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Resilience-Oriented Therapy for Psychosocial Recovery in Rwanda: A Pathway-Stratified Cluster-Randomized Trial of Three Variants

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Resilience-Oriented Therapy for Psychosocial Recovery in Rwanda: A Pathway-Stratified Cluster-Randomized Trial of Three Variants

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Abstract

Background: The genocide against the Tutsi in Rwanda left enduring psychosocial and mental health needs. We developed Resilience-Oriented Therapy (RoT), a group-based intervention with three variants targeting transdiagnostic symptom clusters prevalent in Rwanda.

Methods: We conducted a pathway-stratified cluster-randomized waitlist-controlled trial across five districts of Rwanda from April to September 2023. Adults were matched to pathways by clinical profile after referral of acute-risk cases. Centralized R scripts randomized clusters within pathways to immediate RoT or waitlist control. All 427 baseline participants were analyzed: emotion regulation (RoT-ER), 91/82 participants in 9/10 clusters; identity development (RoT-ID), 63/57 in 8/10; behavioral self-management (RoT-BSM), 73/61 in 8/7 (RoT/waitlist). RoT comprised 24–30 group sessions. Primary outcomes were post-traumatic stress (PTSD), resilience, and pathway-specific clinical symptoms. Outcomes were assessed at scheduled endline. Missing endline records were handled through multilevel multiple imputation. Endline assessors were unmasked. Analyses used baseline-adjusted cluster-level analysis of covariance weighted by baseline cluster size. We used false discovery rate (FDR) correction for multiple testing, with mixed models and primary-outcome Holm correction as sensitivity analyses.

Results: RoT-ER showed lower depression scores (adjusted mean difference = -3.83, 95% confidence interval (CI) [-6.30, -1.36]) and higher resilience scores (5.19, 95% CI [1.65, 8.74]). While RoT-ID estimates suggested higher resilience (5.44, 95% CI [-0.19, 11.08]) and fewer borderline/identity disturbance symptoms (-1.68, 95% CI [-3.59, 0.24]), both confidence intervals included zero. RoT-BSM showed no statistically significant effects on aggression or alcohol- or drug-related outcomes. No RoT pathway showed a statistically significant effect on PTSD symptoms. Routine checks identified no intervention-related harm.

Conclusions: RoT-ER improved depression and resilience, with both effects statistically significant after FDR correction and in sensitivity analyses. The findings support supervised implementation with outcome monitoring. RoT-ID warrants further evaluation, including adjunct

individual support, while RoT-BSM needs refinement and testing. Follow-up studies should assess durability, costs, and effects on family and community participation.

Trial registration: ClinicalTrials.gov NCT07621731 (https://clinicaltrials.gov/study/NCT07621731); retrospectively registered on June 2, 2026.

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Keywords: Resilience-Oriented Therapy; Rwanda; genocide against the Tutsi; cluster randomized trial; pathway stratification; transdiagnostic intervention; group psychotherapy; depression; resilience; societal healing

Background

More than 30 years since the 1994 genocide against the Tutsi, Rwanda is still facing a substantial burden of mental distress, most notably depression, anxiety, and post-traumatic stress [1, 2, 3]. While much progress has been made in making mental health services available through the formal sector, access is still restricted due to stigma and resource constraints [3, 4]. Furthermore, psychological distress in Rwanda is intertwined with other adversities, including disrupted livelihoods, family fragility and weakened social cohesion, many of which can be traced to the genocide [5]. Therefore, expanding mental-health care requires approaches that reach affected communities, address multidimensional trauma, and support participation in family and community life.

Community-based group interventions offer one way to extend care where access to specialist clinical care is limited [4, 6]. In Rwanda, Sociotherapy was developed to foster collective healing through a staged process that nurtures safety, trust, and future orientation among group participants [7, 8]. While Sociotherapy can alleviate general psychological distress [9], it was not designed to address clinically significant symptoms, with such cases typically

being referred for one-to-one therapy in local health centers [5]. To bridge this gap in care, Resilience-Oriented Therapy (RoT) was developed as a group-based, trauma-informed intervention that aims to strengthen personal agency and resilience by developing and activating socioemotional competencies [10].

In RoT, we use the group as a setting in which participants can make sense of distress in the context of adversity and nurture skills and character strengths that support their personal goals and social relationships [10]. This approach draws on an understanding of resilience as adaptation to adversity, supported by personal resources, relationships, and social systems [11, 12]. It combines group-process elements aiming to cultivate agency, responsibility, and motivation for change, coupled with psychoeducation on clinical distress and skills training, so that participants can acquire socioemotional competencies intended to enhance resilience [10].

The intervention adopts a transdiagnostic lens. Difficulties that overlap across diagnoses, such as executive dysfunction, emotion dysregulation, and experiential avoidance, can be targeted through shared psychological processes and skills, allowing treatment to respond to several clinical presentations within a common framework [13, 14]. This is particularly relevant in settings where participants present with overlapping needs and resources are too limited to run a separate service for each disorder [15]. In Rwanda, prescriptive matching, which assigns people to group-based support according to their needs, has been proposed as a way to connect these needs with appropriate forms of transdiagnostic support [16]. RoT applies this rationale through variants that share a common structure while emphasizing different sets of skills tailored to transdiagnostic clinical profiles.

Network and latent profile analyses of a baseline survey in Bugesera, together with participatory development, informed the intervention [10]. Interpeace, a Swiss-based

international organization, coordinated a technical working group involving the Rwanda Biomedical Centre, Prison Fellowship Rwanda, the Centre for Sustainable Peace and Democratic Development (SeeD), and Rwandan and international mental-health specialists. The group developed the theory of change and reviewed the protocol; practitioners and community stakeholders grounded it in local history and needs [10]. The curriculum progresses from psychoeducation on adversity and resilience to skills acquisition and application in family and community life. A participant learning to tolerate distress, for example, can consider how that skill might help them remain engaged in a difficult family conversation. This progression connects the clinical focus of each group with the wider societal healing aim of strengthening people's ability to participate in processes related to community recovery [5, 10].

The resulting intervention comprised three pathway-matched variants [10]. The emotion-regulation variant (RoT-ER) targeted depression, anxiety, rumination, emotion dysregulation, and social withdrawal. The identity-development variant (RoT-ID) targeted alienation, shame, emptiness, identity disturbance, and difficulties with belonging. The behavioral self-management variant (RoT-BSM) targeted aggression, alcohol/substance misuse, poor impulse control, and difficulties taking responsibility in relationships and community life.

