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## **Living positive with HIV in Botswana: a self-help intervention for people living with HIV and depressive symptoms**

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## Chapter 2

# The effectiveness of self-help interventions in the treatment of depressive symptoms in low-and-middle-income countries (LMICs): a meta-analysis



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## The effectiveness of self-help interventions in the treatment of depressive symptoms in low-and-middle-income countries (LMICs): a meta-analysis

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### ABSTRACT

**Background:** Self-help psychological interventions show great potential to close the treatment gap for depressive symptoms in low-and middle-income countries (LMICs). The current meta-analysis investigated the pooled effect of self-help interventions for people with depressive symptoms in LMICs and moderators of these psychological interventions.

**Method:** PubMed, Cochrane Register of Randomized Controlled Trials, PsychInfo, Embase, and Sabinet databases were searched between June 2021 and December 2022 to select studies that met pre-defined inclusion criteria. A coding protocol was used to retrieve and code relevant data from selected studies. We measured publication bias and assessed the study quality using the Cochrane Risk of Bias tool. The program 'Comprehensive Meta-Analysis' (CMA) was used for the data analysis. Overall effect sizes were calculated to assess the effectiveness of self-help programs for depression.


**Results:** Eighteen studies were included in the meta-analysis. Self-help interventions were found to have a medium positive effect on depressive symptoms at post-test (Hedges'  $g = 0.74$ ) and at follow-up (Hedges'  $g = 0.82$ ). There was evidence for publication bias. Larger effects were found for studies that were conducted in lower-middle income countries, had at least mild depression as inclusion criterion, reported less than 30% attrition, did not use relaxation techniques, had a low or medium risk of bias, and that used a booklet form of intervention.

**Conclusion:** This meta-analysis suggests that self-help interventions have a positive effect on people with depressive symptoms in LMICs. The findings could inform the design and implementation of mental health interventions that could prevent or treat depression.

### KEYWORDS

Meta-analysis; self-help; low-and-middle-income; depressive symptoms; interventions

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## Introduction

An estimated 280 million people suffer from depression (World Health Organization (WHO), 2023). Most people with depression are found in low-and-middle-income countries (LMICs), and with limited access treatment (Moitra et al., 2022; WHO, 2023). A mental health report by the WHO (2022), shows that mental health conditions are widespread, under-treated, and poorly addressed due to insufficient resources. There is a large discrepancy between the demand for mental health services and available trained professionals in LMICs (WHO, 2022). For instance, compared to the global average of 3.96 psychiatrists per 100,000 people in high-income countries, there are 0.04 to 0.30 psychiatrists per 100,000 people in LMICs (Rathod et al., 2017). These professionals are mostly based in urban areas and may not be accessible to those in rural areas, creating a treatment gap which is exacerbated by other factors such as poverty, conflict, social inequalities, limited budget for mental health, limited infrastructure, and low self-worth (Rathod et al., 2017).

Given the severe consequences of depression, including significant losses in health and functioning (Boulanger et al., 2009; Katon et al., 2007), and poor medication adherence (Zhou et al., 2022), it is important to address the treatment gap for depression and ensure timely access to those in need. Timely provision of treatment for depression has been directly linked to improved response rates, reduced illness and disability, and lower mortality (Bukh et al., 2013; Dominiak et al., 2021). However, traditional forms of treatment, such as face-to-face therapy or individual methods, may not be feasible for effectively addressing or treating depression in LMICs due to the barriers mentioned above.

In the past two decades, there has been an increase in research focused on self-help treatments for depressive symptoms. Self-help approaches may be guided or unguided and may be delivered in various formats, such as online or via paper manuals (Chamberlain et al., 2008). There are several advantages of self-help treatments which could make them more feasible for LMICs. Participants usually apply self-help interventions at a convenient place and time, reducing transport costs and travel time to treatment centers and giving patients privacy, which may reduce stigmatization and improve access (Ma et al., 2021). Self-help interventions do not necessarily require contact with professionals, therefore, people in LMICs could still get help despite the shortage of trained staff. Self-help interventions have been found to be effective in treating mild to severe depressive symptoms when compared to no-treatment controls in randomized controlled trials (RCTs) (Andersson et al., 2019; Cuijpers et al., 2019; Matcham et al., 2014). Thus far, most studies have been conducted in high-income countries, but there is increasing research on self-help interventions in LMICs

with promising findings (Arjadi et al., 2015; Fu et al., 2020; Martinez et al., 2018; Naslund et al., 2017).

The present study aims to systematically review the results of these studies and to perform a meta-analysis on the effectiveness of self-help interventions to treat depressive symptoms in people from LMICs. To our knowledge, there are three previous meta-analyses that investigated the effectiveness of self-help interventions for depressive symptoms in LMICs (Fu et al., 2020; Karyotaki et al., 2023; Kim et al., 2023). One of the meta-analytic studies investigated participants who experienced both depressive symptoms and substance misuse (Fu et al., 2020) and the other two studies included participants who experienced both depressive and anxiety symptoms (Karyotaki et al., 2023; Kim et al., 2023). These meta-analyses showed that digital self-help interventions were moderately effective in treating depressive symptoms. These findings are encouraging regarding the use of self-help programs for the treatment of depressive symptoms in LMICs. However, all three meta-analyses investigated only digital psychological interventions.

The current meta-analysis investigated the effectiveness of both guided and unguided self-help interventions delivered in different formats (e.g. booklet, digital, etc.) and focused on the treatment of depressive symptoms, (including depressive disorders). The current meta-analysis also aimed to investigate whether selected sociodemographic and clinical variables might account for the differential effect of the intervention on the outcome.

## **Methodology**

The study is approved as part of a larger study on (interventions for depressive symptoms) by the University of Botswana Ethics Committee and Health Research and Development Committee of the Ministry of Health in Botswana (Ref: HPDME 13/18/1).

## **Search strategy**

We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement (Moher et al., 2009) to develop a methodological framework and protocol. Using pre-defined search terms, we searched the following databases: PsycINFO, Embase, PubMed, Cochrane Register of Randomized Controlled Trials, and SABINET African Journals. The search strategy included search words related to depression; self-help programs; various types of self-help programs and LMICs including all countries listed under LMICs (World Bank Group, 2021) (See [Supplementary appendix](#) for an overview of the search terms).

The search was conducted between June 2021 and December 2022. We did not include date as a filter; therefore, all articles ever published on the topic could be retrieved. Firstly, duplicates were removed using Zotero, a reference management tool. Secondly, titles and abstracts of relevant studies were reviewed by 4 independent researchers, each researcher screening a portion of the studies. Articles of studies that were considered relevant were retrieved for the second screening where the 4 researchers each reviewed a portion of the full articles. After the second screening, the excluded articles were screened again by a different researcher. If studies met the inclusion criteria, the articles were included in the coding process for the meta-analysis. When researchers were uncertain about including an article after the full text screening, it was discussed with the other researchers and a decision was made.

