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Single-session interventions for adolescent anxiety and depression symptoms in Kenya: A cluster-randomized controlled trial

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ABSTRACT

Objective: Expanding mental healthcare for adolescents in low-income regions is a global health priority. Group interventions delivered by lay-providers may expand treatment options. Brief, positively-focused interventions conveying core concepts of adaptive functioning may help reduce adolescent symptoms of mental illness. In this trial, we tested three such interventions (growth mindset, gratitude, and value affirmation) as separate single-session interventions.

Method: Consenting adolescents (N = 895; M_{age} = 16.00) from two secondary schools in Kenya were randomized by classroom (24 classrooms; M_{class} = 37.29 students) into single-session interventions: growth (N = 240), gratitude (N = 221), values (N = 244), or an active study-skills control (N = 190). Mixed-effects models controlling for age and gender were used to estimate individual-level intervention effects on anxiety and depression symptoms.

Results: Within the universal sample, the values intervention produced greater reductions in anxiety symptoms than the study-skills control ($p < .05$; d = 0.31 [0.13-0.50]). Within the clinical sub-sample (N = 299), the values ($p < .01$; d = 0.49 [0.09-0.89]) and growth interventions ($p < .05$; d = 0.39 [0.01-0.76]) produced greater reductions in anxiety symptoms. There were no significant effects on depression.

Conclusions: The values intervention reduced anxiety for the full sample, as did the growth mindset and values interventions for symptomatic youths. Future efforts should examine durability of these effects over time.

Mental health problems are the leading cause of disability among adolescents worldwide (The Lancet, 2017). Yet, in many low-resource countries where this burden is exacerbated, there is a severe shortage of treatment options (Collins et al., 2011). In sub-Saharan Africa (SSA), government investment in mental health care is $0.20 per capita annually (Caddick, Horne, Mackenzie, & Tilley, 2016), and there are few trained mental health specialists. For example, in Kenya, there are only 1.8 psychiatrists per million citizens (70 times lower than the median figure in high-income countries; World Health Organization, 2019). Moreover, across SSA countries, societal stigma towards mental illness impedes help-seeking (Ndetei et al., 2016). Consequently, nearly all youths with mental health problems in SSA remain untreated (Erskine et al., 2017).

The need for mental health interventions is profound in Kenya, as previous research has revealed high rates of Kenyan adolescents scoring above clinical cutoffs for depression (45.90%) and anxiety (37.99%) symptoms (Osborn, Venturo-Conerly, Wasil, Schleider, & Weisz, 2020). Additionally, several other factors increase need for mental healthcare and inhibit access for Kenyan adolescents. First, the stigma associated with mental health problems inhibits help-seeking (Ndetei et al., 2016). Additionally, the stress associated with poverty exacerbates mental health issues (McLeod & Shanahan, 1996). Finally, Kenyan high school

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students face significant psychosocial stress from a high-stakes education system in which school failure may presage a lifetime of poverty. The system includes a demanding end-of-secondary-school examination (Yara & Wanjohi, 2011) in which scores largely determine university and career possibilities, adding academic pressure and chronic stress that could increase the risk of mental health problems (Patel & Kleinman, 2003).

Accordingly, developing interventions that target the needs of this population seems imperative. Youth in high-stigma and low-resource environments such as Kenya may especially benefit from scalable and school-based interventions designed to limit stigma (through use of simple psychological principles rather than references to psychopathology) and skill requirements for providers (by employing lay-providers).

Indeed, literature on brief psychological interventions—including "wise" interventions (see Walton, 2014, for a full review) and character-strength interventions—illustrate that interventions focused on a single core concept of adaptive functioning (e.g., growth mindset) and targeting specific psychological processes (e.g., beliefs about one's ability to improve) can improve mental health (Schleider & Weisz, 2018; Walton, 2014). By focusing on one core element, such interventions offer clarity, increasing their suitability for rapid uptake. Additionally, such interventions may help circumvent stigma by focusing on principles related to positive human ideals rather than psychopathology.

Evidence suggests that these wise and character-strength interventions can reduce symptoms of psychopathology and improve psychological wellbeing. Growth mindset interventions, which encourage viewing challenges as opportunities for growth, have been found to improve academic performance and reduce depression and anxiety symptoms in only one session (Schleider & Weisz, 2018; Yeager et al., 2016). Gratitude interventions, which promote recognizing and expressing gratitude, are typically brief and simple and have been shown to increase life satisfaction and prevent depression (Froh, Kashdan, Ozimkowski, & Miller, 2009). Value affirmation interventions, which prompt individuals to identify and act on their personal values, have been shown to boost academic performance and improve stress responses in a single-session (Cohen, Garcia, Purdie-Vaughns, Apfel, & Brzustoski, 2009; Creswell et al., 2005).

In fact, there is evidence from Kenya suggesting the potential of wise interventions, when combined, to reduce psychopathology. The Shamiri ("thrive" in Kiswahili) intervention combines growth mindset, gratitude, and value affirmations into a four-week, lay-provider-delivered, and group-based intervention for adolescents with elevated depression and anxiety. The full Shamiri intervention, tested with Kenyan high school students, reduced depression and anxiety symptoms and improved academic grades relative to a study-skills control group (Osborn, Wasil, Venturo-Conerly, Schleider, & Weisz, 2020; Osborn, Venturo-Conerly et al., 2021). A single-session, digital adaptation of the full *Shamiri* intervention reduced symptoms of depression, but not anxiety, in both a high-symptom and universal sample of Kenyan adolescents (Osborn et al, 2020). This evidence supports the effectiveness of wise and character-strength interventions for improving mental health in low-resource, high-stigma settings.

However, combining three wise interventions has (a) made it difficult to discern which specific interventions are helpful and which are not, and (b) resulted in an intervention better suited for delivery to a smaller number of students with elevated symptoms —four weekly sessions, with associated cost, logistical complexity, and person-power requirements that impact intervention scalability and reduce the potential of the intervention as a universal intervention. In most trials of the full Shamiri intervention, it has been tested only for youth with elevated symptoms of depression and anxiety, and this has necessitated screening to identify the most symptomatic youths. In a context in which screening using symptom questionnaires cannot be completed electronically due to lack of access to devices, screening, especially of the hundreds of interested students at a participating school, whose data must then be entered and analyzed prior to even beginning intervention sessions, adds considerable logistical complexity, cost, and person-power requirements, further undermining scalability.