This paper reports a pragmatic pathway-stratified cluster-randomized evaluation of these three RoT variants. It asks whether pathway-matched RoT improved clinical and psychosocial outcomes under field conditions. We hypothesized that RoT-ER would reduce symptoms of depression and anxiety, that RoT-ID would reduce borderline/identity disturbance symptoms and improve social cohesion, and that RoT-BSM would reduce aggression and alcohol- or drug-related problems. Post-traumatic stress and resilience were primary outcomes across all pathways. We expected post-traumatic stress to improve indirectly through the shared

transdiagnostic processes targeted by RoT [10]. Secondary outcomes included socioemotional difficulties, stigma, social cohesion, perceived community threat, and livelihood-related indicators.

Methods

Design and Setting

This pragmatic, pathway-stratified, cluster-randomized waitlist-controlled trial evaluated three RoT variants in community and health-center settings across Musanze, Nyabihu, Nyagatare, Ngoma, and Nyamagabe districts. SeeD led trial design and analysis with Rwandan researchers. Interpeace coordinated field implementation, with Prison Fellowship Rwanda, Dignity in Detention Rwanda, Haguruka, GAERG and Rwanda We Want contributing data collection, follow-up visits to groups and logistical support. Screening matched participants to RoT-ER, RoT-ID, or RoT-BSM. Within each pathway, cells with enough eligible participants to form a group were randomized to immediate RoT or waitlist. Cells are administrative units below sectors and above villages; each analyzed cluster corresponded to one cell and one therapy or waitlist group within a pathway. Outcomes were measured individually. Analyses compared treatment with control separately within each pathway. The evaluation ran from April 28 to September 15, 2023. Reporting followed the CONSORT cluster-trial framework [17].

The trial was retrospectively registered with ClinicalTrials.gov, registration number NCT07621731, on June 2, 2026 (https://clinicaltrials.gov/study/NCT07621731).

Participants and Screening

Community leaders and clinical experts referred people at risk of mental illness for screening. The wider societal-healing system screened 4,214 individuals and matched them to a RoT variant, Multi-Family Healing Spaces, or Sociotherapy. Screening was hierarchical: acute

clinical risk, including suicidality and other needs for intensive care prompted referral to hospital or health services. Remaining participants were matched by mental-health symptoms and psychosocial difficulties; subclinical trauma symptoms only prompted referral to Sociotherapy. Trial participants were adults aged 18 years or older.

Planned cell eligibility thresholds were at least 10 eligible people for RoT-ER, four for RoT-ID, and seven for RoT-BSM. The different thresholds were due to the anticipated differences in prevalence of profiles at the community level, based on findings from earlier screening surveys, and also related to the maximum number of participants deemed optimal for each RoT variant. The smaller RoT-ID threshold is consistent with clinical guidance for borderline personality disorder group therapy, which identifies four members as a practical minimum for starting a group [18]. Additional file 1, Table S6, describes the screening domains and scoring.

Randomization and Allocation

Cluster and potential-participant lists were prepared by Interpeace in Rwanda and sent to the SeeD team in Cyprus for centralized randomization. Within each RoT pathway, R scripts generated assignments targeting a 1:1 ratio, using restricted randomization to balance the number of treatment and control cells within sectors and districts. Allocation was conducted on April 11, 2023, and lists were returned to local implementers on April 12. The design protocol planned masking of baseline enumerators and participants to allocation. Endline enumerators were unmasked.

Sample Size Planning

Sample-size planning used the Shiny CRT Calculator [19], targeting 80% power at alpha = .05. A 2022 screening survey of 5,745 people in the five districts supplied a sector-level

intraclass correlation (ICC) of .037 (95% CI [.021, .073]) for genocide-adapted PTSD Checklist for DSM-5 (PCL-5) scores. A cohort design with baseline measurement and two-period decay was assumed; cluster and individual autocorrelations were each .50 by judgment. The design-protocol calculator table specified mean difference 0.5, standard deviation (SD) 1.2, and cluster sizes 13, eight, and 10 for RoT-ER, RoT-ID, and RoT-BSM, yielding 10, 12, and 11 clusters per arm. Recruitment allowed one additional cluster per arm for attrition. Analyses included clusters with evaluable baseline data.

Intervention

RoT comprised 24–30 three-hour sessions held twice a week [10], organized into six phases (Table 1). Monthly follow-up meetings were planned over six months; this analysis covers scheduled endline. Facilitators completed five-day training, passed a written protocol examination, and received ongoing supervision. End-of-session checks covered fidelity and participant satisfaction.

Table 1

RoT Phases and Objectives

Phase	Objectives
1. Taking ownership of our personal change	Establish trust and hope; clarify personal values and sources of strength; support agency and responsibility for change through shared narrative and reflection.
2. Understanding trauma and psychological distress	Help participants understand and normalize distress in its personal and social context; address stigma and introduce the possibility of change.
3. Understanding resilience	Connect resilience to participants' strengths and cultural resources; practice self-care, including sleep, physical activity, nutrition, and supportive social connections.
4. Strengthening skills for resilience	Introduce and practice socioemotional skills selected for each variant; examine unhelpful beliefs and behaviors and develop alternative responses to everyday challenges.
5. Building resilient relationships	Apply skills to family and community relationships, socio-economic inclusion, and civic participation; work through difficulties encountered beyond the group.
6. Ongoing transformation	Use monthly check-ins over six months to review progress, adapt skills to everyday situations, and support continued change and community participation.

Note. Summarized from the accepted RoT intervention-development article [10]. Phase 6 describes the intended follow-up provision; outcomes in the present CRT concern baseline to scheduled endline.

Across variants, facilitators linked participants' accounts to a framework of adversity and resilience, helped them cultivate socioemotional competencies suited to their needs, and

supported them in practicing new skills to address everyday difficulties. Group discussion connected this practice to relationships and community participation. The variants differed mainly in the emphasis and sequencing of Phase 4 skills; RoT-ER and RoT-ID shared eight of 12 skills, whereas RoT-BSM emphasized executive and behavioral skills. Table 2 presents the skills targeted in each of its six sessions [10].