### ***Inclusion and exclusion criteria***

The inclusion criteria were: (1) evaluation of a self-help intervention; (2) treatment for depressive symptoms/disorder, (3) study participants were 16 years or older (4) study participants came from a LMIC, (5) articles were written in English, (6) the effect sizes of the collected data were clearly stated in the article and/or retrieved by the authors and/or there was pre- and post-treatment data to calculate the effect size.

Regarding the first criterion, study design could be RCT or pre-post. Studies that examined either guided or unguided forms of self-help programs were included. Regarding the second criterion, treatment had to be specifically focused on depression/depressive symptoms/disorder or listed depression, depressive symptoms, or depressive disorder as one of the primary outcome variables. Therefore, inclusion was based on what the individual studies reported as the intervention target/s or outcome/s. Regarding criterion six, the data required to calculate effect sizes included means, standard deviations, confidence intervals (CI's), and other data such as F, t and p values. Where there was no data to calculate effect sizes, we contacted the authors to obtain the information. When we did not get a response from the authors the article was excluded.

After removing duplicates, there were barely any issues related to multiplicity. If several studies reported findings from the same data, the study with the most relevant data, based on comprehensiveness of data presented in relation to the outcome variable, was included in the meta-analysis and the information from the other articles could be used to fill in gaps. Additionally, in studies that utilized several measures for depressive symptoms, the one with the most comparable and best-validated outcomes, based on psychometric properties, was selected. In cases where studies included multiple interventions and a control group (Gao et al., 2018;

Taleban et al., 2016; Tulbure et al., 2018), we included the most intensive intervention.

### **Coding and data extraction**

A coding protocol was developed and used to retrieve and code all relevant data from the selected studies ( $k=18$ ). First, a selection of articles ( $k=6$ ) was coded by two independent researchers. The mean percentage of agreement was 93% for all study features excluding the quality criteria. Thereafter, the same two researchers consulted the same articles ( $k=6$ ) to resolve the disagreements. Most of the disagreements concerned one of the researchers coding the data as missing, while the other researcher coded valid information. The remainder of the studies ( $k=12$ ) were coded by one researcher and then checked by another researcher who only looked at missing data and filled in the missing data where possible.

We retrieved and coded the following information related to the outcome variables: Cohen's  $d$  and standard deviation, lower and upper bound of the confidence interval (CI) of Cohen's  $d$ , pre- and post-test depression scores including the mean and standard deviation of the intervention group and, in case of an RCT, also of the control group. Confidence intervals were estimated using the inverse variance method.

Other relevant information retrieved and coded included the following variables: year of publication, the country and continent, which classification of LMICs (i.e. low-income country, lower-middle-income country, upper-middle-income country), journal in which the article was published, first and last year of data collection, number of participants at pre-and post-test for intervention and control group, attrition (at each time point of the study), percentage of female participants and female completers, mean age and standard deviation of age of all participants, screening criteria of the individual studies for the intervention (i.e. severe depressive symptoms at baseline, mild depressive symptoms at baseline, no screening of depressive symptoms at baseline), comorbidities of participants (i.e. people without comorbidity, people with comorbidity), intervention target (depression, depression and other), type of intervention (CBT/stress management, mindfulness), guidance (unguided, guided), type of guidance (i.e. telephone, chat, other, multiple combined methods), type of guidance provider (i.e. psychologist, trained counselor, other), content of guidance (i.e. answering questions about the self-help program, giving feedback on assignments, motivate participants, a combination), intervention duration in hours, form of the intervention (i.e. booklet, smartphone app, Internet-based, other), type of control group (i.e. waitlist-control, care as usual, psychoeducation), type of analysis (i.e. Intention to Treat (ITT), per

protocol), study quality and risk of bias (via the Cochrane Risk of Bias tool, elaborated below).

### **Moderators**

The following possible moderators were investigated: study location, first year of participant recruitment, percentage of females, intervention duration in hours, mean age, attrition percentage, intervention provider, comorbidity, intervention type, intervention target, mild to severe depressive symptoms/depression/depressive disorder at baseline as inclusion criterion, use of relaxation technique, CBT technique, stress management, motivational interviewing, whether intervention targeted a single disorder, if intervention was guided, type of guidance, content of guidance, intervention form, type of control group, type of analysis and study quality (see Table 2).

The assumptions for meta-regression were checked (normality and linearity) to perform the moderator analyses with continuous variables. However, none of the variables met both assumptions. Therefore, for statistical reasons, continuous variables were transformed into categorical variables for the moderator analysis. The categories were decided carefully based on both statistical and content-related reasons. The variable first year of recruitment was categorized into two periods based on a median split: 2013–2016 and 2017–2020. Similarly, the variable intervention duration was grouped into two categories: 0–12h and 12.1–22.6h based on a median split and mean age was categorized into 16–31.65 and 31.66–42 years, also based on a median split. The variable percentage of females was categorized into three categories: 0%–50%, 51%–75%, and 76%–100%. Finally, attrition percentage was separated into two categories: below 30% and 30% and higher.

### **Risk of bias**

The ‘Cochrane Risk of Bias assessment tool 2’ (RoB 2; Higgins & Green, 2011), was used to assess the risk of bias for RCTs. The RoB 2 assessment tool assesses the risk of bias based on five domains and another representing the sum score. The following domains were scored: (1) Randomization process, (2) Deviations from intended interventions, (3) Missing outcome data, (4) Measurement of the outcome, (5) Selection of the reported result and (6) Overall bias. The overall risk of bias is calculated by adding the results of the five domains. Based on the questions defined by the tool, the researchers rated, for each domain, whether there was: (1) low risk of bias, (2) some concerns, (3) high risk of bias. The overall risk of bias was calculated based on all the individual domains and rated: (1) low risk of bias, (2) some concerns, (3) high risk of bias.

Two people rated the risk of bias of the studies (each person rating a portion of the 18 articles). Six studies were rated by both authors and the percentage of agreement for these six studies was 98%.

### **Statistical analysis**

The program 'Comprehensive Meta-Analysis' (CMA, version 4) was used for the data analysis. Overall effect sizes were calculated to assess the effectiveness of self-help programs for depression in LMICs when compared to control groups. To measure the effect size, we calculated Hedges'  $g$  by entering relevant data in CMA which mainly included effect sizes from individual studies, standard deviations, sample sizes as well as other available data (e.g.  $F$ ,  $t$  or  $p$  values) for both the intervention and control groups. The effect sizes were classified as small (0.20–0.49), moderate (0.5–0.79) and large (0.8+) (Cohen, 1992). The overall effect size was calculated using the inverse variance method. Outliers (studies with an extremely large effect size and standardized residual  $>3$ ) were identified and adjusted by replacing them with the nearest non-outlier value (Lipsey & Wilson, 2001).