In the present randomized controlled trial, we sought to address these limitations by testing the three wise interventions separately, in the highly scalable format of universal single session interventions implemented by lay-providers. This is consistent with recent calls for assessment of the effects of individual therapeutic elements to help streamline psychotherapies (Leijten, Weisz, & Gardner, 2021). In the current study, we tested several key, short-term outcomes of a universal, classroom-based, single-session version of each component of *Shamiri* (i.e., growth, gratitude, and value affirmation) against an active control intervention in Kenyan secondary schools. To test these intervention elements in conditions representative of real-world delivery, participants were randomized by classroom (i.e., cluster randomized) to conditions, though the outcomes of interest were measured at the individual level. This can serve as a necessary first step in determining whether each single element is effective enough on its own to warrant further testing of long-term effects.

Lay-providers were trained to deliver the single-session intervention sessions. According to a recent review, employing lay-providers to administer evidence-based treatments is both effective and cost-effective (Barnett, Gonzalez, Miranda, Chavira, & Lau, 2018), and local lay-providers are particularly well-poised to deliver culturally appropriate and non-stigmatizing care (Singla et al., 2017). We hypothesized that all three intervention conditions would be acceptable and would outperform the active control in reducing symptoms of anxiety and depression, but there was insufficient prior evidence to inform any prediction about differences among the three interventions. Study outcomes could help clarify whether some intervention elements are more effective than others, informing choice of elements when time and resources are limited, and guiding efforts to maximize efficiency.

1. Methods

1.1. Trial design and registration

This trial was pre-registered at the Pan African Clinical Trials Registry (PACTR201906667800993), following WHO and ICMJE standards. Participants completed assessments at baseline and 2-week follow-up. De-identified datasets and R files can be accessed at https://osf.io/6qtjc/.

1.2. Study setting

The study took place in two public boarding high schools in Kiambu County, Kenya, one all-boys, the other all-girls. Both schools are ranked as sub-county schools (the lowest academic ranking) by the Ministry of Education, and annual student expenditure is $275 per student (Ministry of EducationScience and and Technology, 2016). Kenyan school-going adolescents are fluent in written and oral English (Ndetei et al., 2008).

1.3. Participant recruitment and resulting sample

Study procedures were approved by the Maseno University Ethics Review Committee (MUERC) per guidelines from the National Commission for Science, Technology, and Innovation (NACOSTI)—the federal research regulatory body—prior to the start of study activities. The research team started recruitment in June 2019. Students in forms (i.e., class years) one through four (typically ages 14–18) were eligible to participate, and no exclusion criteria were applied to classrooms or individuals. Participants were informed that they could choose to participate in an intervention to improve well-being and academic performance. All participating students provided informed consent or assent. Parental consent was obtained through school administrators per MUERC guidelines. Of the 950 students who were invited to participate,

55 declined. The 895 participants were cluster-randomized by classroom in equal ratios (without stratification or matching) into one of the three interventions (growth, gratitude, values) or a study-skills control, run in parallel. Mean ages differed significantly between the all-girls and all-boys school (16.2 vs. 15.86; $p < .001$), but symptom variables did not differ among the schools (ps = .32-.66). See Fig. 1 for the CONSORT flowchart and Table 1 for sample characteristics.

1.4. Measures

We measured anxiety symptoms using the brief Generalized Anxiety Disorder Screener-7 (GAD-7). The GAD-7 is a widely-used self-report measure (Spitzer, Kroenke, Williams, & Löwe, 2006) that has been used in several recent studies with samples of Kenyan adolescents (e.g., Osborn, Venturo-Conerly et al., 2020). Recent research demonstrates that the GAD-7 has adequate internal consistency, convergent and divergent validity, and appropriate factor structure in Kenyan adolescents (Osborn et al., in revision). Cronbach's alpha for the GAD-7 in the current study was 0.73, which is in the acceptable range (Nunnally, 1978), but still may reflect the fact that this measure was designed for and validated in primarily Western settings. As in past studies with Kenyan adolescents (Osborn, Venturo-Conerly, 2020), cutoff norms from adolescents in the United States were used to establish a cutoff score of 10 indicating probable moderately-severe anxiety (Spitzer et al., 2006).

We measured depression symptoms using the Patient Health Questionnaire-8 (PHQ-8). The PHQ-8 is a widely-used self-report measure (Kroenke & Spitzer, 2002), often used instead of the PHQ-9, which includes a suicide ideation item. We used PHQ-8 rather than PHQ-9, as a recent study of Kenyan youths suggested that local stakeholders preferred to omit suicide-related content in school settings due to concern about stigma (Osborn, Venturo-Conerly et al., 2020). The PHQ-8—which is highly correlated with and shares a cut-off score with the PHQ-9—has shown adequate internal consistency with samples of Kenyan adolescents (Osborn, Venturo-Conerly et al., 2020). Recent research demonstrates adequate internal consistency, convergent and divergent validity, and appropriate factor structure for the PHQ-8 in Kenyan adolescents (Osborn et al., in revision). Cronbach's alpha for the PHQ-8 in the current study was 0.73; again, this is considered acceptable (Nunnally, 1978), but still appears to reflect the fact that this measure was designed for and validated in primarily Western settings. As in past studies with Kenyan adolescents (Osborn, Venturo-Conerly, 2020), cutoff norms from adolescents in the United States were used to establish a cutoff score of 15 indicating probable moderately-severe depression (Kroenke, Spitzer, & Williams, 2001).

