

# An arts-literacy intervention for adolescent depression and anxiety symptoms: outcomes of a randomised controlled trial of Pre-Texts with Kenyan adolescents



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## Summary

**Background** Mental health problems are prevalent among youth in low-resource countries and are further compounded by stigma and limited access to traditional treatments. The need for scalable, accessible, and stigma-free mental health interventions is urgent. We developed and tested Pre-Texts, an arts-literacy intervention that targets adolescent depression and anxiety, in Kenya.

**Methods** We conducted a universal RCT (Randomized Controlled Trial). Students from Kenyan high schools (N = 235, ages 13–19, 53.19% female) were randomized to either Pre-Texts or a study skills control intervention. Pre-Texts involves the use of a text—such an excerpt from a novel, a physics lesson, or a technical manual—to inspire art-making that is followed by collective reflection on the process of interpretation through artmaking. Participants met daily for a week in groups of 6–12 youths for 1-h sessions. Groups were facilitated by high school graduates trained as lay-providers. This study was pre-registered at the Pan African Clinical Trials Registry (PACTR; registration number: PACTR202111497122432). The trial took place between August 11th 2021 and December 18th 2021.

**Findings** Pre-Texts produced a greater reduction in depression (d = 0.52, 95% CI [0.19, 0.84]) and anxiety (d = 0.51, 95% CI [0.20, 0.81]) symptoms from baseline to 1-month follow-up compared to the control group. Similarly, in a subsample of participants with elevated depression and anxiety symptoms, Pre-Texts produced a greater reduction in depression (d = 1.10, 95% CI [0.46, 1.75]) and anxiety (d = 0.54, 95% CI [–0.07, 1.45]) symptoms.

**Interpretation** Our findings suggest that a brief arts-literacy intervention with challenging school material in a group setting, implemented as an afterschool program, can reduce depression and anxiety symptoms in adolescents in Sub-Saharan Africa. Future replication trials with larger sample sizes with extended follow-ups will help assess the strength and sustainability of these effects.

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**Keywords:** Adolescents; Depression; Anxiety; Pre-Texts; Sub-Saharan Africa; Interventions; School-based texts; Global mental health; Arts

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### Research in context

#### Evidence before this study

Mental health problems are prevalent among youth in low-resource countries like Kenya and are further compounded by stigma and limited access to traditional evidence-based treatments. There is a need to develop scalable and effective interventions that overcome existing barriers. Various such interventions have been tested in sub-Saharan Africa with mixed effects. However, there is limited research on the effectiveness of arts-based interventions targeting depression and anxiety within this population.

#### Added value of this study

This study adds to the limited but growing body of literature on the effectiveness of simple interventions delivered by trained lay providers in sub-Saharan Africa. Specifically, it provides evidence that an arts-literacy intervention can reduce

depression symptoms among Kenyan adolescents, including those with clinically-elevated depression and anxiety symptoms.

#### Implications of all the available evidence

Simple interventions, such as arts-based interventions, that are delivered by lay-providers can reduce adolescent mental health problems in low-resource settings. If clinical significance of outcomes is established, this kind of intervention may prove useful in settings where mental health stigma, limited resources, and a shortage of professional caregivers limit access to mental health care. Further replication trials with larger sample sizes and longer follow-up periods are needed to assess the strength and sustainability of these effects and to provide additional evidence for the feasibility and scalability of this intervention.

## Introduction

Developing effective interventions for adolescent mood and anxiety disorders, which account for 45% of the global burden of disease in youths aged 15–19<sup>1</sup> and lead to negative health, physical, social, behavioural and economic outcomes,<sup>2</sup> is an urgent and critical global public health priority.<sup>3</sup> Such interventions may prove especially valuable in low-resource contexts, particularly in sub-Saharan Africa (SSA), where social and environmental stressors increase the risk of youth mental health problems<sup>4</sup> and where help is often inaccessible due to systemic and structural barriers.

Some of these barriers to youth mental health access include the length and cost of most evidence-based treatments (EBTs) in a region where incomes are low,<sup>5</sup> the fact that many EBTs require delivery by mental health experts like psychologists and psychiatrists in contexts affected by scarcity of experts,<sup>6</sup> government underspending in mental health infrastructure,<sup>7</sup> and a legacy of societal stigma around mental health which prevents young people from seeking help.<sup>8</sup> Additionally, many EBTs in SSA are adapted from Western research and practice without consideration of sociocultural appropriateness, co-development with local experts, or testing with local populations. As such, their efficacy may be handicapped by the limited generalizability of these interventions at a global scale.<sup>9</sup>

It seems that to expand access to youth mental health across SSA, there is a need for the development of interventions that can overcome the existing barriers to accessible youth mental healthcare in the region. Such interventions can complement existing EBTs and expand help-seeking avenues for SSA youths.<sup>10</sup> These efforts to develop interventions that complement EBTs in resource-constrained areas should be guided by four principles. They should: 1) rely upon simple evidence-based and/or theory-driven therapeutic protocols that

minimize the requirement of expert delivery, 2) be stigma-free in both the content of the protocols and in the context of delivery, 3) be designed to be easily scalable in order to meet the mental health needs of SSA youths, and 4) be delivered in community-based contexts like schools.<sup>11</sup>

To broaden the range of mental health interventions available for Kenyan youths, our interdisciplinary and multicultural Kenya—US team modified an arts-education protocol, known as Pre-Texts,<sup>12</sup> to address symptoms of depression and anxiety among Kenyan adolescents. Our approach was influenced by earlier research on the effectiveness of arts-based interventions in preventing or reducing emotional and behavioural issues among children and adolescents.<sup>13–15</sup>

Arts-based interventions broadly encompass a range of psychotherapeutic approaches that utilize art forms such as music, visual arts, dance, and drama to facilitate psychological change.<sup>16</sup> These interventions have demonstrated improvements in youth self-confidence, self-esteem, resilience, and a reduction in externalizing behaviours.<sup>13,15</sup> While there is evidence for small-to-medium improvements in youth depression and anxiety, the long-term effects of arts-based interventions remain unclear.<sup>15,17</sup>