In CMA, a correlation between pre- and post-test should be indicated for each study. Since this correlation was rarely reported in study papers, this was set at 0.5 (based on Follman et al., 1992). Setting the correlation at 0.5 ensured that studies that did not report the correlation between pre- and post-test are not excluded (Follman et al., 1992). Additionally, a moderate correlation of 0.5 strikes a balance between two extremes: a correlation of 0 (no relationship between pre- and post-test scores) and 1 (perfect relationship between pre- and post-test scores).

Heterogeneity between studies was assumed; therefore, a random-effects model was adopted to calculate a pooled effect size. To measure heterogeneity among included studies,  $Q$ , and  $I^2$  statistics were calculated. A significant  $Q$  indicated significant inconsistency and heterogeneity among the studies.  $I^2$  shows the amount of heterogeneity, with an  $I^2$  of 25% representing low heterogeneity, 50% medium heterogeneity and over 75% high heterogeneity. Two-tailed  $p$ -values of  $<.05$  were used within the analysis.

A mixed effect model was used for the moderator analysis. To combine the studies in one subgroup, we applied the random effects model, and the fixed effects model was used when comparing across subgroups (Borenstein et al., 2009). We set the options for the mixed and random effects in CMA to not assume a common among-study variance component across subgroups (do not pool within-group estimates of tau-squared).

To investigate the presence of publication bias in this meta-analysis, a funnel plot and Egger's test of the intercept (Egger et al., 1997) was conducted.

A significant Egger's test of the intercept indicated publication bias within the study. In addition, Duval and Tweedie's trim and fill analysis (2000) was used to estimate missing data due to publication bias and, when there was missing data, studies were imputed to correct this. Thereafter, an adjusted effect size was calculated.

## Results

The electronic search retrieved 2569 articles (Figure 1). A total of 1065 duplicates were removed, and 1504 articles were screened based on titles and abstracts. We removed 1209 articles based on title and abstract and screened 295 articles based on full text. In total, 25 articles met the inclusion criteria. Further screening excluded 3 articles that presented the same data as another included study from the same authors. We excluded another 4 studies that were either not randomized ( $k=2$ ) or had a pre-post design ( $k=2$ ). A total of 18 studies were included in the meta-analysis.

### Deviation from protocol

While the original inclusion criteria allowed for the inclusion of studies that were uncontrolled, there were too few of these types of studies in

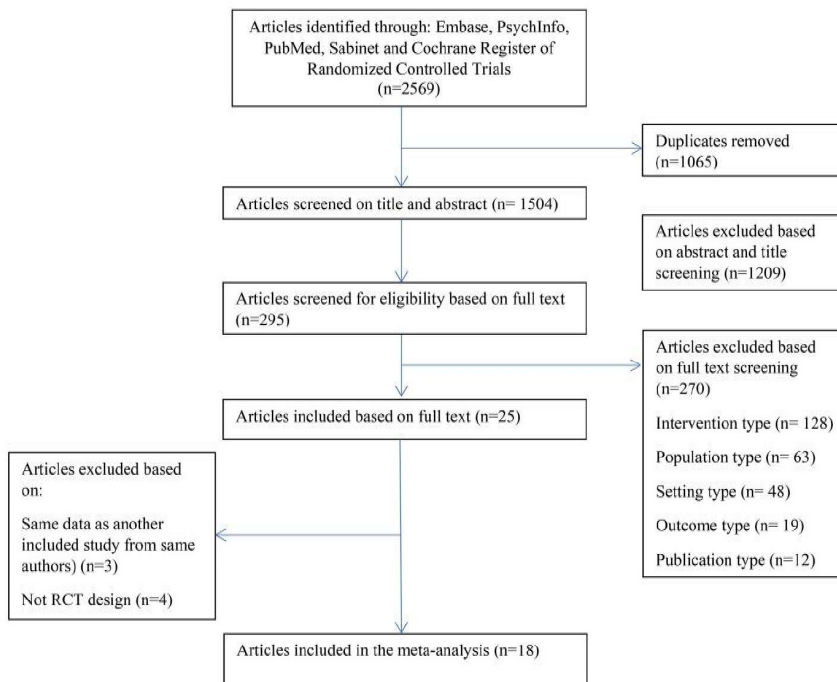


Figure 1. Flow diagram of study inclusion and exclusion.

the current study to run a separate analysis and have a meaningful comparison. Therefore, the 4 studies (2 not randomized and 2 had a pre-post design) were excluded from the final analysis; thus, the final analysis was only based on RCTs.

### **Study characteristics**

Table 1 presents an overview of the characteristics of all included studies. Relatively many of the studies were conducted in China ( $k=7$ ). Other studies were conducted in Iran ( $k=2$ ), Lebanon ( $k=2$ ), Pakistan ( $k=2$ ), Colombia ( $k=1$ ), India ( $k=1$ ), Indonesia ( $k=1$ ), Romania ( $k=1$ ), and Thailand ( $k=1$ ). Regarding the recruitment period, participants were recruited between the years of 2013–2020 ( $k=12/18$ ). The mean of the mean age of participants across studies was 29 years (SD = 7.18; range of the mean: 21 years–42 years,  $k=16$ ). Out of 15/18 studies that reported on gender distribution; two studies included only females while most (13) included females and males. The percentage of females in the included studies was on average 67.86% (range: 7.67%–100%).

Most of the studies ( $k=15/18$ ) utilized CBT/stress management and the rest of the studies utilized mindfulness ( $k=3$ ). A total of 11 interventions were guided while seven studies did not specify if the interventions were guided or unguided. A total of eight studies reported on the duration of the interventions which ranged from 2 h to 22.6 h. The most used measures of (symptoms of) depression were the Patient Health Questionnaire-9 (PHQ-9;  $k=4/18$ ) and the Beck Depression Inventory II (BDI-II;  $k=4/18$ ).

Regarding follow-up, 13/18 studies had one follow-up while the rest did not have a follow-up. Most studies had a standard care control condition ( $k=8/18$ ). A total of 3532 participants were randomized to intervention and control conditions (range 20–617;  $k=18$ ). The percentage of drop-out from the RCT studies ranged from 0% to 50.5% with a mean of 13.3% ( $k=8$ ).

### **Quality of included studies**

Figure 2 presents the quality ratings. The studies were rated based on 5 criteria of the RoB 2 as described in the method section. Regarding the overall risk of bias, ( $k=3/18$ ) studies were classified as low risk of bias, ( $k=6/18$ ) were classified with high risk and the majority (9/18) ‘some concerns’. Only  $k=2/18$  studies rated as low risk on all criteria,  $k=3/18$  studies rated low risk on all but one criterion, and  $k=4/18$  rated as high risk on 1 criterion. The rest ( $k=9/18$ ) of the studies had more than 2 scores of either 1 (some concerns) or a combination of ‘some concerns and ‘high risk’.