Table 2

Phase 4 Skills Targeted by RoT Variant

RoT variant	Phase 4 sessions
Emotion regulation (RoT-ER)	Session 1: present moment awareness & authenticity and self-expression Session 2: acceptance & cognitive defusion Session 3: self-compassion & self-care Session 4: tolerating crises & desensitization to triggers Session 5: core beliefs and focusing on values & disregarding unhelpful impulses Session 6: negotiating disagreements & collaborative planning and problem solving
Behavioral self-management (RoT-BSM)	Session 1: present moment awareness & values formation and goal orientation Session 2: planning and organization & tolerating effort and frustration Session 3: decision making & disregarding unhelpful impulses Session 4: tolerating crises & contextual awareness and active listening Session 5: tolerating interpersonal discomfort & negotiating disagreements Session 6: collaborative planning and problem solving & self-monitoring and self-assessment
Identity development (RoT-ID)	Session 1: present moment awareness & authenticity and self-expression Session 2: recognizing the functions of emotions & tolerating crises Session 3: acceptance & cognitive defusion Session 4: desensitization of triggers & core beliefs and focusing on values Session 5: self-compassion & tolerating effort and frustration Session 6: tolerating interpersonal discomfort & building and nurturing intimate and family relationships

Note. Reprinted from Table 4 of the Resilience-Oriented Therapy manual with permission; formatting and variant labels have been adjusted for this article. RoT-ER = emotion regulation; RoT-BSM = behavioral self-management; RoT-ID = identity development. Session numbers refer to Phase 4, not the full intervention.

Control Condition

Participants in waitlist clusters did not receive the assigned RoT variant during the evaluation period and were invited to participate after the evaluation exercise. CIOMS guidance calls for justification in relation to available effective care, the risks of delay, and participants' health needs [20]. In response, and to minimize risks from delayed access to required services, the screening protocol provided for immediate referral of acute-risk presentations to district mental health services, instead of assigning them to intervention or wait-list control.

Measures

Primary and secondary outcomes were measured using interviewer-administered questionnaires at baseline and endline. The bilingual research team translated the instruments into Kinyarwanda; bilingual Rwandan mental-health practitioners reviewed them collectively. Resource constraints precluded back-translation. For symptom, difficulty, stigma, threat, aggression, substance-use, and food-insecurity outcomes, lower scores indicate improvement. For resilience, forgiveness, hopefulness/agency, social cohesion, and economic security, higher scores indicate improvement.

Post-traumatic stress symptoms were measured with a genocide-adapted PCL-5 Part B symptom scale [21]. The score used in the trial was the mean of four symptom items rated from 0 (not at all) to 4 (extremely). Baseline Cronbach's alpha was .87. Resilience was measured with the 10-item Connor-Davidson Resilience Scale (CD-RISC-10), which is a brief measure of adaptability and coping capacity [22, 23]. Items were summed to a 0 to 40 score, with higher scores indicating greater resilience; baseline Cronbach's alpha was .93. PTSD symptoms and resilience were examined across all three pathways.

For RoT-ER, depression was measured with the 13-item Beck Depression Inventory-Short Form (BDI-SF) [24]. The score used in the analysis summed 13 items, with higher scores indicating greater depressive symptom severity. Baseline Cronbach's alpha was .89. Anxiety and related cross-diagnostic distress were measured with a 10-item cross-diagnostic symptom scale. Items were recoded to a 0 to 40 severity score, with higher scores indicating greater distress; baseline Cronbach's alpha was .95.

For RoT-ID, borderline and identity disturbance symptoms were measured with the McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD; [25]). The score

summed 10 items, with higher scores indicating more borderline-related or identity-disturbance symptoms; baseline Cronbach's alpha was .84. The construct was retained as a variant-primary outcome because RoT-ID was designed for alienation, emptiness, dysregulated belonging, and unstable self-concept.

For RoT-BSM, aggression was measured with retained items from the Aggression Questionnaire [26]. The score was the mean of 13 items after dropping one reverse-coded item in scale construction, with higher scores indicating greater aggression. Baseline standardized Cronbach's alpha for the retained 13 items was .87, reconstructed from the archived item-correlation matrix. Alcohol abuse/dependence and drug abuse/dependence were measured respectively with six-item subscales from the Psychiatric Diagnostic Screening Questionnaire [27]. Each subscale was summed, with higher scores indicating greater abuse/dependence risk; baseline Cronbach's alpha was .86 for alcohol and .88 for drug abuse.

Secondary socioemotional outcomes included emotional well-being difficulties (nine items), collaboration difficulties (10 items), and self-management difficulties (nine items). Hopefulness/agency was measured with four items adapted from agency-oriented hope measurement [28], averaged on a 1 to 4 response scale; baseline Cronbach's alpha was .77. Forgiveness of others was measured with a retained two-item score derived from the Heartland Forgiveness Scale after reliability review [29].

Social and community outcomes included perceived stigma of mental illness, social cohesion, and perceived community threat. Perceived stigma was the mean of five items rated from 1 to 4, with higher scores indicating greater perceived stigma. These were the discrimination-experience items of the Internalized Stigma of Mental Illness scale [30]. Social

cohesion and perceived community threat were derived from the Social Cohesion Scale used in the Rwanda societal-healing program [5].

Livelihood-related outcomes included economic security, short-term food insecurity, and long-term food insecurity. Economic security was a study-specific two-item measure of whether basic needs were consistently covered and whether household assets or savings could meet an unforeseen event. It was retained as an exploratory measure of perceived material security, with a narrower interpretation than overall household economic resilience.

Food insecurity was measured using study-specific adaptations of the Coping Strategies Index [31]. These local adaptations differ from the standard reduced index. The 12-month recall period overlaps baseline and endline, limiting its sensitivity to change during the trial. Additional file 1, Table S7, gives the measurement details and example items for all the secondary outcomes.

Statistical Analysis

The primary estimand was the difference between RoT and waitlist control in endline outcome scores among participants assessed at baseline in the pathway allocation, adjusted for baseline outcome level and accounting for therapy-group clustering. All baseline-assessed participants were retained in this analysis cohort, including those with missing endline data.

Missing endlines were multiply imputed in R mice [32] using multilevel 2l.pan, 50 imputations and 10 iterations. Each pathway-outcome model included baseline and endline scores, allocation, cluster, age, gender, education, marital status and occupation. Imputed values were constrained to the observed pre/post outcome range. Conditional on these predictors, missingness was assumed independent of unobserved endline values.