Given the potential therapeutic benefits and cost-effectiveness of arts-based interventions that can be delivered by lay-providers, they offer a promising avenue for help-seeking for vulnerable youth in SSA. To this end, our team adapted the Pre-Texts protocol, which combines creative arts with literacy, for the treatment of adolescent depression and anxiety symptoms. Pre-Texts involves the use of a text—such an excerpt from a novel, a physics lesson, or a technical manual—to inspire art-making activities among a group of participants.<sup>12</sup> These activities are followed by collective (meta-cognitive/emotional) reflection, to which everyone is called to

contribute, on the process of interpretation of school materials through creative arts. For example, students may use an assigned reading to create a dance or book cover, after which they reflect on the process and their emotions.<sup>12,18,19</sup> Unlike standard art therapy, our approach combines academic challenges—which has been shown to be a source of common youth mental health problems among Kenyan youths—with artmaking with the intention of turning difficulty into a non-competitive, non-judgmental, collective challenge and supporting youth autonomy and communication. In this process, youth exercise agency and critical thinking.<sup>12,18</sup> For more information (and the full protocol) see the [Supplementary materials](#). Pre-Texts was originally developed to improve literacy, innovation, and citizenship in children aged 4–12 and has been used in classroom settings in the US (United States), Latin America, China, India, Zimbabwe, and elsewhere.<sup>12,18,19</sup>

Here, we adapted Pre-Texts in a school-based after-school intervention, delivered to adolescents in group sessions led by lay-providers aged 18–22 trained as facilitators. The administration of Pre-Texts in a school setting was chosen due to the accessibility of schools for mental health service delivery and the fact that most youth access mental health services through schools.<sup>20</sup> Additionally, in low- and middle-income countries such as Kenya, there are policies in place to keep students in school until completion of secondary education. We used task-shifting to lay-providers as recommended by the WHO (World Health Organization) as a means of increasing mental health access.<sup>21</sup> Furthermore, research in Kenya has proven the effectiveness of youth lay-providers, who only have a high school degree, in delivering school-based mental health interventions.<sup>22</sup>

Thus, the present study aimed to evaluate the effectiveness of Pre-Texts arts-literacy intervention for adolescent depression and anxiety in Kenyan high school students, using a randomized controlled trial (RCT). An active control condition, “study-skills”, was used to provide a rigorous comparison standard, with equal dosage and duration of activities for all participants. We hypothesized that compared to the active control group, participants receiving Pre-Texts would report greater reductions in depression and anxiety symptoms. As a universal intervention, where all interested youths could take part, a secondary goal was to assess the impact of Pre-Texts on adolescents who met the clinical cut-off for depression or anxiety.

## Methods

### Study design

We designed a 2-arm RCT with two groups to investigate the effect of the Pre-Texts intervention on youth depression and anxiety compared to an active control group focused on study skills. The study was conducted

in Kibera, a large impoverished urban neighbourhood in Nairobi, Kenya. As youths in Kibera who have limited access to mental health care options are exposed to significant challenges and stressors including violence and crime, financial hardship, drug use, and other psychosocial disadvantages, we believed that this would be a suitable location for a low-cost and potentially scalable mental health intervention.

Participants were recruited from 2 community-run schools—funded by local community and well-wishers instead of the government—that cater to students from Kibera and surrounding areas. Such schools, and secondary schools in general, provide an excellent setting for disseminating youth mental health interventions in Kenya because they provide more accessible options for youths<sup>11</sup> and because governments are implementing policies to ensure that many adolescents transition to, and stay in, secondary schools. Additionally, in low-resource contexts like Kibera, schools may serve as a safe space for students, but on the other hand school-related academic stress has emerged as a significant stressor for youth mental health problems.<sup>23</sup>

### Ethics statement

The study procedures were approved by the Maseno University Ethics Review Committee (MUERC) in Kenya, and we obtained a research permit from the National Commission for Science, Technology, and Innovation (NACOSTI). Informed consent or assent for minors was obtained from all participants, and parental consent was obtained through the school administration for all minors. The study was pre-registered at the Pan African Clinical Trials Registry (PACTR; registration number: PACTR202111497122432) per WHO and the International Committee of Medical Journal Editors (ICMJE) guidelines. The complete study protocol was pre-registered, and it can be found in the [Supplementary materials](#).

### Participants

To be eligible for participation in the study, participants had to be enrolled in either schools. Students in Forms 1, 2, and 3 (Grades 9–11) aged between 12 and 19 were offered the opportunity to take part, and no other exclusion criteria were applied. As this was a universal study, all interested students were eligible. Study recruitment occurred in August 2021. The research team introduced the study and its purpose to interested students during a school gathering, explaining that it was focused on testing the efficacy of an after-school program that may improve youth mental health, wellness, and academic functioning. A total of 307 students were invited to take part, 281 expressed interests by completing an interest form, and 235 of them gave consent/assent. Please refer to [Fig. 1](#) for the CONSORT flowchart and [Table 1](#) for sample characteristics.

