions. These findings are consistent with evidence from sub-Saharan Africa showing that peer-facilitated sexuality education improves knowledge, attitudes, self-efficacy, and behavioural outcomes (Sani et al., 2016; Shangase et al., 2021). However, while the findings are consistent with mechanisms proposed by Peer Education Theory, the study design does not allow the observed effects to be attributed exclusively to peer delivery. Other intervention components, including educational content, participatory learning strategies, and repeated exposure to sexual health information, could also have contributed to the observed behavioural changes.

Nonetheless, the study outcomes can be explained by Peer Education Theory, which posits that individuals are more likely to adopt behaviour change when influenced by credible and relatable peers. Through mechanisms such as observational learning, social reinforcement, and normative influence, peer educators shape attitudes and behaviours in ways that traditional teacher-led approaches may not achieve. This highlights the importance of integrating peer-driven models within school-based sexuality education programmes (Dodd et al., 2022).

Table 6. Student satisfaction with sexuality education sessions.

		Intervention group		Control group	
Session 1: Introduction	Satisfaction level	Frequency ($N = 449$)	Percent (%)	Frequency ($N = 443$)	Percent (%)
Content/subject matter	Satisfactory				
	Satisfactory	442	98.4	439	99.1
	Neither satisfactory nor unsatisfactory	7	1.6	4	0.9
	Not satisfactory	0	0.0	0	0.0
Content delivery/facilitation	Satisfactory	438	97.6	439	99.1
	Neither satisfactory nor unsatisfactory	10	2.2	3	0.7
	Not satisfactory	1	0.2	1	0.2
Participation of students	Satisfactory	443	98.7	441	99.5
	Neither satisfactory nor unsatisfactory	5	1.1	2	0.5
	Not satisfactory	1	0.2	0	0.0
		Intervention group		Control group	
Session 2: Sexuality and human development	Satisfaction level	Frequency ($N = 451$)	Percent (%)	Frequency ($N = 441$)	Percent (%)
Content/subject matter	Satisfactory	446	98.9	431	97.7
	Neither satisfactory nor unsatisfactory	4	0.9	10	2.3
	Not satisfactory	1	0.2	0	0.0
Content delivery/facilitation	Satisfactory	448	99.3	440	99.8
	Neither satisfactory nor unsatisfactory	2	0.4	1	0.2
	Not satisfactory	1	0.2	0	0.0
Participation of students	Satisfactory	445	98.7	439	99.5
	Neither satisfactory nor unsatisfactory	4	0.9	1	0.2
	Not satisfactory	2	0.4	1	0.2
		Intervention group		Control group	
Session 3: Sexual behaviours	Satisfaction level	Frequency ($N = 453$)	Percent (%)	Frequency ($N = 446$)	Percent (%)
Content/subject matter	Satisfactory	451	99.6	436	97.8
	Neither satisfactory nor unsatisfactory	2	0.4	9	2.0
	Not satisfactory	0	0.0	1	0.2
Content delivery/facilitation	Satisfactory	449	99.1	439	98.4
	Neither satisfactory nor unsatisfactory	3	0.7	6	1.3
	Not satisfactory	1	0.2	1	0.2
Participation of students	Satisfactory	440	97.1	446	100.0
	Neither satisfactory nor unsatisfactory	11	2.4	0	0.0
	Not satisfactory	2	0.4	0	0.0
		Intervention group		Control group	
Session 4: Safe sexual practices	Satisfaction level	Frequency ($N = 441$)	Percent (%)	Frequency ($N = 437$)	Percent (%)
Content/subject matter	Satisfactory	440	99.8	435	99.5
	Neither satisfactory nor unsatisfactory	1	0.2	1	0.2
	Not Satisfactory	0	0.0	1	0.2
Content delivery/facilitation	Satisfactory	432	98.0	433	99.1
	Neither satisfactory nor unsatisfactory	8	1.8	3	0.7
	Not satisfactory	1	0.2	1	0.2
Participation of students	Satisfactory	441	100.0	436	99.8
	Neither satisfactory nor unsatisfactory	0	0.0	1	0.2
	Not Satisfactory	0	0.0	0	0.0
		Intervention group		Control group	
Session 5: Risky sexual behaviours	Satisfaction level	Frequency ($N = 445$)	Percent (%)	Frequency ($N = 438$)	Percent (%)
Content/subject matter	Satisfactory	445	100.0	437	99.8
	Neither satisfactory nor unsatisfactory	0	0.0	1	0.2
	Not satisfactory	0	0.0	0	0.0
Content delivery/facilitation	Satisfactory	437	98.2	432	98.6