Primary ANCOVA regressed imputed cluster mean endline outcomes on allocation and baseline cluster means, weighted by baseline cluster size. Rubin's rules pooled estimates and variances, with small-sample degrees of freedom based on cluster counts. We report treatment differences (b), 95% confidence intervals (CIs), p values and standardized effects: b divided by the pathway's baseline participant SD, oriented so that positive values indicate improvement relative to waitlist. Sensitivity analyses used complete-case and unweighted cluster ANCOVA and individual-level mixed ANCOVA with individual baseline adjustment and a cluster random intercept, using the same 50 imputations (Additional file 1, Table S11).

To account for multiple comparisons, we used Benjamini–Hochberg correction with an FDR threshold of .05 [33]. This procedure controls the expected proportion of false positives among significant findings while allowing greater power than family-wise error control. For each pathway, primary outcomes constituted one family (RoT-ER 4, RoT-ID 3, RoT-BSM 5) and 11 exploratory outcomes another. Sensitivity analyses applied Holm correction to primary outcomes, controlling the probability of any false positive within each family [34]. Corrections were calculated separately by model and pathway. Tables 4–6 report FDR-adjusted p values; Tables S10–S11 also provide raw and Holm-adjusted p values.

Descriptive intraclass correlations are reported in Additional file 1, Table S8.

Use of generative AI and AI-assisted technologies

A generative AI tool, specifically OpenAI's GPT-6 Astra model, was used for drafting support, code assistance, manuscript formatting, and quality checks under author supervision. The authors reviewed the outputs, verified substantive content, and remain responsible for the submitted manuscript.

Results

Participant Flow and Baseline Characteristics

The analysis cohort included 427 baseline participants in 52 clusters. Endline completion differed by pathway and arm: 14 RoT-ER participants, 6 RoT-ID participants, and 13 RoT-BSM participants did not complete endline assessment and were imputed in the primary analysis. Figure 1 summarizes cluster and participant flow; Table 3 provides baseline characteristics by variant and arm. Observed baseline and endline outcome means, SDs and denominators by arm are provided in Additional file 1, Table S5. Implementation logs recorded eight treatment dropouts (two RoT-ER, three RoT-ID, three RoT-BSM), including personal reasons, flood displacement, death, and imprisonment; three reasons were unrecorded. These records do not account for all 33 missing endline assessments.

Table 3

Participant Flow and Baseline Characteristics by RoT Variant and Arm

Characteristic	RoT-ER		RoT-ID		RoT-BSM	
	RoT	Waitlist Control	RoT	Waitlist Control	RoT	Waitlist Control
Clusters	9	10	8	10	8	7
Baseline n	91	82	63	57	73	61
Observed endline n	86	73	58	56	69	52
Missing endline n	5	9	5	1	4	9
Age M (SD)	46.3 (12.1)	46.3 (13.9)	46.1 (12.7)	49.7 (13.7)	46.3 (12.3)	43.4 (12.4)
Female %	69.2	79.3	76.2	73.7	35.6	27.9
No schooling %	44.0	34.1	15.9	31.6	26.0	24.6
Primary education %	46.2	51.2	65.1	52.6	49.3	55.7
Secondary+ %	9.9	14.6	19.0	15.8	24.7	19.7

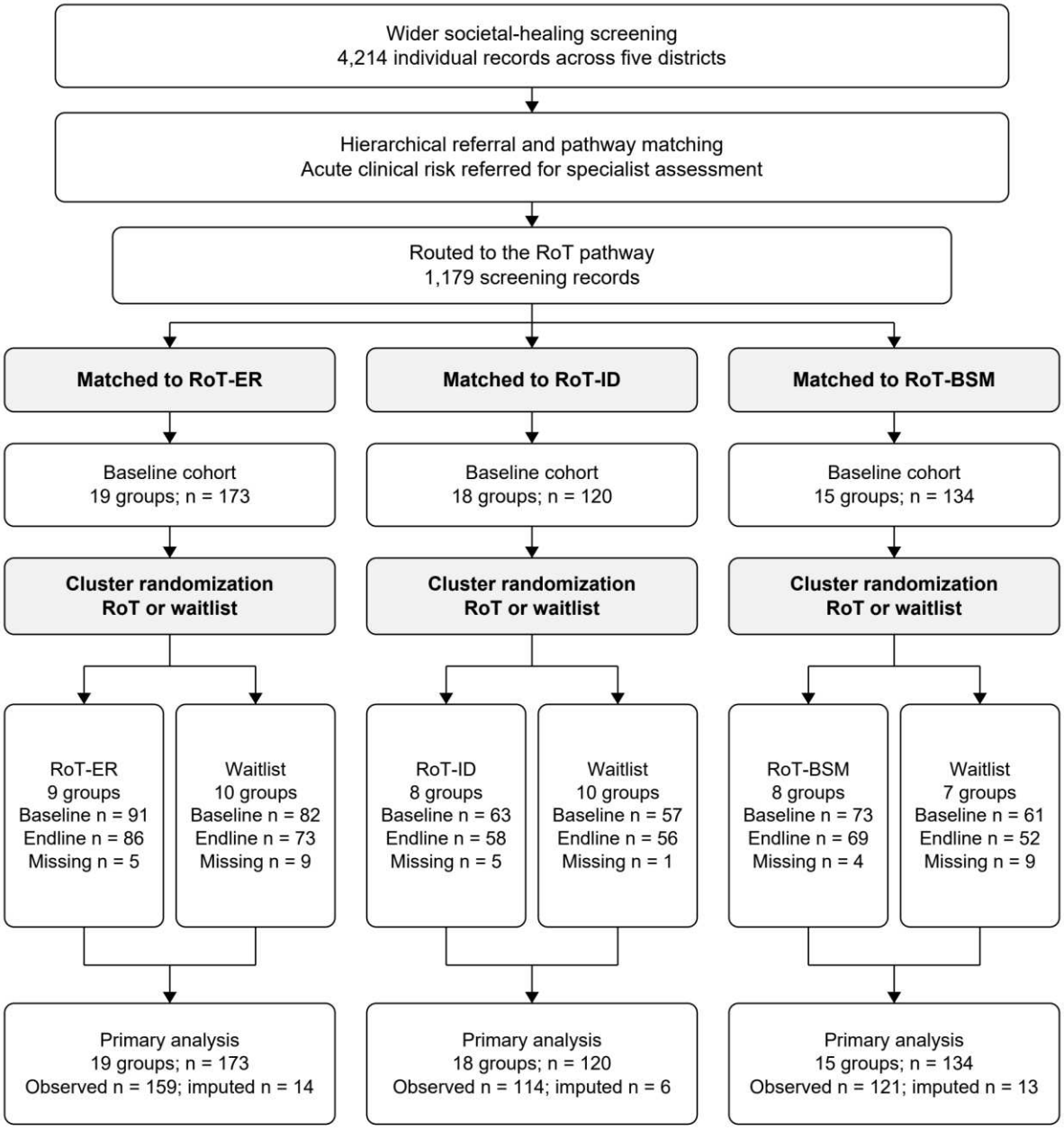
Note. RoT-ER = emotion-regulation variant; RoT-ID = identity-development variant; RoT-BSM = behavioral self-management variant. Values are based on the baseline cohort. M = mean; SD = standard deviation. Education categories are reported as percentages.