We measured self-reported happiness using the Happiness sub-scale of the EPOCH Measure of Adolescent Well-Being (Kern, Benson, Steinberg, & Steinberg, 2016). The EPOCH measures five psychological characteristics, but as preregistered, we only used the Happiness sub-scale. Although this sub-scale has shown adequate internal consistency and reliability in North American and Australian adolescents (Kern et al., 2016), and was recently piloted with Kenyan adolescents for whom it demonstrated adequate internal consistency (Osborn et al, 2020), it has not been carefully validated for this population and Cronbach's alpha in the current study was unacceptably low, at 0.66 (Nunnally, 1978); so, Happiness findings are not reported or interpreted

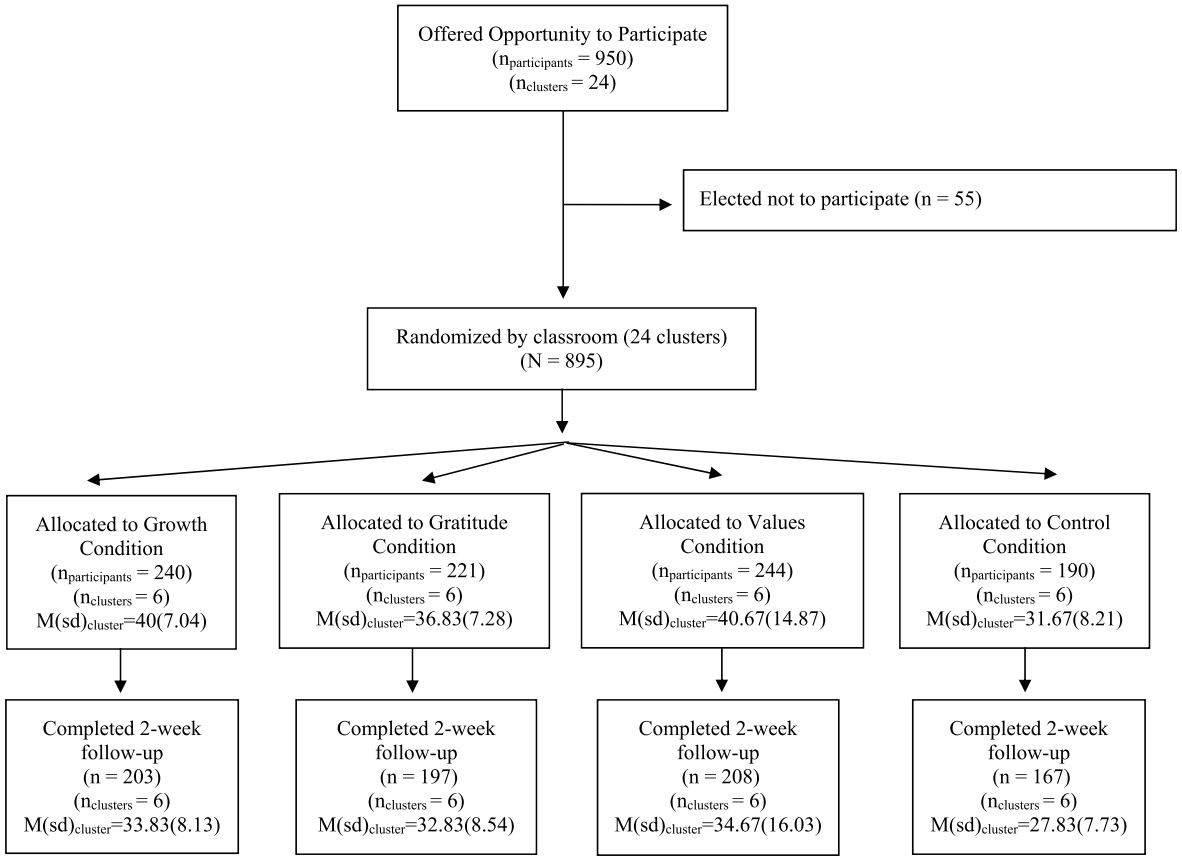

Fig. 1. *CONSORT Enrollment Flowchart.*
Note: All analyses included all randomized participants and were therefore intention-to-treat analyses.

Table 1
Sample characteristics in the full sample at baseline.

Variable	Total Sample ($N = 895$)	Growth ($n = 240$)	Gratitude ($n = 221$)	Values ($n = 244$)	Control ($n = 190$)	Test Statistic*
Age (M, SD)	16.00 (1.44)	16.02 (1.43)	15.83 (1.42)	16.36 (1.46)	15.58 (1.30)	F (3,891) = 10.23, p = <.001*
Sex						
Female – *n* (%)	454 (50.95)	125 (52.08)	107 (48.42)	147 (60.25)	75 (39.47)	X^2 (3) = 16.57, p = <.001*
Symptom levels PHQ–8 (M, SD)	8.32 (4.81)*	8.34 (5.06)	8.23 (4.81)	7.95 (4.65)	8.89 (4.68)	F (3,891) = 1.42, p = .24
GAD–7 (M, SD)	8.11 (4.62)*	8.37 (4.46)	8.00 (4.60)	8.00 (4.80)	8.04 (4.62)	F (3,891) = 0.35, p = .78
EPOCH Happiness	12.68 (3.73)*	12.55 (3.83)	12.15 (3.55)	13.05 (3.84)	13.00 (3.62)	F (3,891) = 2.86p = .04* X^2F (3,891) = 2.86, p = .04*
Form						
One	396	82	112	84	91	
Two	198	81	78	1	38	
Three	161	1	0	102	58	
Four	162	76	29	57	0	

Note: As this table shows, there were some significant group differences at baseline in age, gender, and form, likely due to the classroom-randomization (as opposed to individual randomization) procedure.* Intracluster Correlation Coefficients (ICCs) were calculated using the clus.rho.g function in R. The ICC for PHQ-8 was 0.014, for GAD-7 it was 0.0065, and for EPOCH Happiness it was 0.023. Bartlett's test was non-significant ($p > .05$) for PHQ-8, GAD-7, and EPOCH Happiness, indicating that the same ICC can be applied to all groups (i.e., conditions) for these measures.

in-text (for complete reporting, the findings are available in the supplement).