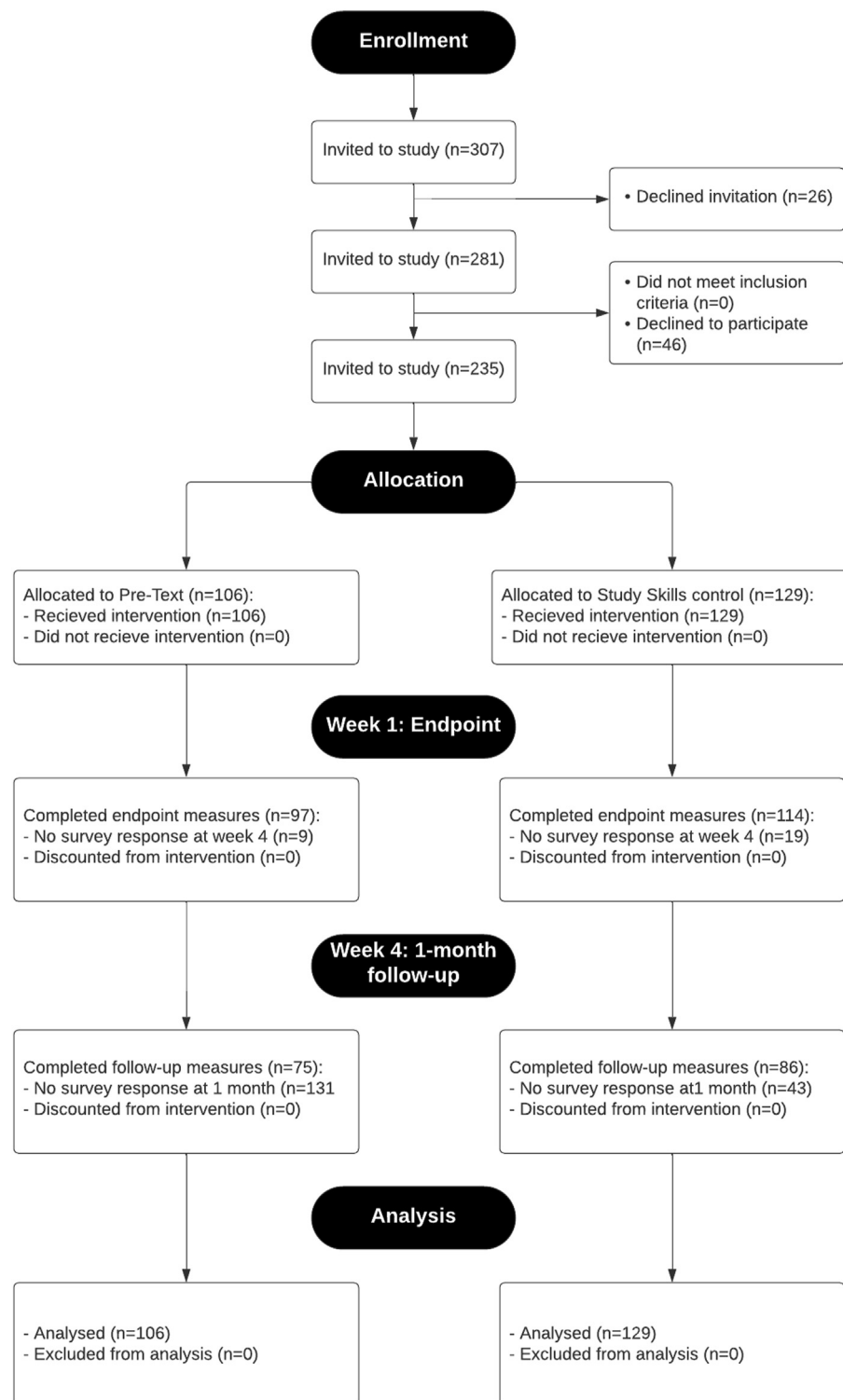


Fig. 1: CONSORT flow diagram.

Variable	No. (%)		
	Total (N = 235)	Pre-Texts (N = 106)	Study skills (N = 129)
Age, mean (SD)	16.36 (1.17)	16.34 (1.28)	16.37 (1.09)
Sex			
Female	125 (53.19)	54 (50.94)	71 (55.04)
Male	110 (46.81)	52 (49.06)	58 (44.96)
Symptom levels, mean (SD)			
Depression (PHQ-8)	8.35 (4.97)	8.29 (5.30)	8.40 (4.69)
Anxiety (GAD-7)	7.36 (4.60)	7.45 (4.92)	7.29 (4.32)
Form (school grade)			
1	68 (27.64)	32 (30.19)	36 (28.68)
2	71 (30.21)	34 (32.07)	37 (28.68)
3	96 (40.85)	40 (37.74)	56 (43.44)
School			
A	135 (57.45)	64 (60.38)	71 (55.04)
B	100 (42.55)	42 (39.62)	58 (44.96)

Note: PHQ-8 = Patient Health Questionnaire-8; GAD-7 = Generalized Anxiety Disorder Screener-7.

**Table 1: Sample characteristics at baseline.**

### Randomisation and masking

Interested students were randomized to either the Pre-Texts or Study Skills group using a random number generator written in R version 4.0.3. Participants were then randomized, on-site, to either the Pre-Texts intervention group or the study skills control intervention. After this, participants were then also randomly assigned to groups of 5–16 youths (average group size = 10).

### Procedures

Students who provided consent were invited to take part in the study and were informed that they should meet with their groups at the scheduled time and location if they wished to participate. After randomization, participants were assigned to groups consisting of 5–16 youths. A youth group facilitator was assigned to lead each group, as described below. The study was conducted as an afterschool program, with students meeting in their groups daily for 1 h over a one-week period, for a total of five meetings lasting 5 h in total. These group meetings were held concurrently during the 4–5 pm slot allotted for school activities, with each group being led by the same facilitator throughout the program. Participants completed outcome measures at baseline, at endpoint (after one week), and at the 1-month follow-up. At the end of the study, participants also gave feedback on the feasibility and acceptability of the program through a feedback survey. It is important to note that the initial study protocol Pre-Texts sessions held weekly and included a midpoint and 2-week follow-up assessment. However, as our study took place in 2021, the realities imposed by the COVID-19 pandemic and subsequent government-directed changes to the school calendar necessitated that the

study design be modified to 5 daily sessions spread over one week.