Primary and Variant-Specific Outcomes

Tables 4–6 summarize outcome effects. Adjusted PTSD differences were nonsignificant in every pathway: RoT-ER, b = -0.27, 95% CI [-0.88, 0.35]; RoT-ID, b = 0.09, 95% CI [-0.86,

304 1.04]; and RoT-BSM, b = -0.39, 95% CI [-1.31, 0.54]. Baseline floor frequencies and paired
305 descriptive changes appear in Additional file 1, Table S9.

306 **Figure 1**
307 Participant flow through screening and *the RoT* trial cohort



308
309 *Screening assigned individuals to RoT-ER, RoT-ID, or RoT-BSM. Eligible cells within each pathway were then*
310 *randomized to immediate RoT or waitlist before baseline assessment. The diagram reports clusters and participants. All*
311 *427 baseline participants were analyzed; 33 missing endline records were imputed. Eight treatment dropouts were*
312 *documented (two RoT-ER, three RoT-ID, three RoT-BSM); these do not explain all missing endline records. RoT-ER =*
313 *emotion regulation; RoT-ID = identity development; RoT-BSM = behavioral self-management.*

Compared with waitlist control, RoT-ER was associated with lower endline depression scores after baseline adjustment, b = -3.83, 95% CI [-6.30, -1.36], FDR-adjusted p = .014, improvement ES = 0.59, and higher resilience scores, b = 5.19, 95% CI [1.65, 8.74], FDR-adjusted p = .014, improvement ES = 0.67. RoT-ER participants also reported fewer anxiety/cross-diagnostic symptoms than waitlist participants, but the difference was not statistically significant, b = -3.44, 95% CI [-7.84, 0.96], FDR-adjusted p = .154.

Table 4

Outcome Effects for RoT-ER

Baseline n = 173; observed n = 159; missing n = 14; clusters = 19

Outcome	b [95% CI]	FDR p	Improvement ES
General primary			
PTSD symptoms	-0.27 [-0.88, 0.35]	.369	0.22
Resilience	5.19 [1.65, 8.74]	.014	0.67
Variant primary			
Anxiety/cross-diagnostic symptoms	-3.44 [-7.84, 0.96]	.154	0.31
Depression	-3.83 [-6.30, -1.36]	.014	0.59
Exploratory secondary			
Collaboration difficulties	-0.20 [-0.53, 0.14]	.627	0.28
Economic security	-0.06 [-0.36, 0.24]	.809	-0.09
Emotional well-being difficulties	-0.42 [-0.82, -0.01]	.242	0.55
Forgiveness of others	-0.00 [-0.34, 0.34]	1.000	-0.00
Hopefulness/agency	0.26 [0.02, 0.51]	.242	0.38
Long-term food insecurity	-0.56 [-2.22, 1.09]	.809	0.15
Perceived community threat	0.02 [-0.52, 0.56]	1.000	-0.03
Perceived stigma	-0.06 [-0.32, 0.21]	.809	0.07
Self-management difficulties	-0.23 [-0.57, 0.11]	.627	0.30
Short-term food insecurity	-3.07 [-11.63, 5.49]	.809	0.17
Social cohesion	0.07 [-0.23, 0.37]	.809	0.11

Note. RoT-ER = emotion-regulation variant; RoT-ID = identity-development variant; RoT-BSM = behavioral self-management variant. b is the baseline-adjusted RoT-minus-waitlist difference from cluster-level analysis of covariance with multiple imputation. CI = confidence interval; ES = standardized effect size. Improvement ES divides b by the SD across baseline participants in the pathway and reverses the sign for outcomes on which lower scores indicate improvement. Positive values indicate improvement relative to waitlist. P values are Benjamini–Hochberg adjusted separately for primary and exploratory outcomes within this pathway. Confidence intervals are pointwise; raw p values and Holm sensitivity results are in Table S10.

For RoT-ID, point estimates indicated higher resilience, b = 5.44, 95% CI [-0.19, 11.08], FDR-adjusted p = .121, ES = 0.68, and fewer borderline/identity disturbance symptoms, b = -1.68, 95% CI [-3.59, 0.24], FDR-adjusted p = .121, ES = 0.54. However, both confidence intervals included zero, leaving the magnitude of the effects uncertain.

Table 5

Outcome Effects for RoT-ID

Baseline n = 120; observed n = 114; missing n = 6; clusters = 18

Outcome	b [95% CI]	FDR p	Improvement ES
General primary			
PTSD symptoms	0.09 [-0.86, 1.04]	.841	-0.07
Resilience	5.44 [-0.19, 11.08]	.121	0.68
Variant primary			
Borderline/identity disturbance symptoms	-1.68 [-3.59, 0.24]	.121	0.54
Exploratory secondary			
Collaboration difficulties	-0.26 [-0.78, 0.26]	.582	0.33
Economic security	0.14 [-0.19, 0.46]	.582	0.18
Emotional well-being difficulties	-0.51 [-1.04, 0.03]	.429	0.67
Forgiveness of others	0.09 [-0.41, 0.59]	.830	0.11
Hopefulness/agency	0.19 [-0.23, 0.61]	.582	0.25
Long-term food insecurity	-0.71 [-3.14, 1.72]	.743	0.18
Perceived community threat	-0.06 [-0.63, 0.52]	.830	0.08
Perceived stigma	-0.40 [-0.96, 0.16]	.539	0.42
Self-management difficulties	-0.26 [-0.77, 0.25]	.582	0.31
Short-term food insecurity	2.04 [-12.05, 16.13]	.830	-0.09
Social cohesion	0.30 [-0.04, 0.63]	.429	0.45

Note. RoT-ER = emotion-regulation variant; RoT-ID = identity-development variant; RoT-BSM = behavioral self-management variant. b is the baseline-adjusted RoT-minus-waitlist difference from cluster-level analysis of covariance with multiple imputation. CI = confidence interval; ES = standardized effect size. Improvement ES divides b by the SD across baseline participants in the pathway and reverses the sign for outcomes on which lower scores indicate improvement. Positive values indicate improvement relative to waitlist. P values are Benjamini–Hochberg adjusted separately for primary and exploratory outcomes within this pathway. Confidence intervals are pointwise; raw p values and Holm sensitivity results are in Table S10.