1.5. Feedback questionnaire

As in previous studies (Osborn, Venturo-Conerly et al., 2020), to determine whether the students perceived the interventions as useful and acceptable, we administered a feedback questionnaire. The questionnaire asked each participant to rate on a Likert scale how helpful the program was, and to comment in their own words on the most helpful aspects of the program, their favorite part of the program, and what they would change about the program. Participants also reported sociodemographic data.

1.6. Provider fidelity

Lay-provider fidelity and competency were assessed via independent ratings of audio recordings of the sessions. A rubric developed by the study team provided a framework for rating lay-provider fidelity to the four protocols, as well as skillfulness and clarity. As in past trials of Shamiri, we randomly selected 10% of sessions, and two independent raters otherwise unaffiliated with the study assessed these recordings. Gwet's AC2 for ordinal ratings was calculated using the rel package in R to assess inter-rater reliability (Gwet, 2008). Mean ratings (out of 7) and AC2 for each rating, were: 6.67 (AC2 = 1.00) for delivering protocol content, 6.83 (AC2 = 0.99) for completing specific tasks in the protocol, 6.33 (AC2 = 0.97) for thoroughness, 6.50 (AC2 = 0.95) for skillfulness, 6.67 (AC2 = 0.97) for clarity, and 6.17 (AC2 = 0.85) for purity, or not including any content outside the protocol. All ratings and AC2 values were in acceptable range. We ran ANOVAs to assess for condition differences on each of the six codes measuring fidelity and competence. Across the six measures, only one (delivering required content) showed a significant condition difference ($p < .001$); means (out of a maximum of 7) were 7.0 (SD = 0) for the intervention conditions and 6.0 ($SD = 0$) for the study skills condition. None of the five other fidelity measures showed a condition difference.

1.7. Procedures

1.7.1. Lay-provider selection and training

Lay-providers ($N = 13$) were recent Kenyan high school graduates selected based on online applications and in-person interviews assessing for relevant characteristics including interest, availability, conscientiousness, experience, personal characteristics, and experience indicating group leadership ability (for full selection procedures and criteria, see Venturo-Conerly et al., 2021). Lay-providers were trained first as part of a previous study (Osborn et al, 2020) via: (a) two 5-h training days, including didactics and role-play, led by members of the study team, to convey how to deliver all three Shamiri elements and the study-skills control, in the four-session format (see Venturo-Conerly et al., 2021); and (b) an additional hour-long training in how to deliver the single-session versions for this study. During training and intervention delivery, lay-providers were kept blind to the fact that the Study-Skills condition was a control; instead they were informed that all four conditions were being tested for their effectiveness. All lay-providers were trained in all conditions to allow for random assignment of providers to conditions.

1.7.2. Intervention and control conditions

The intervention was conducted in the 24 secondary school classrooms ($M_{Class} = 37.29$ students). A random number generator was used by the study team to randomly assign classrooms to conditions and lay-providers to classrooms. Based on these random assignments, all but two of the participating lay-providers were assigned to multiple conditions. In the sessions, first, participants completed baseline questionnaires (~15 min). The next 40 min were devoted to intervention content. In the last 5 min, participants completed feedback questionnaires. Participants filled out follow-up measures two weeks after the intervention. Full intervention protocols are available in the supplement.

Growth Intervention. First, lay-providers explained that everyone can improve with effort, and participants read an article describing neuroplasticity, and our ability to grow when faced with challenges. Then, participants discussed the concepts of growth and neuroplasticity. After, participants read a testimonial written by a successful young adult from Kenya who faced a challenge and grew as a result. Next, participants discussed using problem-solving skills to handle challenges and created a list of effective strategies for growth. Then, participants completed a "saying is believing" exercise: they wrote letters using what they had learned to help another student facing a challenge. Lay-providers then presented a take-home activity: using skills and concepts from the session to address a personal challenge.

Gratitude Intervention. Lay-providers began the session by emphasizing the importance of gratitude and discussing personal examples of gratitude. Then, participants read an article about the impact of expressing and practicing gratitude on our well-being, happiness, and health. Next, the participants discussed the things and people toward which they feel grateful. Afterwards, each participant wrote a 'Gratitude Letter' in which they thanked an individual who had positively impacted their lives. Lay-providers assigned take-home activity: writing three things for which participants felt grateful every day for one week.

Value Affirmation Intervention. Lay-providers began the session by describing how our personal values contribute to shaping our lives (e.g., our decision-making and academic outcomes). Then, participants read an article on the importance of recognizing and applying personal values. Lay-providers then presented a values-related testimonial of a Kenyan role-model, followed by a short exercise in which participants chose their 3–5 most important values from a list of possible values. Participants then discussed the personal importance of their values and role models. Finally, each participant wrote in greater depth about one of the values they had previously selected and planned a specific way in which they could better live according to that value. Lastly, the lay-providers explained a take-home activity: complete the specific values-promoting activity they planned previously.

Study-Skills Control. The study-skills control condition, which has been used in all trials of the three-component group and digital Shamiri Intervention, was designed to match the wise interventions in duration and format, to control for the non-specific aspects of the intervention sessions (e.g., having discussions, completing activities in-session), and to provide skill-building of actual practical value to the students. The intervention was not designed to directly impact mental health symptoms, but there was reason to believe that it might do so to some degree. Because students in Kenya experience high rates of depression and anxiety symptoms related to undue pressure to succeed academically (Yara & Wanjohi, 2011), it might be expected to have some impact on symptoms of depression and anxiety. In fact, previous trials using a study-skills control in Kenyan adolescents support such effects on mental health problems (Osborn, Wasil, et al., 2020). Thus, study-skills represented a particularly strong, active control condition for comparison to the wise interventions.

In this active control arm, lay-providers and students read and discussed an article about study-skills. Then, participants shared specific study-skills they have found useful in preparation for exams. Next, participants read an "Effective Study Strategies" worksheet and discussed helpful study strategies such as studying well before a test as opposed to cramming. Then, the group discussed how to best implement these strategies. Next, lay-providers explained the take-home activity: applying a strategy they learned to an academic challenge in the coming week.