### Group facilitator selection and training

Both the Pre-Texts and study skills groups were led by trained group facilitators who were between 18 and 22 years old, with an average age of 21.3 years. To qualify as a facilitator, one needed to have a high school diploma and be from around the Nairobi area. Semi-structured interviews were conducted by the lead author with study staff, following a recent protocol on recruiting and training youth lay-providers for school-based mental health interventions.<sup>22</sup> The interviews assessed past experiences, interest in the program, general familiarity with mental health issues, and interpersonal skills.

All facilitators received 20 h of training that covered both Pre-Texts and study skills content, led by the first author. The training included general communication and group facilitation skills, as well as referring students in need to proper school resources. The training followed a validated protocol for youth lay-providers that has been widely used in Kenya.<sup>22</sup> In addition to didactic training, facilitators learned how to use challenging texts as raw material for artmaking. Facilitators were randomly assigned to groups in each school, with each facilitator leading both Pre-Texts and study skills groups. The study team provided weekly supervision meetings for all facilitators.

### Intervention arms

**Pre-Texts.** Pre-Texts is a creative arts-literacy intervention that involves five 1-h sessions spaced 1 day apart, including between-session homework exercises that encourage students to go off on tangents related to

the text. The intervention is suitable for a variety of texts, including literary, technical, and scientific works, and is delivered in English, with group facilitators having the discretion to conduct group exercises in either English or Kiswahili.

Each session begins with a warm-up exercise and the distribution of “raw materials” including recycled paper, cardboard, pencils, crayons, and markers. After this, participants are invited to practice an art activity that exploits the text as inspiration. The art activity is designed to help students deepen their understanding of the text and to engage with its themes and messages on a more personal level. Participants are then given time to reflect on the art activity and to share their thoughts and feelings with the group.

A unique aspect of the Pre-Texts intervention is that it invites students to draw on their own experiences and cultural backgrounds to enrich their understanding of the text rather than on pre-existing and prescribed interpretations. Students are encouraged to use local arts, languages, traditions, and tastes as resources for learning, which makes the intervention more engaging and relevant to their own lives.

The full Pre-Texts protocol is available in the online [Supplementary materials](#), which provide detailed instructions on how each session was conducted, as well as guidance on how to adapt the intervention for different age groups and cultural contexts.

**Study-skills control.** We used a study skills control intervention, which has been previously used in clinical trials with Kenyan youths to address academic pressure that contributes to depression and anxiety.<sup>24</sup> The study skills intervention focused on notetaking, time management, and effective reading strategies and involved didactic sessions, group discussions, and activities to practice the skills. The structure of the sessions mirrored that of the intervention sessions, and the full protocol is available in the [Supplementary materials](#).

**Outcomes.** Our primary outcomes were depression and anxiety symptoms. To evaluate adolescent depression symptoms, we used **PHQ-8 (Patient Health Questionnaire 8)**, a validated diagnostic and severity measure that consists of eight items.<sup>25</sup> The PHQ-8 excludes the suicidal ideation item and has similar cut-off norms to the PHQ-9, which is highly correlated.<sup>25</sup> Here, Cronbach’s alpha for the PHQ-8 was 0.72.

For assessing adolescent anxiety, we employed the GAD-7 (Generalized Anxiety Disorder Screener 7), a widely used and validated tool consisting of seven items with established cut-off norms.<sup>26</sup> Here, Cronbach’s alpha for the GAD-7 was 0.73.

Both the PHQ-8 and GAD-7 were self-reported and have been validated and used in clinical trials with Kenyan adolescents.<sup>23,27</sup>

**Statistical analysis.** To determine the necessary sample size for our study—aiming for a power of 0.80 to detect an effect size of  $d = 0.30$ , with an  $\alpha$  level of 0.05 over 3 measurement points—we performed a power analysis utilizing Optimal Design. This analysis necessitated a total of 150 participants per condition. Given the assumption of a 10% attrition rate, we planned to recruit approximately 330 participants. However, due to the constraints posed by the COVID-19 pandemic in 2021, our final recruitment numbered 281 students.

The data structure of our study was both hierarchical and clustered, comprising four nested levels: participants (level 1) grouped within groups (level 2), themselves nested within group facilitators (level 3), and finally within schools (level 4). Moreover, as different groups met on varying days, group leaders sometimes facilitated multiple groups, resulting in unstructured cross-classification. Thus, we employed random intercept linear mixed-effects models using the lme4 package in R version 4.3.0. We operationalized our primary outcome, the difference between the two groups (with “Study Skills” serving as a reference), as a Time \* Condition interaction. Our models also accounted for age and sex as covariates, given their use in stratified randomization. We calculated Cohen’s  $d$  values to compare mean gain scores between the Pre-Texts and control groups from baseline to the 1-month follow-up.

Further, as a secondary outcome, our study sought to understand the impact of Pre-Texts on participants meeting clinical cut-offs for symptoms of depression and anxiety. To this end, we utilized the norms established in previous studies with Kenyan youths.<sup>24,28</sup> As with our primary outcome, we calculated effect sizes (ESs) using mixed-effects models.

Our study adopted an intent-to-treat approach; missing data points were imputed via the Fully Conditional Specification (FCS) approach, leveraging the multivariate imputation by chained equations (MICE) algorithm in R.<sup>29</sup> Analyses were performed on 20 imputed datasets and the results subsequently pooled. Detailed statistical analyses can be found in the [Supplementary materials](#). The underlying R code and datasets have been made available in our Open Science Framework repository.

Given attrition, we conducted sensitivity analyses that utilized two models for each outcome: 1) the intent-to-treat approach where all randomized participants and employing the aforementioned imputation methods, and 2) a sensitivity analysis with only the actual observations (i.e., unimputed data); we report findings from this assessment in the [Supplementary materials](#). Finally, to calculate whether the difference in scores resulted into clinically reliable change, we calculated the Reliable Change Index (RCI)<sup>30</sup> using the formula  $RCI = \frac{X_2 - X_1}{SE_{diff}}$  where  $X_2$  is score at 1-month follow-up,  $X_1$  is score at baseline, and  $SE_{diff}$  is the standard error of the difference between the two scores calculated as



$SE_{diff} = \sqrt{2(SE^2)}$  where SE, the standard error of measurement, is calculated as  $SE = SD \times \sqrt{1-r}$  where SD was drawn from standard deviations from baseline and the reliability measure, *r*, derived from prior studies of the psychometrics of the PHQ-8 and GAD-7 with Kenyan youth.