For RoT-BSM, the adjusted differences were b = -0.00 for aggression, 95% CI [-0.21, 0.20], FDR-adjusted p = .960; b = 0.25 for alcohol abuse/dependence, 95% CI [-0.42, 0.92], FDR-adjusted p = .709; and b = -0.01 for drug abuse/dependence, 95% CI [-0.40, 0.37], FDR-adjusted p = .960. All three intervals included zero. The resilience estimate was b = 3.83, 95% CI [-1.83, 9.48], FDR-adjusted p = .709.

Secondary Outcomes

No exploratory outcome was statistically significant after FDR correction in any pathway (Tables 4–6). RoT-ER participants reported fewer emotional well-being difficulties (b = -0.42, 95% CI [-0.82, -0.01], FDR-adjusted p = .242, ES = 0.55) and greater hopefulness/agency than waitlist participants (b = 0.26, 95% CI [0.02, 0.51], FDR-adjusted p = .242, ES = 0.38).

For RoT-ID, the estimates for emotional well-being difficulties, b = -0.51, 95% CI [-1.04, 0.03], FDR-adjusted p = .429, ES = 0.67, and social cohesion, b = 0.30, 95% CI [-0.04, 0.63], FDR-adjusted p = .429, ES = 0.45, were in the direction of improvement but were not statistically significant. Estimates for the remaining outcomes are reported in Table 5.

For RoT-BSM, no exploratory outcomes differed significantly between arms in the primary cluster-level model (Table 6).

Table 6

Outcome Effects for RoT-BSM

Baseline n = 134; observed n = 121; missing n = 13; clusters = 15

Outcome	b [95% CI]	FDR p	Improvement ES
General primary			
PTSD symptoms	-0.39 [-1.31, 0.54]	.709	0.31
Resilience	3.83 [-1.83, 9.48]	.709	0.50
Variant primary			
Aggression	-0.00 [-0.21, 0.20]	.960	0.01
Alcohol abuse/dependence	0.25 [-0.42, 0.92]	.709	-0.15
Drug abuse/dependence	-0.01 [-0.40, 0.37]	.960	0.01
Exploratory secondary			
Collaboration difficulties	-0.29 [-0.87, 0.29]	.640	0.42
Economic security	-0.02 [-0.34, 0.31]	.919	-0.02
Emotional well-being difficulties	-0.08 [-0.64, 0.49]	.919	0.10
Forgiveness of others	-0.08 [-0.62, 0.46]	.919	-0.10
Hopefulness/agency	-0.09 [-0.54, 0.36]	.919	-0.14
Long-term food insecurity	-2.29 [-5.35, 0.78]	.640	0.62
Perceived community threat	-0.30 [-0.88, 0.28]	.640	0.41
Perceived stigma	-0.20 [-0.55, 0.15]	.640	0.23
Self-management difficulties	-0.14 [-0.67, 0.39]	.919	0.19
Short-term food insecurity	-10.48 [-29.42, 8.46]	.640	0.56
Social cohesion	-0.03 [-0.44, 0.37]	.919	-0.07

Note. RoT-ER = emotion-regulation variant; RoT-ID = identity-development variant; RoT-BSM = behavioral self-management variant. b is the baseline-adjusted RoT-minus-waitlist difference from cluster-level analysis of covariance with multiple imputation. CI = confidence interval; ES = standardized effect size. Improvement ES divides b by the SD across baseline participants in the pathway and reverses the sign for outcomes on which lower scores indicate improvement. Positive values indicate improvement relative to waitlist. P values are Benjamini–Hochberg adjusted separately for primary and exploratory outcomes within this pathway. Confidence intervals are pointwise; raw p values and Holm sensitivity results are in Table S10.

Sensitivity Analyses

Complete-case cluster-level models were similar to the primary MI results, indicating that imputing the 33 missing endline records did not materially change the main pattern. Unweighted

cluster-level analyses gave broadly similar results, but estimated larger RoT-ID benefits, particularly for borderline/identity disturbance symptoms. This suggests that the RoT-ID finding is sensitive to the weighting of larger clusters. Estimates and intervals are provided in Additional file 1, Table S1.

Mixed models estimated reductions in RoT-ER depression (b = -3.79, 95% CI [-6.30, -1.28]) and gains in resilience (5.32 [1.73, 8.91]), both with FDR-adjusted p = .015. Both effects also remained significant after Holm correction: adjusted p = .020 and .022 in weighted cluster models, and .028 for each in mixed models. RoT-ID and RoT-BSM primary confidence intervals included zero. Complete-case and Kenward–Roger analyses gave similar results; no exploratory mixed-model effect was significant after FDR correction (Tables S1 and S11).

Harms

End-of-session fidelity and participant-satisfaction checks identified no intervention-related adverse effects. Harms monitoring relied on these routine checks.

Discussion

In this pragmatic cluster-randomized trial, RoT-ER improved depression and resilience relative to waitlist among participants who presented with internalizing difficulties in the aftermath of the Genocide against the Tutsi in Rwanda. For RoT-ID, the estimates for borderline/identity disturbance symptoms and resilience were promising and warrant further evaluation. RoT-BSM showed no statistically significant effects on its variant-specific primary outcomes, aggression and alcohol- and drug-related problems. These patterns need to be interpreted in relation to the distinct populations entering each pathway.