1.7.3. Data analysis plan

We used an intention-to-treat approach by including all those initially randomized in analyses of intervention effects. Missing item- and subject-level data were imputed five times, allowing for clustering by classroom, using the 21.lmer method from the mice package in R (van Buuren & Groothuis-Oudshoorn, 2011). On a subject level, 13.41% of entries were missing at follow-up. On an item-level, 3.46% of outcome measure items were missing at baseline, and 14.58% at follow-up (including subject-level missing items).

Pooled, hierarchical, linear mixed-effects models in R were used to estimate the effects of the interventions for the full sample and, separately, for a sub-sample (N = 299; M_{age} = 15.96, SD_{age} = 1.52; 54.18% female) who met cutoffs for probable moderate-to-severe anxiety (GAD-7 $\geq$ 10) or depression (PHQ-8 $\geq$ 15). These cutoffs for inclusion in the clinical sub-sample have been used in past trials of the Shamiri Intervention with Kenyan youths (Osborn, Wasil, et al., 2020). We analyzed primary outcomes for each active intervention (growth, gratitude, values) contrasted against the control. Each model included a random effect for classroom (i.e., cluster) and for participant, fixed effects for time, condition, and time*condition interaction, and controlled for participant age and gender.

Additionally, we calculated effect sizes for main outcomes using mean gain scores. We selected this method of effect size calculation for two reasons: (1) It is increasingly common in psychotherapy effectiveness research (Schleider & Weisz, 2018), and (2) it accounts for baseline group differences, which we expected in our trial, as it was randomized by classroom as opposed to by individual. Importantly, the groups in this trial did not differ at baseline in their symptom levels, but rather only in their demographic characteristics (see Table 1). Finally, reliable change (Wise, 2004) was assessed using the formula $s\sqrt{(1\text{-}r)}*1.96$, where ($s$) is standard deviation and (r) is reliability from psychometric publications for the PHQ-8 and GAD-7 administered to Kenyan adolescents (Osborn, Venturo-Conerly et al., 2020).

Power and sample size were estimated using Optimal Design for multilevel models (Westfall, Kenny, & Judd, 2014). Such calculations yielded an optimal sample size of N = 2025 assuming four groups of two repeated measures, an average cluster size of 40, an effect size of 0.30, an ICC of 0.05, and a standard threshold for significance ($\alpha = 0.05$) and for power ($1\text{-}\beta = 0.80$). The final sample of N = 895 leaves this study underpowered to detect smaller effects. Because of the limited power, and because this was evidently the first effort of its kind with SSA populations, we did not correct for multiple comparisons, so that our tests would be sensitive enough to maximize the heuristic, hypothesis-generating potential of this trial.

2. Results

2.1. Sample characteristics

Participating adolescents (N=895) were cluster-randomized by classroom (M_{class} = 37.29 students) into the growth intervention (n = 240), gratitude intervention (n = 221), value affirmation intervention (n = 244), or study-skills active control (n = 190). We included all students who wished to participate at two secondary schools, in forms (i.e., class years) one-four. Study participants were 50.95% female, and the mean age was $M(SD)_{age}$ = 16.00 (1.44). In the clinical sub-sample (N = 299; M_{age} = 15.96, SD_{age} = 1.52; 54.18% female), n = 86 were assigned to the growth intervention, n = 75 to gratitude, n = 76 to gratitude, and n = 62 to the study-skills active control. No adverse events were reported. For full sample demographics, see Table 1.

2.2. Primary outcomes

For graphs of primary outcomes, see Figs. 2 and 3. See Tables 2 and 3 for full results of linear mixed-effects models. For effect sizes (Cohen's ds) comparing the study-skills active control to each intervention, see Table 4. For effect sizes (Cohen's ds) comparing each of the active interventions to each other, see supplement.

2.3. Anxiety

In linear mixed-effects models predicting self-reported anxiety symptoms controlling for age and gender, within the clinical sub-sample, we found a significant time*condition interaction effect on anxiety symptoms favoring the values condition ($B = -2.22$, $p < .01$; Cohen's d = 0.49 [0.09-0.89]) and the growth condition ($B = -1.78$, $p < .05$; Cohen's d = 0.39 [0.01-0.76])) over the study-skills control. Within the universal sample, we found a significant time*condition interaction effect on anxiety symptoms for the values condition ($B = -0.93$, $p < .05$; Cohen's d = 0.31 [0.13-0.50]); mean gain scores were larger for values (2.26) than for study-skills (1.27). Given these significant interaction effects, main effects should not be interpreted.

Within the clinical sub-sample, changes in anxiety symptoms surpassed the reliable change threshold of 4.45 for the values condition (4.70) and nearly so for the growth condition (4.40). For reductions in individual GAD item scores (ranging from 0.14 for item 4 to 0.46 for item 3) from baseline to follow-up, see Supplementary Table 3.

2.4. Depression

In linear mixed-effects models predicting self-reported depression symptoms controlling for age and gender, we found non-significant effects for condition, gender, age, and time*condition in the clinical sub-