Table 1. Descriptive data of included articles.

Authors	Recruitment period <sup>b</sup>	N after randomization and sample description	Mean Age (SD) <sup>b</sup>	Range <sup>b</sup>	% of females <sup>b</sup>	Intervention name (N) <sup>c</sup> ; type (T) <sup>d</sup> , guidance provider (G) <sup>e</sup> ; duration (D) <sup>b</sup>	Control group	Primary outcome measure <sup>e</sup>	Brief description of each study results	Follow up, period of follow-up	Attrition <sup>%b</sup>
Arjadi et al. (2018), Indonesia	2016–2017	313; met the criteria for MDD or PDD	24.48 (NS)	NS	80.83	N: Guided Act and Feel Indonesia (GAF-I); T: CBT/stress management, G: Counselor, D: 5 hours	Psychoeducation platform	PHQ-9	An effect size of 0.24 for the GAF-ID group compared with the control group at 10 weeks was sustained over time (effect size 0.24 at 3 months, and 0.27 at 6 months).	Yes, 3 months, 6 months	NS
Cuijpers et al. (2022), Lebanon	2019–2020	569, had depression and impaired functioning	31.50 (8.70)	NS	58.35	N: Step-by-Step, T: CBT/stress management, G: Counselor, D: 2.5 hours	Enhanced care as usual	PHQ-9	Significant effects on depression (standardized mean differences: 0.71; 95% CI: 0.45 to 0.97) Significant effects on all outcomes were retained at 3-month follow-up.	Yes, 3 months	NS
Gao et al. (2018), China	2014	95, individuals willing to participate	31.76 (8.19)	NS	35.79	N: Present Awareness Mindfulness (PAM) and Progressive Muscle Relaxation (PMR), T: CBT/stress management, G: NS, D: NS	Waitlist control	Brief POMS	It was found that PAM and PMR are both efficacious interventions that resulted in greater reductions in perceived stress and improved mood.	Yes, 1 month	50.52
Guo et al. (2020), China	2017–2018	300, PLWH with depressive symptoms	28.30 (5.80)	NS	7.67	N: The Run for Love Intervention, T: CBT/stress management, G: NS, D: NS	Care as usual and a brochure on nutrition for PLWH	CES-D	At the 3-month follow-up, reduction in CES-D in the intervention group (from 23.9 to 17.7 vs from 24.3 to 23.8; standard effect size $d=0.66$ ).	Yes, 3 months, 6 months, 9 months	NS

(Continued)

Table 1. Continued.

Authors	Recruitment period <sup>b</sup>	N after randomization and sample description	Mean Age (SD) <sup>b</sup> Range <sup>b</sup>	% of females <sup>b</sup>	Intervention name (N) <sup>c</sup> , type (T) <sup>c</sup> , guidance provider (G) <sup>b</sup> , duration (D) <sup>b</sup>	Control group	Primary outcome measure <sup>e</sup>	Brief description of each study results	Follow up, period of follow-up	Attrition <sup>g</sup> % <sup>b</sup>
Heim et al. (2021), Lebanon	NS	138, participants with depressive symptoms.	27.30 (NS) 18–50yrs	67.39	N: Step by Step, T: CBT/stress management, G: Counselor, D: 2 hours	Psychoeducation on depression and anxiety	PHQ-9	Statistically significant symptom reduction in depression as measured with the PHQ-9 (Cohen's $d = 0.73$ ; $p = .009$ )	Yes, 3 months	NS
Ju et al. (2022), China	2020	617, had a current Kessler Psychological Distress Scale score over 22.	31.53 (9.50) NS	78.28	N: Mindfulness Intervention for Emotion distress, T: Mindfulness, G: course assistant, D: 21 hours	Waitlist	ODSIS	The intervention group had a greater increase in changes of all outcome variables ( $p < 0.001$ ) when compared to the control group.	No	NS
Kirupa et al. (2015), India	2013	20, patients who suffered from diabetic foot ulcer or venous ulcer	NS (NS) NS	NS	N: Bibliotherapy, T: CBT/stress management, G: Other, D: NS	Care as usual	BDI-II	Bibliotherapy highly proven to significant in increasing quality of life ( $F = 20.3, P < 0.001$ ), decreasing the psychological distress ( $F = 25.2, P < 0.01$ ) and decreasing depression ( $F = 5.18, P < 0.05$ ).	Yes, 14 days and 21 days	0
Latif et al. (2021), Pakistan	2019–2019	39, individuals with depressive symptoms	34.44 (NS) NS	53.85	N: Culturally adapted CBT-based guided self-help 'Kushi or Khatoon', T: CBT/stress management, G: NS, D: NS	Care as usual	HADS	Preliminary evaluation of a culturally adapted CBT-based online programme for depression found to be feasible and acceptable to Pakistani patients with anxiety and depression.	Yes, 12 weeks	0

(Continued)

Table 1. Continued.

Authors	Recruitment period <sup>b</sup>	N after randomization and sample description	Mean Age (SD) <sup>b</sup>	% of females <sup>b</sup>	Intervention name (N) <sup>c</sup> , type (T) <sup>d</sup> , guidance provider (G) <sup>e</sup> , duration (D) <sup>b</sup>	Control group	Primary outcome measure <sup>e</sup>	Brief description of each study results	Follow up, period of follow-up	Attrition <sup>g</sup> % <sup>b</sup>
Liu et al. (2021), China	2020	125, mothers who were primary caregivers of preschool children diagnosed with autism	32.89 (3.68) NS	100	N: Joint Attention Symbolic Play, Engagement and Regulation Online course, T: CBT/stress management, G: Counselor, D: 22.60 hours	Care as usual	SDS	statistically significant group × time interaction effects for the intervention on depression (F = 26.563, P < .001).	Yes, 20 weeks	NS
Ma et al. (2018), China	NS	96, volunteers without identified mental illness.	27.84 (NS) 18–47 y	NS	N: Self-direct based mindfulness-intervention (SDMBI) T: Mindfulness, G: NS, D: 16 h	Waitlist	SDS	Results showed that participants had significant pre- and post-test differences on mindfulness, emotion regulation difficulties, and psychological distress, with medium to large effect sizes.	No	33.33
Naeem et al. (2014), Pakistan	NS	192, patients with depression	NS (NS) NS	NS	N: Self-help book, based on CBT methods and culturally adapted, T: CBT/stress management, G: family/hospital staff, D: 5 h.	Care as usual	HADS	CaCBT based self-help found to be effective when compared to care as usual in reducing the symptoms of depression and anxiety, as well as somatic symptoms and disability.	No	4.69
Perera et al. (2020), Colombia	2016–2017	214, college students with mild to moderately severe depressive symptoms	22.15 (4.70) 18–52 y	71.50	N: Colombian iCBT: Yo puedo sentirme bien/I can feel better, T: CBT/stress management, G: Counselor, D: NS.	Waitlist	PHQ-9	There were significant effects post treatment for the intervention group, maintained at 3-month follow-up	Yes, 3 months	NS

(Continued)

Table 1. Continued.