Cells were randomized to RoT or waitlist within pathways; participants were not randomized between variants. Comparisons therefore address each variant’s intended outcomes,

not which variant was more effective. No variant significantly reduced PTSD symptoms. Indirect improvement was hypothesized through shared transdiagnostic processes [10], although the curriculum lacked structured trauma processing. A trial comparing prolonged exposure with present-centered therapy found improvement in both conditions, with greater PTSD reduction following prolonged exposure [35]. Whether adding trauma processing would improve RoT outcomes was not tested.

Low baseline PTSD scores may have limited improvement. Screening matched participants on internalizing, identity, or externalizing profiles; subclinical trauma alone prompted Sociotherapy referral [10], and severe active psychopathology, particularly suicidality, prompted more intensive care. Baseline zero scores occurred in 48.6% of RoT-ER, 24.2% of RoT-ID, and 41.0% of RoT-BSM participants (Additional file 1, Table S9). This could constrain change, particularly in RoT-ER and RoT-BSM. However, scores declined in both arms, and RoT-ID baseline symptoms were higher. Floor effects may have contributed, but their role in the nonsignificant comparisons remains uncertain.

RoT-ER

RoT-ER improved depression and resilience, with standardized effects of 0.59 and 0.67. This pattern is consistent with the variant's emphasis on managing distress while recovering the capacity to pursue valued goals. Through psychoeducation, emotional literacy practice, values development, and group psychosocial support, participants are encouraged to apply their emerging skills to address difficulties in everyday life [10]. The related exploratory outcomes were not statistically significant after FDR correction.

Both primary effects remained statistically significant after FDR correction and in mixed-model and Holm sensitivity analyses. In the original score units, the adjusted differences

correspond to 3.83 fewer BDI-SF points and 5.19 more CD-RISC-10 points relative to waitlist. Their confidence intervals range from reductions of 1.36 to 6.30 depression points and from gains of 1.65 to 8.74 resilience points. Clinical interpretation would be strengthened by participant-rated improvement, changes in everyday functioning, and thresholds for meaningful change validated in this population.

RoT-ID

For RoT-ID, the point estimates indicated improvement in resilience and borderline/identity disturbance symptoms, with standardized effects of 0.68 and 0.54, respectively. However, both confidence intervals included zero, and the estimates were sensitive to how clusters were weighted, with RoT-ID having the smallest clusters, which limited precision.

The identity-development curriculum connects work on distress and core beliefs with self-compassion and the capacity to build intimate and family relationships [10]. From this perspective, changes in self-understanding and belonging are intended to contribute to improvements in the relationships participants return to between sessions. Future iterations of the protocol could therefore include more activities related to self-discovery and finding oneself in relation to others. RoT-ID shares eight of its 12 Phase 4 skills with RoT-ER (Table 2), and the protocol's strong emphasis on skills acquisition may leave limited space for participants to engage in such processes of self-discovery. RoT-ID could also be combined with adjunct treatment, such as individual therapy, per the dialectical behavior therapy (DBT) model, or more intensive psychosocial support in participants' everyday environments [36]. Further evaluations should include more clusters and longer follow-up, because gains in identity development may take time to emerge and may not be apparent immediately after the intervention.

RoT-BSM

RoT-BSM showed no statistically significant effects on aggression or substance-use outcomes despite targeting externalizing difficulties. Group work alone may be insufficient when these difficulties are linked to social, economic, or family circumstances [5]. Stigma-related underreporting could also limit detectable change. At baseline, 84 of 134 RoT-BSM participants (62.7%) scored zero for alcohol problems and 116 (86.6%) for drug problems (Additional file 1, Table S9). These floors limit measurable improvement without establishing why treatment effects were nonsignificant. Benefits for some participants may also be obscured by insufficient intervention intensity at cohort level.

Further development of RoT-BSM could consider complementing group-based skills work with individualized support in participants' everyday environments, helping them apply new skills in specific challenging situations. In the wider program's correctional Sociotherapy stream, participants described acknowledging harm, apologizing to family members, and returning to education with outside support [37]. Although these accounts concern a different group-based intervention, they suggest a possible gap in the theory of change underpinning RoT-BSM. The empowerment framing of the RoT may suit participants with internalizing problems or identity disturbance but fit less well with the needs of participants with behavioral difficulties. The current RoT-BSM curriculum teaches planning, impulse regulation, and negotiation of disagreements [10], which are appropriate intervention targets for the specific population group, but perhaps a broader framing around social accountability and repairing harm, as in correctional Sociotherapy, might align it better with these needs. Individualized case management, family involvement, and links to substance-use or livelihood services could complement the group intervention. Recording whether participants use RoT-BSM skills during conflict or substance-

use situations would help distinguish difficulties in learning a skill from difficulties in applying it.

RoT Within Societal Healing

The trial also contributes to Rwanda's wider effort to connect clinical mental health with programs that address social determinants of distress, in the domains of family support, social cohesion, and sustainable livelihoods [5]. Within this societal healing approach, screening and referral are intended to direct people toward interventions suited to their needs, while retaining access to more intensive care where required [10, 16]. The RoT findings concern the clinical and socioemotional part of this system. Their practical significance therefore lies both in the outcomes of each pathway and in how those pathways can function alongside other forms of support.

Interpeace's report on the Rwanda Societal Healing Programme describes participants' experiences of improved self-management and renewed social connection across its interventions [37]. RoT participants described returning to social contact and improving family relationships; one account linked a young mother's growing capacity to manage distress with changes in her relationship with her own mother and plans to earn a living [37]. These qualitative accounts provide context for the trial's controlled evidence of gains in depression and resilience within RoT-ER. Social cohesion and perceived community threat did not improve significantly in the trial. Future studies could examine how clinical gains develop into changes in family and community relationships over time.

Within a multisystemic approach, personal recovery and supportive social conditions can reinforce one another [5]. Greater emotional competence may help a person sustain relationships or pursue livelihood opportunities, while more secure relationships and material conditions may

help maintain therapeutic gains. RoT seeks to activate this reciprocal process by connecting skills development with their use in family and community life, particularly in Phase 5 (Table 1) [10].

Strengths and Limitations

The study has several strengths. Randomizing clusters to RoT or waitlist provided a concurrent comparison group for each variant within its intended pathway. The trial was delivered in community and health-center settings across five districts, where the intervention was intended to be used. Facilitators were trained, assessed, and supervised, and the primary analysis retained all baseline participants through multilevel multiple imputation. Assessing both clinical and psychosocial outcomes allowed symptom change to be examined alongside resilience and social functioning.