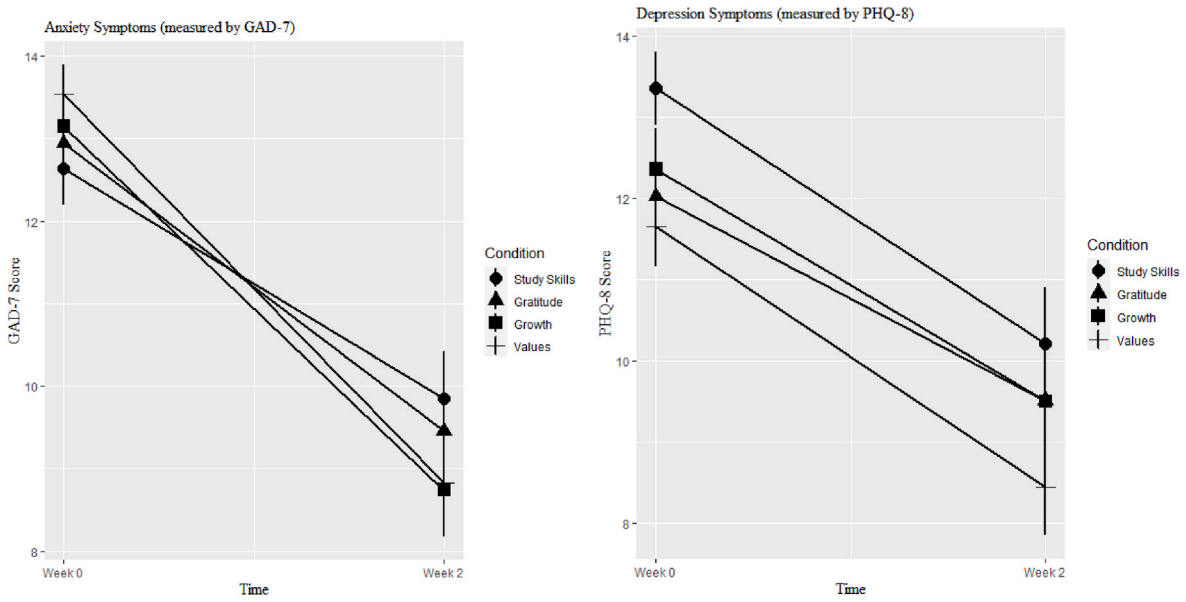

Fig. 2. Trajectory of primary outcome scores in the clinical sub-sample from baseline to 2-week follow-up.

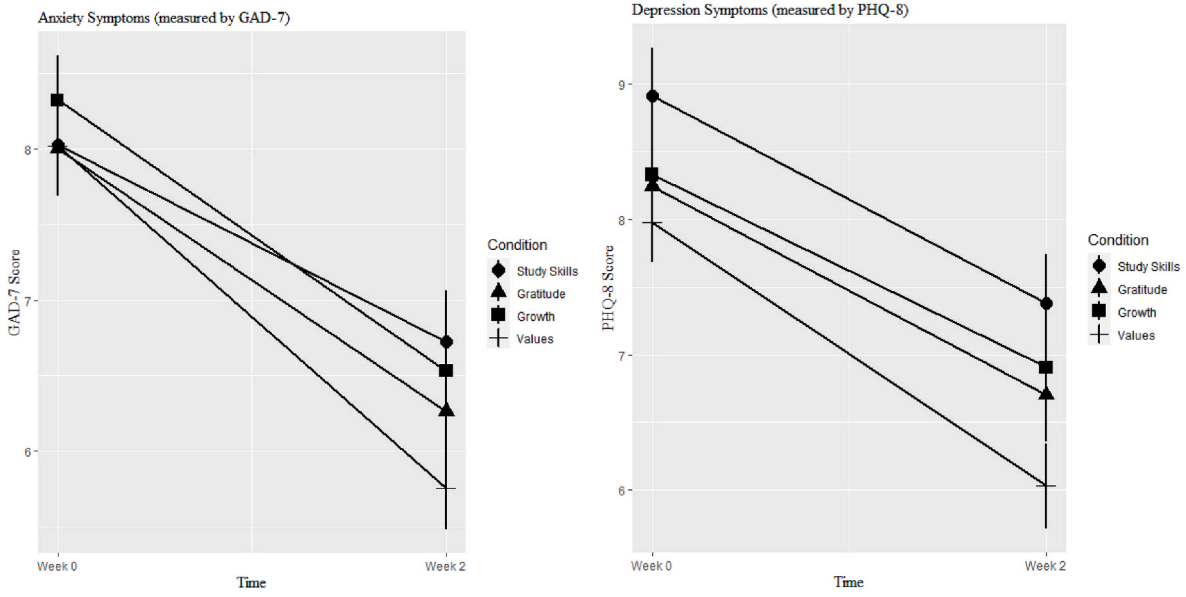

Fig. 3. Trajectory of primary outcome scores in the universal sample from baseline to 2-week follow-up.

sample and the universal sample. We found a significant effect for time in both the clinical and universal samples. This effect was in the predicted direction, indicating that adolescents in all conditions experienced decreases in self-reported depression symptoms from baseline to 2-week follow-up.

2.5. Feasibility and acceptability

Participants rated the helpfulness of the interventions and study-skills control on a scale from 1 (worst)-to-5 (best). All conditions were rated as highly helpful on average, reflecting good acceptability (M $(SD)_{overall}$ = 4.68 (0.66). Broken down by condition, the growth condition was rated M(SD) = 4.73 (0.61), gratitude M(SD) = 4.82 (0.47), values M(SD) = 4.45 (0.82), and study-skills M(SD) = 4.87 (0.53). An ANOVA testing for differences in helpfulness ratings across all the intervention and control groups revealed a significant difference (F = 15.29; $p < .001$). Post-hoc tests using the TukeyHSD function in R revealed that this difference was driven by the values condition, which received significantly lower ratings than the other three conditions.

3. Discussion

We tested in this trial three classroom-based, single-session interventions—growth, gratitude, and value affirmation. Here, compared to an active study-skills control group, the value affirmation intervention reduced anxiety symptoms in the universal sample. Both the value affirmation and growth mindset interventions reduced anxiety in a sub-sample endorsing moderate-to-severe symptoms at baseline. None of the interventions significantly reduced depression symptoms relative to the control. Participants rated all the conditions as highly helpful. Interestingly, however, the values condition received a significantly lower helpfulness rating than the other conditions, despite showing the greatest effects on anxiety symptoms. The magnitude of this difference in ratings was small – the overall average rating across all conditions was

Table 2
Results of Mixed-Effects Models on Main Outcomes in the Universal Sample.