Table 6. (*Continued*)

Session 5: Risky sexual behaviours	Satisfaction level	Intervention group Frequency (*N* = 445)	Intervention group Percent (%)	Control group Frequency (*N* = 438)	Control group Percent (%)
	Neither satisfactory nor unsatisfactory	7	1.6	4	0.9
	Not satisfactory	1	0.2	2	0.5
Participation of students	Satisfactory	439	98.7	434	99.1
	Neither satisfactory nor unsatisfactory	4	0.9	3	0.7
	Not satisfactory	2	0.4	1	0.2
Session 6: HIV/AIDS, other STIs, and Teenage pregnancy and associated dangers	Satisfaction level	Intervention group Frequency (*N* = 398)	Intervention group Percent (%)	Control group Frequency (*N* = 412)	Control group Percent (%)
Content/subject matter	Satisfactory	394	99.0	410	99.5
	Neither satisfactory nor unsatisfactory	4	1.0	1	0.2
	Not satisfactory	0	0.0	1	0.2
Content delivery/facilitation	Satisfactory	388	97.5	406	98.5
	Neither satisfactory nor unsatisfactory	5	1.3	3	0.7
	Not satisfactory	5	1.3	3	0.7
Participation of students	Satisfactory	393	98.7	407	98.8
	Neither satisfactory nor unsatisfactory	3	0.8	3	0.7
	Not satisfactory	2	0.5	2	0.5
Session 7: Deviant sexual behaviours and associated dangers	Satisfaction level	Intervention group Frequency (*N* = 414)	Intervention group Percent (%)	Control group Frequency (*N* = 389)	Control group Percent (%)
Content/subject matter	Satisfactory	352	85.0	384	98.7
	Neither satisfactory nor unsatisfactory	51	12.3	2	0.5
	Not satisfactory	11	2.7	3	0.8
Content delivery/facilitation	Satisfactory	372	89.9	382	98.2
	Neither satisfactory nor unsatisfactory	25	6.0	4	1.0
	Not satisfactory	17	4.1	3	0.8
Participation of students	Satisfactory	387	93.5	385	99.0
	Neither satisfactory nor unsatisfactory	23	5.6	2	0.5
	Not satisfactory	4	1.0	2	0.5
Session 8: Prevention of risky sexual behaviours	Satisfaction level	Intervention group Frequency (*N* = 452)	Intervention group Percent (%)	Control group Frequency (*N* = 435)	Control group Percent (%)
Content/subject matter	Satisfactory	452	100.0	431	99.1
	Neither satisfactory nor unsatisfactory	0	0.0	3	0.7
	Not satisfactory	0	0.0	1	0.2
Content delivery/facilitation	Satisfactory	450	99.6	430	98.9
	Neither satisfactory nor unsatisfactory	2	0.4	3	0.7
	Not satisfactory	0	0.0	2	0.5
Participation of students	Satisfactory	447	98.9	433	99.5
	Neither satisfactory nor unsatisfactory	5	1.1	2	0.5
	Not Satisfactory	0	0.0	0	0.0

The significant increase in abstinence from sex suggests that peer-led, skills-based approaches can effectively strengthen adolescents' intentions to delay sexual debut. This aligns with Ugandan evidence identifying attitudes, perceived norms, and self-efficacy as key determinants of abstinence (Rijsdijk et al., 2012). The stronger outcomes observed in this study may reflect the enhanced credibility and social proximity of peer educators, which reinforces behavioural intentions through shared identity and role modelling. Programmatically, this underscores the need to prioritise peer-led life-skills and abstinence components within school curricula, particularly for younger adolescents at risk of early sexual initiation.

The reduction in multiple sexual partnerships is particularly important given its strong association with HIV transmission. Consistent with regional evidence, interventions that address peer norms, negotiation

Table 7. Students' post-intervention evaluation.