**Role of the funding source.** The funding bodies had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. All authors had full access to the data and had final responsibility for the decision to submit for publication.

## Results

### Sample characteristics

Some 235 adolescents with a mean age of 16.36 years (SD = 1.17) took part in the study, with sample characteristics such as age, gender, form, and school listed in Table 1. Of these, 106 were randomized to the Pre-Texts intervention group (M age = 16.34, SD = 1.28), and 129 were randomized to the Study-Skills control group (M age = 16.37, SD = 1.09). As expected, depression and anxiety symptoms were positively correlated ( $r = 0.67$ ).

### Primary outcomes

#### Intervention effects on adolescent depression symptoms

The model predicting self-report depression symptoms revealed non-significant effects for time, intervention condition, and the covariates age and sex, but significant Time × Condition interaction effects at 1-month follow-up ( $B = -0.68$ ,  $SE = 0.018$ ,  $p = 0.00$ ; see Table 2). The Time × Condition effect showed that youths who received the Pre-Texts intervention experienced greater reductions in depressive symptoms from baseline to 1-month follow-up compared to those in the control group ( $d = 0.52$ , 95% CI [0.19, 0.84]; see Table 3 and Fig. 2). Sensitivity analyses with only actual observations (i.e., un-imputed data) revealed similar effects (see Supplementary materials).

#### Intervention effects on adolescent anxiety symptoms

The model predicting self-reported anxiety symptoms revealed non-significant effects for condition, age and sex, but significant effects for Time ( $B = 0.25$ ,  $SE = 0.12$ ,  $p = 0.031$ ) and Time × Condition interaction effect at 1-month follow-up ( $B = -0.62$ ,  $SE = 0.18$ ,  $p = 0.008$ ; see Table 2). This significant effect showed that adolescents who received the Pre-Texts intervention experienced greater reductions in anxiety symptoms from baseline to 1-month follow-up compared to control-group youths ( $d = 0.51$ , 95% CI [0.20, 0.81]; see Table 3 and Fig. 2). Sensitivity analyses with only actual observations (i.e., un-imputed data) revealed similar effects (see Supplementary materials).

### Secondary outcomes

#### Intervention effects on depressive symptoms for the sub-sample of adolescents with elevated depression symptoms at baseline

We investigated the effects of Pre-Texts on a subsample of youths who reported elevated depression symptoms at baseline (PHQ-8 ≥ 10). Of the 235 youths in our sample, 83 youths (Pre-Texts = 38; Study skills = 45) met this criterion. The mean baseline PHQ-8 scores for youths in this subsample was 13.79 (SD = 2.71) in the Pre-Texts group and 13.44 (SD = 2.70) in the study skills control group. The model predicting self-reported depressive symptoms revealed nonsignificant effects for Condition, Time, and Age but significant effects for Sex ( $B = 1.51$ ,  $SE = 0.65$ ,  $p = 0.023$ ; See Table 2), and Time × Condition interaction effects ( $B = -1.95$ ,  $SE = 0.30$ ,  $p < 0.001$ ; See Table 2). The significant Time × Condition effect revealed that adolescents who received the Pre-Texts intervention experienced larger declines in depression symptoms from baseline to 1-month follow-up than control-group youths ( $d = 1.10$ , 95% CI [0.46, 1.75]; See Table 3 and Fig. 3). Sensitivity analyses with only actual observations (i.e., un-imputed data) revealed similar effects (see Supplementary materials).

#### Intervention effects on anxiety symptoms for the sub-sample of adolescents with elevated anxiety symptoms at baseline

We investigated the effects of Pre-Texts on a subsample of youths who reported elevated anxiety symptoms at

Predictors	Full sample						Elevated—symptoms subsample					
	PHQ-8			GAD-7			PHQ-8			GAD-7		
	B	SE	<i>p</i>	B	SE	<i>p</i>	B	SE	<i>p</i>	B	SE	<i>p</i>
(Intercept)	8.14	3.74	<b>0.030</b>	9.16	3.73	<b>0.014</b>	9.28	4.43	<b>0.038</b>	14.66	5.65	<b>0.010</b>
Time	0.13	0.12	0.278	0.25	0.12	<b>0.031</b>	-0.17	0.21	0.387	-0.08	0.23	0.718
Condition (Pre-Texts)	-0.27	-0.59	0.653	-0.04	0.58	0.940	-0.32	0.79	0.691	-0.06	0.90	0.940
Sex (male)	0.58	0.54	0.282	0.03	0.54	0.961	1.51	0.65	<b>0.023</b>	0.79	0.80	0.326
Age	-0.01	0.23	0.951	-0.14	0.23	0.549	0.12	0.27	0.641	-0.26	0.34	0.446
Time * condition (Pre-Texts)	-0.68	0.18	<b>&lt;0.001</b>	-0.62	0.18	<b>&lt;0.001</b>	-1.95	0.30	<b>&lt;0.001</b>	-0.65	0.35	0.065

Note: PHQ-8 = Patient Health Questionnaire-8; GAD-7 = Generalized Anxiety Disorder Screener-7; SE = standard error. Statistically significant values are indicated in bold ( $p < 0.005$ ).

Table 2: Results of linear mixed models predicting intervention effects on self-reported depression and anxiety symptoms.