	Anxiety Symptoms (GAD-7)			Depression Symptoms (PHQ-8)		
Predictors	B	SE	p value	B	SE	p value
(Intercept)	8.44	1.95	**0.00***	7.17	1.99	**0.00***
Time	−1.29	0.38	**0.00***	−1.48	0.37	**0.00***
Condition: Gratitude	−0.09	0.59	0.88	−0.62	0.54	0.25
Condition: Growth	0.38	0.59	0.51	−0.45	0.55	0.41
Condition: Values	−0.10	0.59	0.87	−0.91	0.54	0.10
Gender	0.10	0.39	0.80	0.22	0.34	0.52
Age	0.09	0.12	0.45	0.10	0.13	0.44
Time*Condition: Gratitude	−0.37	0.50	0.46	0.07	0.51	0.89
Time*Condition: Growth	−0.53	0.48	0.26	0.00	0.53	0.99
Time*Condition: Values	−0.93	0.46	**0.05***	−0.46	0.52	0.38

Note: The above table includes outcomes of mixed-effects models with random effects for participant and classroom examining the effects of time, condition, and their interaction on anxiety and depression symptoms in the universal sample. In these models we controlled for the effects of age and gender, and we did not correct for multiple comparisons. Significant ($p < .05$) effects are indicated in bold and with an asterisk.

Table 3
Results of Mixed-Effects Models on Main Outcomes in the Clinical Sub-Sample.

	Anxiety Symptoms (GAD-7)			Depression Symptoms (PHQ-8)		
Predictors	B	SE	p value	B	SE	p value
(Intercept)	8.44	2.45	**0.00***	12.92	3.20	**0.00***
Time	−2.52	0.64	**0.00***	−2.96	0.69	**0.00***
Condition: Gratitude	0.29	0.83	0.73	−1.49	1.10	0.17
Condition: Growth	0.42	0.81	0.61	−1.03	1.06	0.33
Condition: Values	0.61	0.84	0.46	−1.96	1.10	0.08
Gender	0.26	0.50	0.61	0.20	0.70	0.78
Age	0.26	0.15	0.09	0.03	0.20	0.86
Time*Condition: Gratitude	−1.00	0.86	0.25	0.22	0.96	0.82
Time*Condition: Growth	−1.78	0.83	**0.03***	0.00	0.97	1.00
Time*Condition: Values	−2.22	0.85	**0.01***	−0.12	0.94	0.90

Note: The above table includes outcomes of mixed-effects models with random effects for participant and classroom examining the effects of time, condition, and their interaction on anxiety and depression symptoms in the clinical sub-sample. In these models we controlled for the effects of age and gender, and we did not correct for multiple comparisons. Significant ($p < .05$) effects are indicated in bold and with an asterisk.

4.68, while for values it was 4.45, yet this finding indicates that the interventions perceived as most helpful are not necessarily the most effective. In this study, study skills may have been most highly (4.87/5) because of the cultural importance of educational achievement; in comparison, most Kenyan students have already received years of religious education about "virtues" which are similar to "values", potentially making the values intervention seem less novel than the others. Offering a study skills intervention element along with wellness and mental health interventions may increase motivation of schools and students to participate in wellness and mental health interventions. Our findings suggest that value affirmation may be more effective for reducing anxiety than the other interventions alone, and that none of the three interventions alone reduced depression symptoms significantly. Under constraints of resource limitations, the single-session values intervention may be the most effective intervention of those tested for Kenyan adolescents with anxiety.

Our findings add to a small but growing literature on positively focused, low-cost mental health interventions for adolescents in low-income regions. A previously-tested small-group-based *Shamiri* intervention that combined growth mindset, gratitude, and value affirmation into a four-week intervention for Kenyan adolescents with elevated symptoms produced significant effects on both depression ($d = .38$) and anxiety ($d = 0.39$) symptoms (Osborn, Wasil, et al., 2020). It is possible that the increased dosage of a four-week intervention, as well as the increased attention given to each participant in the small-group format, may explain why the four-week version of *Shamiri* was more effective in addressing depression symptoms than the single-session, 1-h interventions in the present study.

However, it is also possible that combining several intervention elements may produce additive or multiplicative benefits. For instance, a growth mindset intervention emphasizing that individuals have the potential to improve and grow may be more impactful when followed by interventions teaching specific ways that people can change (e.g., acting more in alignment with personal values) or teaching specific, resilience-building skills (e.g., gratitude journaling). Additionally, individuals seem to benefit differently from different therapies depending on individual personality and preferences (Swift & Callahan, 2009). Some youths may benefit most from growth mindset interventions, others gratitude, and others value affirmation; therefore, including more elements may increase the likelihood that each youth will benefit from at least one element, boosting the overall effectiveness of the intervention.

It is also possible that the three interventions target different mechanisms and outcomes on their own than they do in combination. Specifically, it may be that value affirmation, and to some extent growth mindset, can on their own alleviate anxiety symptoms, but that all three interventions need to be combined to alleviate depression symptoms. This hypothesis is supported by a recent trial of a digital adaption of the *Shamiri* intervention that combined all three elements into a single-session, self-guided intervention. This version of the intervention led to reductions in depression symptoms but *not* anxiety symptoms, unlike in the present study (Osborn et al, 2020). Future studies are required to investigate: (1) the additive value of combining elements, and (2) the specific mechanisms and outcomes targeted by each combination of elements.

Our study responds to recent calls for new ideas to help address the need for youth mental health care in low-income countries such as Kenya (Martin, Murray, Darnell, & Dorsey, 2018). Brief, low-cost interventions focused on positive psychological principles rather than psychopathology may not only help improve mental health outcomes, but also may be especially appropriate for use in low-resource and high-stigma contexts. Importantly, such contexts exist outside of LMICs; even in high-income countries, only about a third of youth in need receive mental health care (Merikangas et al., 2011). Although scaling up even the tested mental health interventions would require considerable effort and innovation, the brevity, positive focus, and simplicity of these interventions may enhance their scalability as self-guided or lay-provider-delivered interventions. Their delivery in school-settings could also help expand access to mental health support for adolescents in resource-scarce environments around the world.

Additionally, universal single-session interventions such as those tested in this present study can be delivered to all interested youth at a school without requiring the cumbersome and labor-intensive process of screening to determine who may participate. Of note, screening in Kenyan high schools is quite labor intensive because it cannot be done using electronic questionnaires, but instead must be collected and entered by hand, often for hundreds of potential participants. However, alternative methods of screening, such as asking students to attend intervention sessions only if they think they could benefit or asking teachers to select those who could benefit, could potentially offer a relatively scalable and effective alternative to universal interventions.