Authors	Recruitment period <sup>b</sup>	N after randomization and sample description	Mean Age (SD) <sup>b</sup> Range <sup>b</sup>	% of females <sup>b</sup>	Intervention name (N) <sup>c</sup> , type (T) <sup>c</sup> , guidance provider (G) <sup>c</sup> , duration (D) <sup>b</sup>	Control group	Primary outcome measure <sup>e</sup>	Brief description of each study results	Follow up, period of follow-up	Attrition <sup>g</sup> % <sup>b</sup>
Shahsavani et al. (2021), Iran	2018	102, pregnant women; medium score range, depression, anxiety, and stress	28.40 (NS) 18–35 y	100	N: I-GSH-CBT intervention, T: CBT/stress management, G: Counselor, D: NS.	Care as usual	DASS-42	Implementing the I-GSH-CBT significantly reduced CBF, DASS-42 scores.	No	NS
Songprakun and McCann (2012), Thailand	NS	56, individuals with moderate depression	42 (9.72) 18–58 y	73.21	N: The Good Mood Guide: A self-help manual for depression, T: CBT/stress management, G: NS, D: NS.	Care as usual	CES-D	At post-test, the distress scores of the intervention group lower than the control group. Post-test to 1-month follow-up, distress scores decrease steadily in the intervention group but only slightly in the control group. depressive symptoms less intense post-treatment ( $F=12.30$ , $p<.001$ ).	Yes, 1 month	3.57
Taleban et al. (2016), Iran	NS	203, individuals with depressive symptoms	39.83 (NS) NS	93.60	N: Bibliotherapy and text messaging, T: CBT/stress management, G: NS, D: NS.	NS	BDI-II	Significant differences found among the three conditions at post-intervention (Cohen's $d$ between 0.45 and 1.89).	Yes, 6 months	11.39
Tulbure et al. (2018), Romania	2014	79, individuals with current diagnosis of MDD or dysthymia	32.05 (NS) NS	82.28	N: iCBT intervention (Conventional CBT and Religious CBT), T: CBT/stress management, G: Psychologist, D: NS.	Waitlist	BDI-II	Significant differences found among the three conditions at post-intervention (Cohen's $d$ between 0.45 and 1.89).	Yes, 6 months	11.39

(Continued)

Table 1. Continued.

Authors	Recruit-ment period <sup>b</sup>	N after randomization and sample description	Mean Age (SD) <sup>b</sup>	% of females <sup>b</sup>	Intervention name (N) <sup>c</sup> ; type (T) <sup>d</sup> ; guidance provider (G) <sup>e</sup> ; duration (D) <sup>b</sup>	Control group	Primary outcome measure <sup>e</sup>	Brief description of each study results	Follow up, period of follow-up	Attrition <sup>g</sup> % <sup>h</sup>
Ying et al. (2023), China	2020	194, Chinese residents with CES-D score of $\geq 16$ .	40.15 (NS)	62.37	N: Healthy Psychological Station, Clinician-guided iCBT; T: CBT/ stress management, G: Counselor, D: NS	Waitlist	CES-D	iCBT participants had greater reductions on all the outcomes compared to the waitlist group at post-intervention (PHQ-9) at and at follow-up ( $d=0.12$ ) and the CES-D at post-intervention ( $d=0.06$ ), compared to the CBT group.	No	NS
Zhao et al. (2022), China	NS	182, students with at least mild depressive symptoms	21.76 (NS)	52.75	N: iACT, T: Mindfulness, G: NS, D: 3 hours	Waitlist	BDI-II	The iACT group showed significantly more improvement in depressive symptoms ( $d=1.27$ ) both at T1 and T2 and compared with the waitlist control group.	Yes, 3 months	NS

<sup>a</sup>RCT: Randomized Controlled Trial.

<sup>b</sup>NS: Not stated.

<sup>c</sup>MDD: Major depressive disorder; PDD: Persistent depressive disorder; PLWH: people living with HIV.

<sup>d</sup>iACT: internet-based Acceptance and Commitment Therapy; iCBT: Internet based cognitive behavioral therapy; IGSHCBT: Internet based guided self-help CBT.

<sup>e</sup>BDI-II: Beck Depression Inventory; CES-D: Center for Epidemiologic Studies Depression Scale; DASS: Depression anxiety stress scale; HADS: Hospital Anxiety and Depression Scale; ODSIS: Overall Depression Severity and Impairment Scale; PHQ-9: Patient Health Questionnaire-9; POMS: Profile of Mood State; SDS: Self-rating Depression Scale.