	Pre-Texts			Study skills control			Cohen's d, based on mean gain score [95% CI] (baseline to 1-month follow-up)	Reliable change index (RCI; baseline to 1-month follow-up)
	Baseline (M, [SD])	Endpoint (M, [SD])	1-month follow-up (M, [SD])	Baseline (M, [SD])	Endpoint (M, [SD])	1-month follow-up (M, [SD])		
Effect on full sample:								
• Depressive symptoms	8.29 (5.30)	6.57 (4.64)	5.69 (4.23)	8.40 (4.69)	7.81 (4.49)	8.37 (5.53)	<b>0.52 [0.19, 0.84]</b>	0.94
• Anxiety symptoms	7.45 (4.92)	5.90 (4.70)	5.33 (4.19)	7.29 (4.32)	6.65 (4.53)	7.55 (5.22)	<b>0.51 [0.20, 0.81]</b>	0.92
Effect on elevated-symptoms subsample:								
• Depressive symptoms	13.79 (2.71)	7.79 (4.25)	6.99 (4.32)	13.44 (2.70)	9.34 (4.65)	10.88 (5.01)	<b>1.10 [0.46, 1.75]</b>	<b>4.83</b>
• Anxiety symptoms	12.38 (2.76)	7.57 (4.87)	8.18 (4.50)	12.26 (2.39)	8.49 (4.53)	10.17 (5.24)	0.54 [-0.07, 1.45]	<b>3.24</b>

Note: For depressive and anxiety symptoms, lower scores indicate better functioning. For functioning. Where applicable, Cohen's d values were corrected (multiplied by -1.0) such that positive values indicate greater improvements for intervention-group participants versus control-group participants. Significant gains are highlighted in bold.

**Table 3: Mean and effect sizes comparing mean gains (Cohen's d) and reflecting symptom reduction from baseline to 1-month follow-up for youths receiving the Pre-Texts intervention versus study-skills control intervention.**

baseline ( $GAD-7 \geq 10$ ). Of the 235 youths in our sample, 72 youths (Pre-Texts = 38; Study skills = 34) met this criterion. The mean baseline GAD-7 scores for youths in this subsample was 12.38 (SD = 2.76) in the Pre-Texts group and 12.26 (SD = 2.39) in the study skills control group. The model predicting self-reported anxiety symptoms revealed nonsignificant effects for Time, Condition, and the covariates Age and Sex, and Time x Condition ( $B = -0.65$ ,  $SE = 0.35$ ,  $p = 0.065$ ; See Table 2).

This suggests that youths who received Pre-Texts generally experienced larger declines in anxiety symptoms from baseline to 1-month follow-up than control-group youths ( $d = 0.54$ , 95% CI [-0.07, 1.45]; See Table 3 and Fig. 3). Sensitivity analyses with only actual observations (i.e., un-imputed data) revealed similar effects but a significant Time x Condition interaction ( $B = -0.92$ ,  $SE = 0.36$ ,  $p = 0.012$ ; see Supplementary materials).

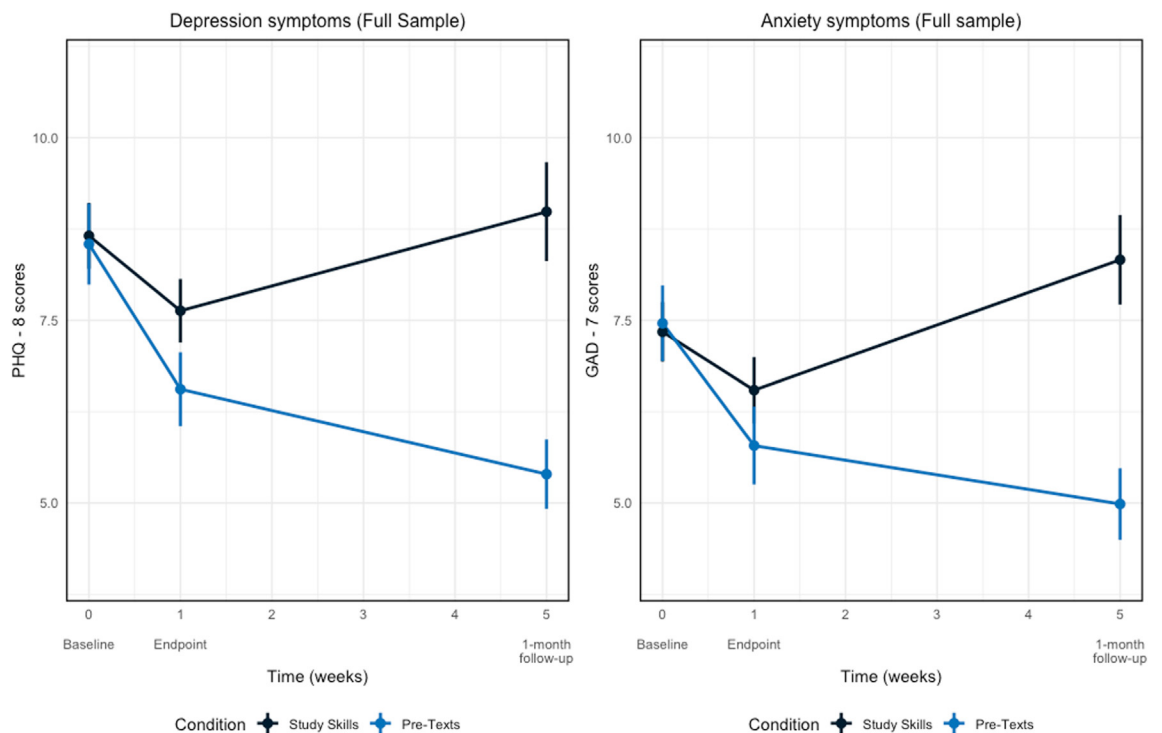
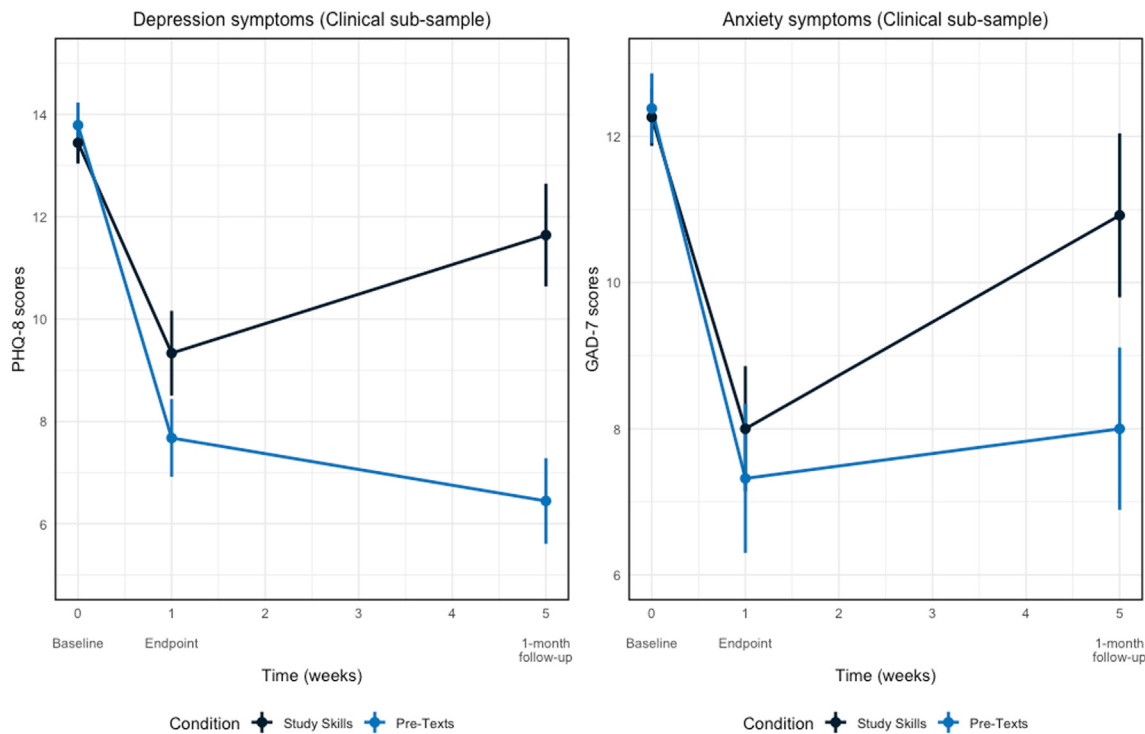