Future research may evaluate the cost-effectiveness of the kinds of interventions tested and compare the stigma invoked by these interventions to that invoked by traditional psychotherapy. Relatedly, future research may evaluate the willingness of young people to participate in these kinds of interventions versus traditional psychotherapy. Finally, few measures of hypothesized intervention

Table 4
Means and Effect Sizes (Cohen's ds) Comparing Mean Gains for Active Interventions Against the Control.

Outcome variable	Growth Intervention Group			Gratitude Intervention Group			Values Intervention Group			Study-Skills Control Group	
	M (SD) baseline	M (SD) 2 weeks	Cohen's *d*, based on mean gain score [95% CI] (Baseline to 2 weeks)	M (SD) baseline	M (SD) 2 weeks	Cohen's *d*, based on mean gain score [95% CI] (Baseline to 2 weeks)	M (SD) baseline	M (SD) 2 weeks	Cohen's *d*, based on mean gain score [95% CI] (Baseline to 2 weeks)	M (SD) baseline	M (SD) 2 weeks
Universal Sample											
Primary outcomes:											
Youth depression	8.33 (5.14)	6.91 (5.15)	-.03 [-.21,.16]	8.25 (4.75)	6.70 (5.18)	.00 [-.19, 0.19]	7.98 (4.62)	6.03 (4.91)	.08 [-.12, .29]	8.92 (4.82)	7.38 (5.04)
Youth anxiety	8.32 (4.56)	6.53 (4.76)	.10 [-.09, 0.29]	8.00 (4.64)	6.26 (4.73)	.09 [-.10, .28]	8.02 (4.81)	5.76 (4.29)	.31 [.13, .50]	8.03 (4.54)	6.72 (4.70)
Clinical Sub-Sample											
Primary outcomes:											
Youth depression	12.36 (4.67)	9.51 (5.79)	-.06 [-.41, .29]	12.02 (4.46)	9.51 (5.55)	-.13 [-.49, .23]	11.66 (4.36)	8.80 (5.45)	-.06 [-.45, .34]	13.36 (3.52)	10.21 (5.41)
Youth anxiety	13.14 (2.61)	8.74 (5.21)	**.39 [.01, .79]**	12.94 (3.21)	9.45 (4.92)	.17 [-.20, .54]	13.53 (3.11)	8.83 (4.47)	.49 [.09, .89]	12.64 (3.43)	9.85 (4.42)

Note: These values reflect symptom reductions from baseline to 2-week follow-up for each intervention relative to the study-skills control group. Additionally, Intracluster Correlation Coefficients (ICCs) were calculated using the clus.rho.g function in R. ICCs at baseline for the full sample are reported in Table 1. At follow-up, the ICC for PHQ-8 was 0.026, for GAD-7 it was 0.050, and for EPOCH Happiness it was 0.027. Bartlett's test was non-significant ($p > .05$) for PHQ-8, GAD-7, and EPOCH Happiness, indicating that the same ICC can be applied to all groups (i.e., conditions) for these measures.

mechanisms (e.g., gratitude, perceived control, sense of purpose) and adaptive functioning have been validated for use in this population; future research may develop and assess the validity of such measures, with the goal of incorporating empirically sound measures into future trials.

One limitation of the present study is the sample size, which, though large in comparison to other psychotherapy trials (Weisz et al., 2017, 2019), was under-powered to detect small effects due to the cluster randomization and four-group design. Fortunately, the cluster randomization did not result in between-group differences in symptom levels at baseline, and models controlled for differences in demographic characteristics (age and gender). Another potential limitation is that the study-skills control intervention was associated with noticeable reductions in anxiety and depression symptoms; while this does suggest that the study-skills control was a strong standard of comparison, it also likely limited the ability to detect intervention effects. Finally, as in any real-word trial, the naturalistic setting creates the potential for internal validity threats, but these threats must be balanced against the practical benefits of testing an intervention in the setting in which it will be disseminated.

Taken together, our findings suggest that single-session, universal, value affirmation interventions, and to some extent growth interventions, may reduce anxiety symptoms in Kenyan adolescents. Based on the findings of this trial, the single-session values intervention may be most effective for Kenyan adolescents; future research may seek to replicate this finding with more extensive follow-up. This trial represents a potential first step toward development of a brief, scalable, low-cost, positively-focused approach to expanding youth mental healthcare in low-resource regions in Kenya and beyond. The findings also provide further evidence that simple interventions that focus on positive human attributes, may be effective and accessible for youths in Kenya who have few formal treatment options. Future research may also investigate why the single-element, single-session interventions tested in this trial did not appear to alleviate depression symptoms relative to an active control, while the three elements tested in this intervention, when combined, have been found to alleviate depression symptoms (Osborn, Rodriguez, et al., 2020; Osborn et al, 2021). Research that builds on this work to unearth how certain intervention elements and their combinations drive change, as well as for whom these elements are and are not effective, may enrich our understanding of which intervention components, in which combinations, and under what conditions, best balance scalability with effectiveness.

Declarations of interest

KVC, TO and AW are affiliated with the Shamiri Institute, a 501(c)3 non-profit committed to developing and disseminating interventions for adolescents in Sub-Saharan Africa.

CRediT authorship contribution statement

Katherine E. Venturo-Conerly: led, Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Validation, Visualization, and, Writing – original draft. **Tom L. Osborn:** led, Funding acquisition, and, Data curation, Formal analysis, Investigation, Methodology, Writing – review & editing, Writing – original draft, and project administration. . **Rediet Alemu:** and. **Elizabeth Roe:** and. **Micaela Rodriguez:** and. **Jenny Gan:** and. **Susana Arango:** and. **Akash Wasil:** Data curation, Investigation, Methodology, Writing – original draft, and . **Christine Wasanga:** led, Supervision, Funding acquisition, Methodology, Project administration, and . **John R. Weisz:** and.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.brat.2022.104040.

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