		Intervention group		Control group	
Session	Satisfaction level	Frequency ($N = 456$)	Percent (%)	Frequency ($N = 452$)	Percent (%)
Session 1: Introduction	Satisfactory	452	99.1	445	98.5
	Neither satisfactory nor unsatisfactory	3	0.7	5	1.1
	Not satisfactory	1	0.2	2	0.4
Session 2: Sexuality and human development	Satisfactory	444	97.4	419	92.7
	Neither satisfactory norunsatisfactory	8	1.8	29	6.4
	Not satisfactory	4	0.9	4	0.9
Session 3: Sexual behaviours	Satisfactory	451	98.9	438	96.9
	Neither satisfactory norunsatisfactory	4	0.9	11	2.4
	Not satisfactory	1	0.2	3	0.7
Session 4: Safe sexual practices	Satisfactory	455	99.8	449	99.3
	Neither satisfactory norunsatisfactory	1	0.2	3	0.7
	Not satisfactory	0	0.0	0	0.0
Session 5: Risky sexual behaviours	Satisfactory	449	98.5	435	96.2
	Neither satisfactory nor unsatisfactory	4	0.9	13	2.9
	Not satisfactory	3	0.7	4	0.9
Session 6: HIV/AIDS, other STIs, and teenage pregnancy and associated dangers	Satisfactory	453	99.3	443	98.0
	Neither satisfactory nor unsatisfactory	3	0.7	6	1.3
	Not Satisfactory	0	0.0	3	0.7
Session 7: Deviant sexual behaviours and associated dangers	Satisfactory	375	82.2	386	85.4
	Neither satisfactory nor unsatisfactory	57	12.5	45	10.0
	Not satisfactory	24	5.3	21	4.6
Session 8: Prevention of risky centersexual behaviours	Satisfactory	451	98.9	438	96.9
	Neither satisfactory norunsatisfactory	5	1.1	11	2.4
	Not satisfactory	0	0.0	3	0.7

skills, and relationship dynamics are more effective in reducing concurrency (UNAIDS, 2022). Peer Education Theory further explains this outcome, as adolescents adjust their behaviours to align with perceived peer norms and expectations (Boozalis et al., 2020). These findings imply that sexuality education programmes should explicitly incorporate norm-change strategies and peer-driven discussions around relationships and decision-making to reduce partner concurrency.

Similarly, improvements in condom use behaviours highlight the value of combining knowledge with practical, skills-based learning. While previous studies report gaps between knowledge and consistent condom use (Shangase et al., 2021), the better outcomes observed here suggest that peer-led approaches can bridge this gap by promoting open dialogue and skills reinforcement. Through peer modelling and social support, adolescents may feel more confident negotiating condom use. This has important implications for programme design, emphasising interactive, peer-facilitated condom education to translate knowledge into sustained protective practices.

The observed reduction in alcohol and drug use further illustrates the broader impact of the intervention. Substance use is closely linked to impaired decision-making and increased sexual risk among adolescents (Mthiyane et al., 2025). Peer Education Theory suggests that peer influence plays a critical role in shaping substance use behaviours, and the intervention likely disrupted these negative influences while reinforcing positive norms (Myat et al., 2024). This finding highlights the need for integrated interventions that address both sexual and non-sexual risk behaviours within a unified framework.

In contrast, the absence of significant effects on transactional and cross-generational sex underscores the limitations of short-term, school-based interventions in addressing structurally driven behaviours. These practices are often influenced by socio-economic inequalities, gender norms, and power dynamics that extend beyond peer influence (Boozalis et al., 2020). This suggests that while peer-led approaches are effective for individual-level behaviour change, they should be complemented by broader structural interventions such as economic empowerment, community engagement, and gender-transformative programming to address structural drivers of vulnerability.

High levels of student satisfaction indicate that participants responded positively to the intervention and perceived the sessions favourably. Consistent with global evidence, adolescents often respond positively to participatory and peer-driven learning environments (Kabelka et al., 2025; UNESCO, 2024). However, lower satisfaction with sensitive topics highlights the need for non-judgmental, rights-based facilitation to reduce stigma and enhance engagement (Gilbey et al., 2022; Kreager et al., 2025). This underscores the importance of training peer educators not only in content delivery but also in facilitation skills that foster inclusivity and trust.

Overall, the findings provide evidence that participation in a structured school-based sexuality education programme was associated with improvements in several adolescent sexual health behaviours. Although peer delivery may have contributed to these outcomes, the intervention comprised multiple interrelated components and the relative contribution of each component could not be determined within the present study. Future research should examine implementation processes and mechanisms of action to better understand how such interventions achieve behavioural change.