Fig. 2: Fitted values showing trajectories of youth depressive and anxiety symptoms for the full sample of adolescents in the present study.





**Fig. 3:** Fitted values showing trajectories of youth depressive and anxiety symptoms for the subsample of adolescents with elevated depression and anxiety symptoms.

#### Clinically reliable change

In the complete sample, participants receiving Pre-Texts did not achieve the threshold for clinically reliable change in depression (RCI = 0.94) and anxiety (RCI = 0.92) symptoms from baseline to one-month follow-up. However, in the subgroup of participants with clinically elevated symptoms at baseline, those who received Pre-Texts met the threshold for clinically reliable change for both depression (RCI = 4.83) and anxiety (RCI = 3.24) symptoms within the same timeframe.

#### Fidelity, feasibility and acceptability

Treatment fidelity was assessed by two unaffiliated raters evaluating 20% of randomly selected sessions. The Gwet AC2 statistic measured inter-rater agreement. On a 1–7 scale, group leaders performed well in adherence to intervention protocol (6.41; AC2 = 0.93), task completion (6.45; AC2 = 0.91), thoroughness (6.69; AC2 = 0.93), skilfulness (6.03; AC2 = 0.95), clarity (6.80; AC2 = 0.96), and purity, meaning no incorporation of extraneous intervention elements (6.86; AC2 = 0.84).

Participants also rated their understanding and usefulness of the interventions and their recommendation likelihood on a 1–5 scale. Independent *t*-tests showed both Pre-Texts and study skills groups had high mean ratings. No significant differences were found in understanding the program content (Pre-Texts: *M* = 3.50,

*SD* = 0.87; Study skills: *M* = 4.72, *SD* = 0.49) or in recommending the interventions (Pre-Texts: *M* = 4.52, *SD* = 1.16; Study skills: *M* = 4.76, *SD* = 0.81).

#### Discussion

This study examined the efficacy of Pre-Texts, an arts-based intervention integrating art-making activities with school texts and reflective exercises, targeting depression and anxiety symptoms among Kenyan adolescents. Delivered as an afterschool program by trained youth lay-providers, Pre-Texts significantly ameliorated self-reported depression and anxiety symptoms compared to a study skills control group, from baseline to 1-month follow-up. In a subsample with clinically elevated symptoms at baseline, Pre-Texts proved effective in reducing depressive symptoms, with potential effectiveness on anxiety symptoms. Both Pre-Texts and study skills groups were rated comparably high and perceived as equally beneficial and comprehensible, demonstrating similar recommendability to peers. These findings suggest that the discernible difference in effectiveness between the two programs can be attributed to Pre-Texts' capacity to address mental health issues, rather than its general acceptability or appeal. To our knowledge, this research is among the initial investigations into the efficacy of an arts-based

intervention for depression and anxiety symptoms among Kenyan and other Sub-Saharan African populations.

Our study adds to recent research demonstrating the effectiveness of brief, lay-provider delivered interventions in Kenya. Similar to trials of the Shamiri intervention—which teaches growth mindset, gratitude, and value affirmations—Pre-Texts led to significant reductions in depression and anxiety symptoms.<sup>28</sup> These findings also align with research on “wise” interventions from Western samples<sup>31</sup> and other global mental health interventions.<sup>32</sup> It seems that simple and scalable interventions, like the arts-based Pre-Texts, can help surmount the challenges of stigma and a scarcity of professional experts, thereby contributing significantly to intervention development efforts with a view towards closing the youth mental health treatment gap.