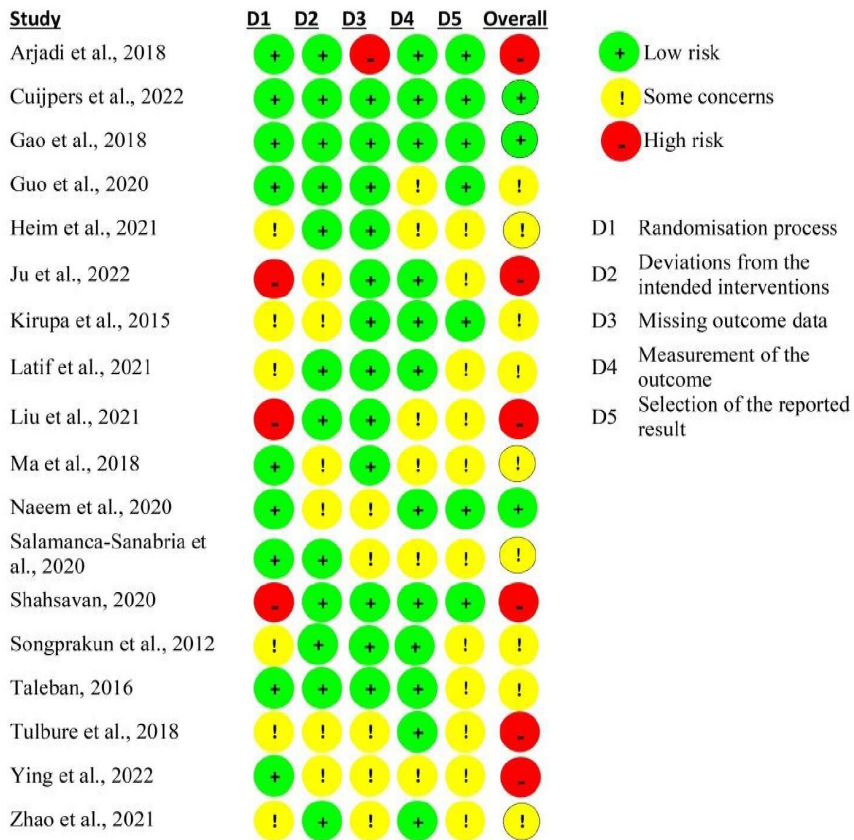
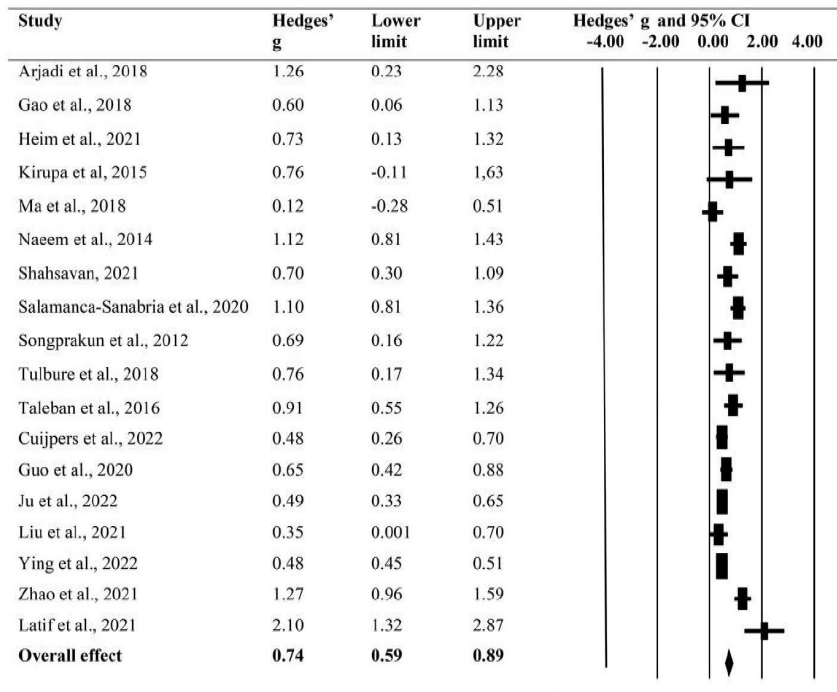


Figure 2. Quality of included Studies.

### Main hypothesis: intervention effectiveness

The overall effect size of self-help programs ( $k=18$ ) on the improvement of depressive symptoms in LMICs was Hedges'  $g = 0.74$ , 95% CI [0.59, 0.89],  $p < .001$  (Figure 3). This result represents a moderate effect size according to the classification of Cohen (1992). The effect sizes for the individual studies ranged between small ( $k=5/18$ ), moderate ( $k=7/18$ ) and large ( $k=6/18$ ). We identified 1 outlier (Latif et al. (2021)) and replaced it with an effect size of 2.10 with  $SE = 0.39$  (Lipsey & Wilson, 2001). Additionally, heterogeneity was substantial and significant ( $Q=89.48$ ,  $p < .001$ ,  $I^2=81\%$ ). This result suggests that not all studies in the analysis shared a common effect size.

Regarding follow-up period ( $k=11$ ), the overall effect size was somewhat larger with overall Hedges'  $g = 0.82$ , 95% CI [0.63, 1.01],  $p < .05$  (Figure 4). The effect sizes for the individual studies based on follow-up results ranged between small ( $k=1/11$ ), medium ( $k=4/11$ ) and large ( $k=6/11$ ).



**Figure 3.** Intervention effect sizes – Pre-test-post-test.

### **Publication bias**

The funnel plot was inspected and clearly showed that studies were missing on the left side of the plot (Figure 5), suggesting publication bias. Egger's regression test of the intercept was performed and found to be significant (Hedges'  $g = 1.60$ , 95% CI [0.50, 2.70],  $t(16) = 3.08$ ,  $p = .01$ ), also suggesting publication bias. Furthermore, we performed Duval and Tweedie's trim and fill analysis which showed that 7 studies needed to be filled on the left side of the plot (as shown by black dots in Figure 5). After filling the 7 missing studies, the adjusted effect size was Hedges'  $g = 0.48$ , 95% CI [0.45, 0.51]. Overall, there appears to be evidence of publication bias in this meta-analysis; studies with smaller effect sizes are missing.

### **Moderators of intervention effect**

Table 2 presents the results of the moderator analysis. The point estimate Hedges'  $g$  was retrieved from the mixed effects analysis and the  $Q$  statistic indicated whether there is a difference between the subgroups. The results regarding study location (categories: lower-middle-income and upper-middle-income [ $k = 18$ ]) showed a larger effect size for studies conducted in lower-middle-income countries and heterogeneity was significant. Similarly, we found that studies that had 'at least mild depression at baseline' as an

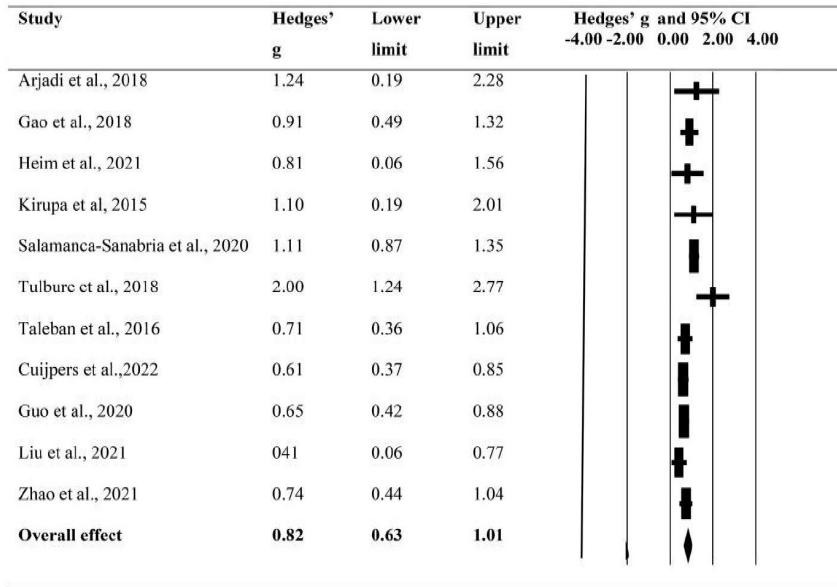
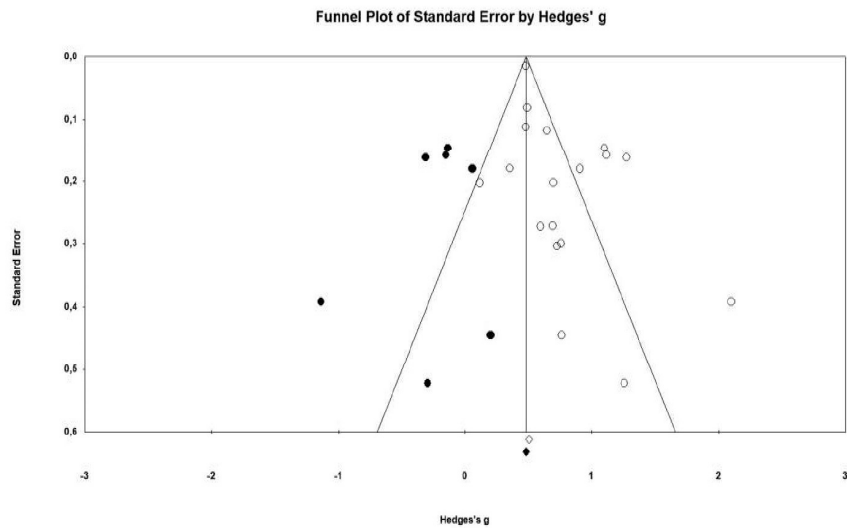