Practical feasibility

The intervention may also contribute to improving health equity by increasing access to adolescent-friendly sexual and reproductive health information among young people who may otherwise have limited access to such resources. Because peer educators are drawn from the same social and educational environments as participants, peer-led approaches may reduce communication barriers and increase the relevance of health information. Future adaptations of the intervention could further strengthen its equity impact through greater attention to gender-responsive programming, inclusion of vulnerable and underserved adolescents, stronger linkages with youth-friendly health services, and collaboration with families and communities. Such adaptations may help ensure that the benefits of sexuality education are equitably distributed across different adolescent populations.

Conclusion

The study provides evidence that participation in a peer-led sexuality education programme is associated with improvements in several sexual health behaviours among school-going adolescents. Participants also reported high levels of satisfaction with the intervention. Significant improvements in abstinence, partner reduction, and substance use highlight its impact. However, sustaining these gains requires integration with youth-friendly services, ongoing reinforcement, and community engagement to maximise long-term adolescent health outcomes.

Strengths and limitations

This study's key strength lies in its robust cluster randomised controlled design, large sample size ($n = 912$), and use of mixed-effects and GEE models, enhancing causal inference and internal validity. The peer-led, theory-informed intervention and high participant retention further strengthen reliability. However, reliance on self-reported behaviours introduces social desirability bias, while the short (3-month) follow-up limits assessment of long-term impact. The study's geographic focus on Masaka City may also limit generalisability. Further, the study did not include formal measures of implementation fidelity, programme acceptability, or implementation quality. Therefore, it was not possible to determine the relative contribution of peer delivery compared with other intervention components such as educational content or participatory teaching methods. Also, gender was categorised as either male or female, limiting appreciation of other gender expressions of study participants.

Further, equity-related analyses were limited because gender information was collected only using the categories male and female, consistent with routine school records. Consequently, the study was unable to examine intervention effects across a broader spectrum of gender identities. Future research should incorporate more inclusive measures of gender identity and be specifically designed to assess potential differences in intervention experiences and outcomes across diverse adolescent populations.

Ethics statement

The study involved human participants and adhered to the Uganda National Guidelines for Research Involving Human Participants (UNCST, 2014) and the Data Protection and Privacy Act (2019); (Shangase et al., 2021). Ethical approval was obtained from Uganda Martyrs University, Gulu University Research Ethics Committee, and the Uganda National Council for Science and Technology (HS5938ES), alongside permissions from education authorities and participating schools. Written informed consent was obtained from adults, while minors provided assent with parental consent. Confidentiality and anonymity were ensured through coded tools and restricted data access. Ethical principles of voluntary participation, privacy, and data integrity were strictly upheld throughout the study.

Participant safety

No adverse events related to study participation or intervention delivery were reported. Participant safety was monitored throughout implementation through supervision by peer educators, teachers, and the research team. Adolescents who disclosed distress, abuse, coercion, or psychosocial concerns were referred through a structured support system involving school counsellors, youth-friendly health services, and appropriate social welfare services.

Generalisability and health equity

Although conducted in Masaka City, the intervention demonstrates potential applicability to other secondary school settings in Uganda and similar low-resource contexts. However, successful implementation may depend on availability of trained peer educators, supportive school leadership, curricular integration, and referral systems. Potential barriers include cultural resistance, competing academic priorities, insufficient training resources, and limited teacher support. The intervention may also contribute to health equity by improving access to adolescent-friendly sexual health information among students who may otherwise have limited access to such information and services.

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Author contributions

CRediT: **Samuel Ssanyu Balamaga:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing; **Kizito Omona:** Conceptualization, Supervision, Validation, Writing – review & editing; **Juliet Ndibazza:** Data curation, Methodology, Supervision, Visualization, Writing – review & editing.

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ORCID

Samuel Ssanyu Balamaga http://orcid.org/0000-0002-4339-7461
Kizito Omona http://orcid.org/0000-0003-2962-0919
Juliet Ndibazza http://orcid.org/0000-0002-3345-758X

Data availability statement

All relevant data are within the manuscript and its Supporting Information files. Any further requests regarding the data used for this study could be made through the corresponding author.

Generative AI disclosure statement

In preparing this manuscript, generative AI was used solely as a supportive tool to assist with language editing, clarity of expression, and organisation of content. Specifically, Copilot AI was used to refine wording and improve readability; however, all substantive content, including study design, data analysis, interpretation of findings, and conclusions, remains the original work of the authors. The authors take full responsibility for the accuracy, integrity, and originality of the manuscript.

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