The study also has limitations. Fewer and unevenly sized clusters limited precision; baseline PTSD ICCs (.048–.269; Table S8) exceeded the .037 planning value. Retrospective registration limits verification of prospective analysis specifications. Endline attrition was higher in RoT-ER and RoT-BSM waitlist arms, and imputation assumes missingness at random. Flooding affected both arms; nine treatment cells paused two to four sessions. These disruptions may have affected exposure and outcomes. Interviewer-administered self-report, stigma-sensitive outcomes, and unmasked endline enumerators introduce potential reporting bias. Social desirability may have suppressed baseline reports before therapeutic trust developed, although the extent of bias is unknown. Internal consistency does not establish the validity or responsiveness of locally adapted secondary measures. Scheduled endline assessment cannot establish durability or transfer to family and community settings. The waitlist comparison cannot separate curriculum effects from attention and group participation. Mixed models for several

RoT-BSM outcomes had boundary variance estimates, and substance-use residuals were strongly nonnormal (Table S11).

Implications

Further implementation of RoT-ER could build on the training and supervision systems used in this program, while incorporating mixed-methods outcome monitoring and assessment of potential mediators or moderators of therapeutic effect. For RoT-ID, adjunct individual support merits evaluation; RoT-BSM requires reconceptualization and testing before wider implementation. For all variants, future versions of the intervention could better address symptoms of post-traumatic stress that may accompany or underlie the main clinical presentation. For example, a module that draws on principles from Narrative Exposure Therapy [38] could follow the main skills-building phase [39], so that acquired competencies can be applied to reconstruct post-traumatic identity. Such a combination would need testing, because adding a skills phase has not consistently improved outcomes over trauma-focused treatment alone [40].

As a group-based treatment, RoT may cost less than one-to-one therapy because therapist time is shared among participants, although costs were not assessed in this trial. This is an important consideration in lower-income countries, such as Rwanda, where one-to-one treatment for all mental health conditions might not be financially sustainable [16]. Supervised delivery through existing health centers and community partners could provide a practical basis for extending RoT, with clear responsibility for delivery and outcome assessment assigned to specific societal actors [5, 10]. Training could combine protocol instruction with assessed practice and feedback, informed by WHO and UNICEF's EQUIP resources [41]. Supervision could address how facilitators apply the protocol when participants become distressed or struggle

with an exercise. Repeated outcome assessments, attendance records, and documentation of adverse events would help identify participants who need further support and establish whether benefits persist. Recording referral completion and staff time would also help assess whether delivery can be sustained as access expands and would provide the data needed for a cost-effectiveness analysis.

Conclusions

RoT-ER improved depression and resilience relative to waitlist, with both effects statistically significant after FDR correction and in sensitivity analyses. These findings support supervised implementation with outcome monitoring. RoT-ID showed promising but uncertain effects and merits evaluation with more clusters and longer follow-up, and possible adjunct individual support. RoT-BSM showed no statistically significant effects on its target outcomes, and its content and delivery need reconceptualization to better support participants with behavioral difficulties. No variant showed a statistically significant reduction in post-traumatic stress symptoms, which future versions of the intervention should address. Because RoT aims to strengthen participation in family and community life, services should also address barriers to participation outside therapy.

List of abbreviations

ANCOVA, analysis of covariance; CI, confidence interval; BDI-SF, Beck Depression Inventory-Short Form; CD-RISC-10, 10-item Connor-Davidson Resilience Scale; CRT, cluster-randomized trial; DBT, dialectical behavior therapy; ES, effect size; FDR, false discovery rate; ICC, intraclass correlation; ITT, intention to treat; MI, multiple imputation; MSI-BPD, McLean Screening Instrument for Borderline Personality Disorder; PCL-5, PTSD Checklist for DSM-5; PDSQ, Psychiatric Diagnostic Screening Questionnaire; RNEC, Rwanda National Ethics

Committee; SD, standard deviation; RoT, Resilience-Oriented Therapy; RoT-BSM, behavioral self-management variant; RoT-ER, emotion-regulation variant; RoT-ID, identity-development variant; SIDA, Swedish International Development Cooperation Agency.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Rwanda National Ethics Committee operating under the Ministry of Health of Rwanda (approval no. 122/RNEC/2023). Written informed consent was obtained from all participants.

Consent for publication

Not applicable. The manuscript does not report identifiable individual participant data.

Availability of data and materials

The de-identified individual-level data, study protocol, analysis documentation and code, and pre-post assessment materials are available from the corresponding author on reasonable request, subject to ethics, data-protection, copyright restrictions, and partner-governance approvals. Access to the RoT intervention manual may also be requested from the corresponding author, subject to permission from the relevant rights holders.

Competing interests

The authors declare that they have no competing financial interests. AL and EA led the conceptualization and development of RoT and its materials, with contributions from TB, MI, AM, EK, KN, and GC. ED led the Rwandan adaptation and fieldwork coordination, with contributions from ER, MM, and GM. ED, MM, GM, and FK are affiliated with Interpeace, the grant recipient and an implementing partner. These roles are disclosed as potential nonfinancial competing interests. The authors declare no other nonfinancial competing interests.

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Authors' contributions

OP led the CRT design and statistical analysis, supported by AG, ER, and VS, and co-led manuscript synthesis and interpretation with AL. AL also led the overall scientific conceptualization and intervention framing. ED led the Rwandan adaptation of the intervention and research materials and fieldwork coordination, with contributions from ER, MM, and GM. EA led the drafting of the Resilience-Oriented Therapy intervention and training materials, under the guidance of AL, and supported by KN, MI, EK, AM, and GC. TB and AM contributed to intervention conceptualization in line with current global mental health practices. FK led program fundraising on behalf of Interpeace, as well as senior Rwandan stakeholder engagement. All authors contributed to manuscript review and approved the final submission version.

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Supplementary information

Additional file 1 provides further details on screening and participant flow (Tables S3 and S6), the outcome measures and their scoring (Tables S2 and S7), and observed outcomes by trial arm (Table S5). It also reports the sensitivity analyses and imputation diagnostics (Tables S1 and S4), intraclass correlations (Table S8), PTSD and substance-use floor frequencies and paired PTSD changes (Table S9), and FDR-adjusted results and Holm sensitivity analyses (Table S10). Detailed mixed-model results and diagnostics appear in Table S11. File format: .docx.

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