Figure 4. Intervention effect sizes- follow-up.



Key

- Added by Trim and Fill
- Included studies

Figure 5. Funnel plot of standard error by Hedges' g.

inclusion criterion (compared to no baseline score for depressive symptoms or only severe depression at baseline as inclusion criterion) showed a larger effect size ( $k=18$ ) and heterogeneity was significant.

**Table 2.** Moderators of intervention effect on depression.

Moderator	Subgroup	<sup>a</sup> k	Hedges' g	<sup>b</sup> 95%CI	<sup>c</sup> Q for difference
Location	Lower middle income	8	0.95	0.69, 1.21	4.20*
	Upper middle income	10	0.63	0.47, 0.79	
First year of recruitment	2007–2016	6	0.82	0.60, 1.04	3.47
	2017–2020	6	0.56	0.39, 0.72	
Percentage of females	0%–50%	2	0.64	0.43, 0.85	2.33
	51%–75%	7	0.90	0.59, 1.22	
	76%–100%	6	0.63	0.43, 0.82	
Intervention duration	0–12 hours	3	0.95	0.29, 1.61	2.60
	12.1–22.6 hours	3	0.38	0.18, 0.59	
Mean age	0–31.65 years	9	0.71	0.48, 0.93	0.02
	31.66–42 years	7	0.74	0.46, 1.01	
Attrition percentage	Below 30%	6	1.02	0.71, 1.33	5.95**
	30% and above	2	0.32	–0.14, 0.79	
Intervention provider	Psychologist	1	0.76	0.17, 1.34	1.50
	Trained counselor	7	0.64	0.44, 0.84	
	Other	4	0.99	0.45, 1.53	
Comorbidity	Without comorbidity	14	0.72	0.55, 0.90	0.32
	With comorbidity	4	0.81	0.55, 1.07	
Intervention type	CT/Stress management	15	0.77	0.60, 0.94	0.20
	Mindfulness	3	0.63	0.06, 1.21	
Intervention target	Depression	9	0.77	0.55, 0.99	0.07
	Depression and other	9	0.73	0.45, 1.00	
Depression at baseline as inclusion criterion	No depression/depressive symptoms/disorder	5	0.46	0.38, 0.54	14.00*
	Yes, at least mild depressive symptoms	10	0.89	0.66, 1.11	
	Yes, clinical diagnosis	3	0.79	0.42, 1.16	
Relaxation technique	No	11	0.91	0.68, 1.15	8.72*
	Yes	7	0.50	0.36, 0.65	
CBT technique	No	5	0.68	0.17, 1.18	0.10
	Yes	13	0.76	0.60, 0.92	
Stress management technique	No	9	0.78	0.56, 1.00	0.20
	Yes	9	0.71	0.51, 0.91	
MI technique	No	16	0.77	0.60, 0.94	3.58
	Yes	2	0.51	0.30, 0.72	
Meditation technique	No	11	0.86	0.63, 1.09	2.10
	Yes	7	0.60	0.35, 0.86	
Intervention single disorder	Only depression intervention	11	0.73	0.53, 0.92	0.13
	Depression and other disorder intervention	7	0.80	0.47, 1.12	
Intervention guided	Unguided	4	0.84	0.45, 1.23	0.17
	Guided	13	0.75	0.58, 0.92	
Type of guidance	Telephone	2	1.37	–0.01, 2.75	0.85
	Chat	3	0.74	0.34, 1.13	
	Other	1	0.70	0.30, 1.09	
	Multiple combined methods	3	0.77	0.31, 1.23	
Guide content	1.Answer questions (about self-help program)	3	1.01	0.24, 1.78	6.27
	2.Give feedback on assignments	2	0.72	0.39, 1.05	
	3.Motivate participants	1	0.91	0.55, 1.23	
	Both 1&2	1	1.26	0.23, 2.28	
	Both 2&3	1	1.10	0.81, 1.40	
	Both 1&3	4	0.66	0.39, 0.93	
Intervention form	Booklet	2	1.02	0.79, 1.26	24.01*
	Smartphone app	5	0.48	0.45, 0.51	
	Audiotape	1	0.60	0.06, 1.13	
	Internet based	5	0.95	0.47, 1.43	
Control group	Waiting list	7	0.68	0.45, 0.92	0.48
	Standard care	8	0.77	0.51, 1.03	
	Psychoeducation	2	0.86	0.35, 1.38	
Analysis type	ITT <sup>d</sup>	10	0.82	0.61, 1.03	4.01
	Per protocol	2	0.70	0.38, 1.01	
	Both 1 and 2	3	0.52	0.32, 0.72	

(Continued)

**Table 2.** Continued.

Moderator	Subgroup	<sup>a</sup> k	Hedges' g	<sup>b</sup> 95%CI	<sup>c</sup> Q for difference
Cochrane total score	Low risk	3	0.73	0.29, 1.18	8.70
	Some concerns	9	0.89	0.60, 1.18	
	High risk	6	0.48	0.45, 0.51	

<sup>a</sup>k = number of studies (studies that didn't report about the moderator are left out of the analysis).

<sup>b</sup>Lower and upper limit of 95% Confidence Interval.

<sup>c</sup>Q for differences between subgroups.

<sup>d</sup>ITT: Intention to Treat.

\*Significant moderator ( $p < .01$ ).

\*\*Significant moderator ( $p < .05$ ).

Additionally, the results regarding attrition (categories: below 30%; 30% and above [ $k=8$ ]) showed a larger effect size for studies that reported less than 30% attrition and heterogeneity was significant. Interventions that did not include relaxation techniques (categories: no, yes [ $k=18$ ]) had a larger effect size and heterogeneity was significant. Intervention form was also a significant moderator (categories: booklet; smartphone app; Internet-based; audiotape [ $k=13$ ]). The results showed the largest effect size for studies that used the booklet form of interventions and heterogeneity was significant. Internet-based interventions also had a large effect. There were no significant differences between the subgroups regarding the rest of the moderators that were investigated.