Our study found inconsistent effects on anxiety symptoms among a subset of youths presenting elevated anxiety symptoms at baseline with discrepancies observed between the model with observed data, which suggested a significant effect, and the model with imputed data, which did not. The broad confidence interval of the effect size ( $d = -0.07$  to  $1.45$ ) suggests the sub-sample of 72 participants may have been underpowered to fully assess the impact of Pre-Texts on anxiety symptoms. Larger future replications are necessary to clarify these effects. If Pre-Texts indeed mitigates anxiety symptoms, the mechanisms facilitating such alleviation warrant further investigation. Conversely, if no effects are observed, it aligns with recent thinking that suggests guided exposure to feared stimuli as the most effective anxiety intervention for youths,<sup>5</sup> a challenging element to incorporate into an art-based intervention like Pre-Texts.

Interestingly, our control group using a study skills intervention may have inadvertently addressed a significant anxiety source for Kenyan youths: academic pressure.<sup>33</sup> Kenyan secondary students often face substantial anxiety linked to the profound impact of exam performance on future educational and occupational opportunities.<sup>33</sup> Given that our intervention coincided with the third school term characterized by intense exam preparation, the study skills intervention may have targeted and alleviated a key anxiety source. This observation underscores the importance of prudent control condition selection in future trials.

Nevertheless, the study found that many Kenyan youths found the intervention understandable, helpful, and would recommend it to their friends, which is encouraging for reducing the stigma associated with help-seeking.<sup>8</sup> Future studies should investigate the extent to which Pre-Texts can reduce stigma.

The mechanisms underlying change in arts-based interventions, like Pre-Texts, remain to be definitively ascertained. Despite their routine integration into child and adolescent mental health services in the West,

rigorous testing of these interventions in controlled trials is sparse.<sup>13,14</sup> Even where tests have occurred, standard reporting guidelines and validated assessments tools have not always been employed,<sup>13,15</sup> handicapping our ability to conclusively understand how these interventions improve youth mental health. Nevertheless, some theories suggest that interventions like Pre-Texts work by increasing individual agency and connectedness with the environment, thus bolstering self-belief, autonomy, and emotional affiliation.<sup>14,15,34</sup>

In the specific context of Pre-Texts—where youths engage in art-making activities inspired by texts, with a subsequent collective reflection on the process—we hypothesize, and future research is definitely needed to offer deeper insights, that this methodology provides opportunities for supported risk-taking, promoting resilience, confidence, independence, and creative learning—factors that may alleviate or prevent mental health problems.<sup>14,15,34</sup> Moreover, creativity and communication emerge as influential factors in mental health improvement. Perhaps the unique feature of Pre-Texts, incorporating academic challenges into art-making, transforms potential distress into empowering challenges, fostering autonomy, communication, critical thinking, and decision-making.<sup>12</sup> Unfortunately, our study only reports on the efficacy of Pre-Texts on youth mental health outcomes.

Our study's limitations include a sample size insufficient to detect small to medium differences between conditions. Nevertheless, due to the novelty and hypothesis-generating potential of our study, as well as the need for an expansive catalogue of mental health help-seeking options in SSA, our study is heuristically valuable albeit our findings should be considered suggestive rather than definitive. Future larger-scale studies could offer stronger assessment of this intervention. Such studies should also consider minimizing the potential risk of contamination—which is also a limitation in the present study—and strengthen internal validity though those efforts should consider the enhanced ecological validity that a “real-world” setting offers.

Furthermore, our one-month follow-up, although longer than most reported in meta-analyses of youth mental health interventions across 50 years,<sup>35</sup> remains relatively brief. Future studies are needed to gauge the durability of the effects across an extended follow-up period. In addition to exploring the intervention's long-term effects, investigating optimal dosage would also provide more comprehensive insights.

Lastly, we utilized Western-developed standardized instruments to assess depression and anxiety symptoms. Despite their proven psychometric validity and widespread use in Kenyan youth clinical research, cross-cultural research reveals potential limitations. These tools might not fully capture the culturally specific features of mental health distress among Kenyan youth, such as symptom presentations or the role of social and

environmental issues.<sup>9</sup> Future research should consider supplementing these tools with locally co-developed measures to ensure a more culturally sensitive approach.

In conclusion, our research indicates that Pre-Texts, a cost-effective arts-based intervention facilitated by youth lay-providers in an afterschool group setting, might effectively alleviate depression and anxiety symptoms in adolescents residing in a large, low-income urban neighbourhood in Kenya. While further study is needed to determine the intervention's potency and longevity, our findings highlight that simple, scalable, and low-stigma community-based interventions can address the mental health requirements of underprivileged youth in resource-constrained settings. This study paves the way for novel research and intervention methodologies that harness the power of creative expression and cultural engagement to address adolescent mental health issues from unique perspectives. Future research is encouraged to explore such interventions to bridge the mental health needs-services gap and expand the array of help-seeking options available to underserved youth.

#### Contributors

T.L.O., D.S., and D.M.N. contributed to the conceptualization and design of the study. T.L.O. and D.M.N. were involved in the acquisition, analysis, and interpretation of the data, with T.L.O. conducting the statistical analysis. T.L.O., D.S., and P.L.S. contributed to the initial drafting of the manuscript, while T.L.O., D.S., P.L.S., V.M., and D.M.N. all provided critical revisions for intellectual content.

#### Data sharing statement

De-identified individual participant data that underlie our study's results will be openly available for 3 years post-publication. Access is unrestricted for anyone seeking to use the data.

#### Declaration of interests

Mr. Osborn is employed by Shamiri Institute (a mental health non-profit in Kenya). Drs. Mutiso and Ndeti are employed by the Africa Mental Health Research and Training Foundation.

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#### Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.eclinm.2023.102288>.

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