## Discussion

This meta-analysis examined studies that used self-help psychological interventions to address depressive symptoms amongst 3532 participants in LMICs. Our first aim was to investigate the effectiveness of these interventions. A total of 18 studies with an RCT design were included in the meta-analysis.

We found that participants who took part in these interventions reported significantly lower levels of depressive symptoms at both post-test and follow-up compared to those in the control groups, with moderately high effect sizes. The effect sizes found in this meta-analysis were comparable to those reported in other recent meta-analyses (Fu et al., 2020; Karyotaki et al., 2023; Kim et al., 2023). However, we identified evidence of publication bias, which led to a smaller corrected effect size.

Our second aim was to determine if certain characteristics of the participants, studies, or interventions influenced the effects of the interventions. We identified five significant moderators: study location (study characteristic), mild depressive symptoms at baseline as inclusion criterion (study characteristic), attrition (study characteristic), use of relaxation technique (intervention characteristic), and intervention form (intervention characteristic). Our findings revealed that interventions conducted in

lower-middle-income countries had a larger effect size compared to those conducted in upper-middle-income countries. To date, no studies have extensively studied the disparities between lower and upper middle-income countries regarding the effectiveness of psychological interventions.

Another significant moderator was mild depressive symptoms as an inclusion criterion. Studies that included participants who had at least mild depressive symptoms, yielded large effect sizes while those that included only participants with severe depression yielded moderate effect sizes. Studies that did not screen for depression at baseline yielded a small effect size. A recent systematic review by Elias et al. (2024) found that high baseline depression severity influenced treatment response. Such findings emphasize the importance of screening for depressive symptoms at baseline.

The findings of this meta-analysis also showed that attrition may influence intervention effects. We found that studies with less than 30% attrition had a larger effect size. Similarly, Forbes et al. (2023) found that when patients engaged more with interventions their symptoms significantly improved. These results suggest that the longer participants are retained in the interventions, the better the outcome.

Another significant moderator was the use of relaxation exercises in interventions to reduce depressive symptoms. Studies using this technique had significantly smaller effect size. This aligns with Furukawa et al. (2021), who discussed that including relaxation techniques in depression interventions might not be beneficial. Intervention format was another significant moderator in the current meta-analysis. The results showed a large effect size for studies that used the booklet format or internet-based interventions, compared to interventions using smartphone applications. We did not find literature comparing the effectiveness of the booklet format of interventions with internet, smartphone apps or other formats in LMICs. The effect of internet-based interventions in reducing depressive symptoms in our study is larger in comparison to previous research (Fu et al., 2020; Karyotaki et al., 2023; Kim et al., 2023).

Other factors, such as the use of CBT techniques, did not moderate intervention effect in the current meta-analysis. This finding is inconsistent with a previous meta-analysis that found the use of CBT techniques to improve intervention effect (e.g. Vally & Maggott, 2015). The use of guidance within self-help interventions was not found to be a moderator in the current meta-analysis, which varies from other studies (Bennett et al., 2019; Ye et al., 2014).

### **Limitations**

This meta-analysis has several limitations. First, the evidence of publication bias, potentially indicated that studies with smaller effect sizes

were not included in the analysis. Therefore, while our results are encouraging, they should be interpreted with caution. Second, we only included studies published in English, potentially excluding studies published in other languages in LMICs which may have influenced the publication bias. Third, there was heterogeneity in the measures used to assess for depressive symptoms across studies. Fourth, some of the studies included did not screen for depression at baseline. The findings, however, show that it is more useful to enroll people with depressive symptoms, regardless of severity, in psychological interventions for depression than to enroll people who may not have depressive symptoms. Another limitation of the current study is that the meta-analysis only analyzed and reported data from RCTs, making comparisons with other study designs difficult. Furthermore, we only included peer-reviewed studies published in academic journals. It is likely that due to barriers to publishing in international peer-reviewed journals, particularly for researchers or practitioners in LMICs, our analysis may have missed important findings. In addition, the studies in the meta-analysis were categorized as low, medium or high risk of bias. The majority of the studies were categorized as medium risk, meaning that high-quality studies are needed to draw robust conclusions regarding the effects of self-help interventions in LMICs.

### ***Positive aspects***

The positive aspects of this study include that it is one of the few meta-analyses conducted on self-help interventions in LMICs. Secondly, it is timely considering the growing burden of depressive symptoms, emphasizing the importance of immediate treatment. Additionally, the findings of this study could encourage further research on self-help interventions and their effects on mental health outcomes in LMICs. Moreover, these results highlight the potential for integrating cost-effective self-help interventions into clinical practice, thus reducing the need for extensive human resources.

### ***Recommendations for future research***

Based on the results of this meta-analysis, we recommend that future studies should focus on performing and publishing high-quality studies that assess the effectiveness of self-help interventions. These studies should move beyond piloting to implementing interventions at a large scale and integrating them into routine care. LMICs should prioritize research funding and cover publication fees, especially in Africa where the population suffering from depression is growing and there is a lack of studies on this topic.

Additionally, we recommend screening for depressive symptoms at baseline as a critical step in interventions for depression in LMICs. This will ensure that only those with depressive symptoms are enrolled in the interventions and can benefit from them. It would be especially beneficial for future studies to compare the effectiveness of interventions that use the same standardized measurement tools for evaluation of depressive symptoms. It is important that these tools are comparable validated measures. Future studies should also investigate the reasons for high attrition in self-help interventions to retain more participants and improve mental health outcomes, thus increasing the power of the studies. Regarding the format of interventions, it is recommended to further explore booklet or internet-based formats as well as specific aspects of guidance (e.g. providing feedback, motivation, and clarification) or no guidance that might improve intervention effects.

The inconsistent findings regarding the use of relaxation techniques suggest the need for further research in this area. It is premature to exclude relaxation techniques since previous studies have recommended them for the treatment of depressive symptoms (e.g. Jorm et al., 2008; Li et al., 2020; Nicolussi et al., 2016). Lastly, future studies could investigate specific components of CBT techniques or other treatment modalities to identify components that are more effective in treating depressive symptoms.

## **Conclusion**

The aim of this meta-analysis was to examine the effectiveness of self-help psychological interventions in reducing depressive symptoms in participants in LMICs. We also investigated moderators of intervention effect. Overall, self-help psychological interventions had a moderately high effect on the treatment of depressive symptoms. Effectiveness was related to the income status of the country, mild depressive symptoms at baseline as inclusion criterion, intervention format, not using a relaxation technique and low attrition. We recommend further research that can inform mental health policies to disseminate and scale up psychological interventions in LMICs.

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No potential conflict of interest was reported by the author(s).

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