

Discovering Common Elements of Empirically Supported Self-Help Interventions for Depression in Primary Care: a Systematic Review



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BACKGROUND: Although the efficacy of self-help cognitive-behavioral therapy (CBT) for depression has been well established, its feasibility in primary care settings is limited because of time and resource constraints. The goal of this study was to identify common elements of empirically supported (i.e., proven effective in controlled research) self-help CBTs and frameworks for effective use in practice.

METHODS: Randomized controlled trials (RCTs) for self-help CBTs for depression in primary care were systematically identified in Pubmed, PsycINFO, and CENTRAL. The distillation and matching model approach was used to abstract commonly used self-help techniques (practice elements). Study contexts associated with unique combinations of intervention elements were explored, including total human support dose (total face-to-face, telephone, and personalized email contact time recommended by the protocol), effective symptom domain (depression vs. general psychological distress), and severity of depression targeted by the study. Relative contribution to intervention success was estimated for individual elements and human support by conditional probability (CP, proportion of the number of times each element appeared in a successful intervention to the number of times it was used in the interventions identified by the review).

RESULTS: Twenty-one interventions (12 successful) in 20 RCTs and 21 practice elements were identified. Cognitive restructuring, behavioral activation, and homework assignment were elements appearing in > 80% of successful interventions. The dose of human support was positively associated with the proportion of interventions that were successful in a significant linear fashion (CPs: interventions with no support, 0.20; 1–119 min of support, 0.60; 120 min of support, 0.83; $p = 0.042$). In addition, human support increased the probability of success for most of the extracted elements. Only social support activation, homework assignment, and interpersonal skills were highly successful (CPs ≥ 0.60) when minimal support was provided.

DISCUSSION: These findings suggest that human support is an important component in creating an evidence-informed brief self-help program compatible with primary care settings.

KEY WORDS: depression; primary care; self-help; distillation and matching model; common element.

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INTRODUCTION

Improving treatment for depression is a critical challenge in primary care. Depression is a leading health problem causing significant societal burden.^{1,2} In the USA, more than half of outpatient treatment of depression takes place in primary care.³ However, the benefit of antidepressant medication, the first-line treatment of depression in primary care³, is suboptimal for the mild to moderate depression⁴ typical of patients in primary care.^{3,5} Although cognitive-behavioral therapy (CBT) is a patient-preferred alternative,^{6–8} primary care services have numerous structural barriers to offering it, including the complexity of interventions and the number of sessions over which they are delivered.^{3,9–13}

Self-help CBT, a form of CBT that patients can do in their own time by following instructional materials, is potentially as effective as face-to-face CBT¹⁴ and therefore appears to be a good fit for delivery in primary care. However, the self-help CBT interventions found to be successful in controlled research typically include highly protocolized doses of support; interventions with a lack of human contact^{15–19} have failed to adequately activate patients' engagement and thus been less effective for people with depression in primary care compared to self-referred general populations.²⁰ For self-help CBT to be effective in primary care, it likely needs to be simple to administer and supported in a way that is practical within the structure of primary care.²¹

One hopeful method of translating self-help CBT into primary care practice is to identify the key self-help components

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from empirically supported multi-component interventions and provide them in the context of routine primary care visits. Brief but continuous guidance for using self-help materials could then be offered by trained primary care staff on an ongoing basis.²² The goal, thus, of this systematic review is to identify self-help components that primary care clinicians might be able to use with patients in routine care. Specific aims are (1) to identify the most strongly supported self-help components and the clinical contexts (e.g., patients' characteristics or availability of human support) in which they must be used to be effective and (2) to estimate the relative contributions of individual components and human support to intervention success. To address the first question, we used the distillation and matching model (DMM),^{23,24} a data-mining approach, to identify the most highly supported intervention components (referred to as "elements") in multi-component self-help programs. To address the second question, we calculated the conditional probability (CP) of intervention success for each element and for the degree of human support provided.²⁵

METHODS

The study had four steps: (1) systematically identifying self-help CBT interventions for depression in primary care, (2) distillation, (3) CP estimation, and (4) matching. Eligible interventions were classified into successful or non-successful groups. Interventions in both groups were used in the distillation and CP estimation steps. Subsequently, only successful interventions were used to match practice elements with the contexts in which they were effective.²⁴

(1) Systematically Identifying Articles on Self-Help CBT for Depression in Primary Care (Figure 1)

We targeted self-help CBT interventions with minimum additional support from a clinician. Peer-reviewed articles were identified with search strategies using terms representing the concepts of depression, self-help, primary care, and randomized controlled trials (RCTs) in PubMed, PsycINFO, and CENTRAL databases from inception to December 31, 2016 (Supplement 1). We included only English-language papers because abstraction of practice elements described by many synonyms in non-English articles posed additional challenges with translation and comparability. Eligible papers were then identified using the following criteria:

Population. Studies targeting adults with depression or depression and anxiety in primary care or outpatient psychiatric clinics. Both settings were included because symptom severity and constellation vary little between them, and thus, results of trials would be applicable to either.²⁶ Studies exclusively targeting patients with major chronic

physical conditions (e.g., diabetes) were excluded because we focused on the elements universally applicable to patients with depression as a primary problem.

Characteristics of the Interventions. Printed or computerized self-help interventions based on CBT principles, primarily intended to reduce depressive symptoms or general psychological distress, that included ≤ 180 min of human support²⁰ were included. Interventions involving components other than self-help and related human support were excluded.

Study Design. RCTs of (1) self-help compared with no treatment/wait-list control/treatment as usual (TAU) or (2) self-help plus TAU compared with TAU alone were included. Because TAU for depression in primary care has varying degrees of effectiveness,^{27,28} we excluded studies in which self-help was found to be comparable to TAU because we could not definitively determine whether the self-help intervention had been successful or not.

Outcome. Studies measuring intervention effect using established self-report or objective scales for depressive or general psychological distress symptoms were included.

When there were multiple reports for the same trial, the first time point after the intervention was included. Supplemental information was collected from sources such as self-help manuals, program websites, previous publications for the same materials, and personal communication with the authors.

(2) Distillation: Extracting Study Results, Practice Elements, and Context Variables

Intervention Success. Self-help interventions that showed statistically significant improvement versus control conditions or had significant time-by-group interaction in one or more depression-specific or general psychological distress outcome measures were deemed successful.²⁵

Practice Element Distillation. Practice elements are identifiable discrete components of multi-component interventions that are "therapeutic activities, techniques, or strategies commonly used as part of the larger treatment plans."^{23,24} We focused distillation on the core facets of self-help interventions: skills/knowledge and strategies used to promote patient engagement and behavioral change. The initial codes were developed referring to the cognitive-behavioral classification framework of psychological problems^{29,30} and to engagement and implementation criteria for self-help guidance materials.³¹ Self-help elements that had similar therapeutic actions were aggregated regardless of their theoretical origins.^{23,24} Atlas.ti³² and Dedoose³³ were used for code management.

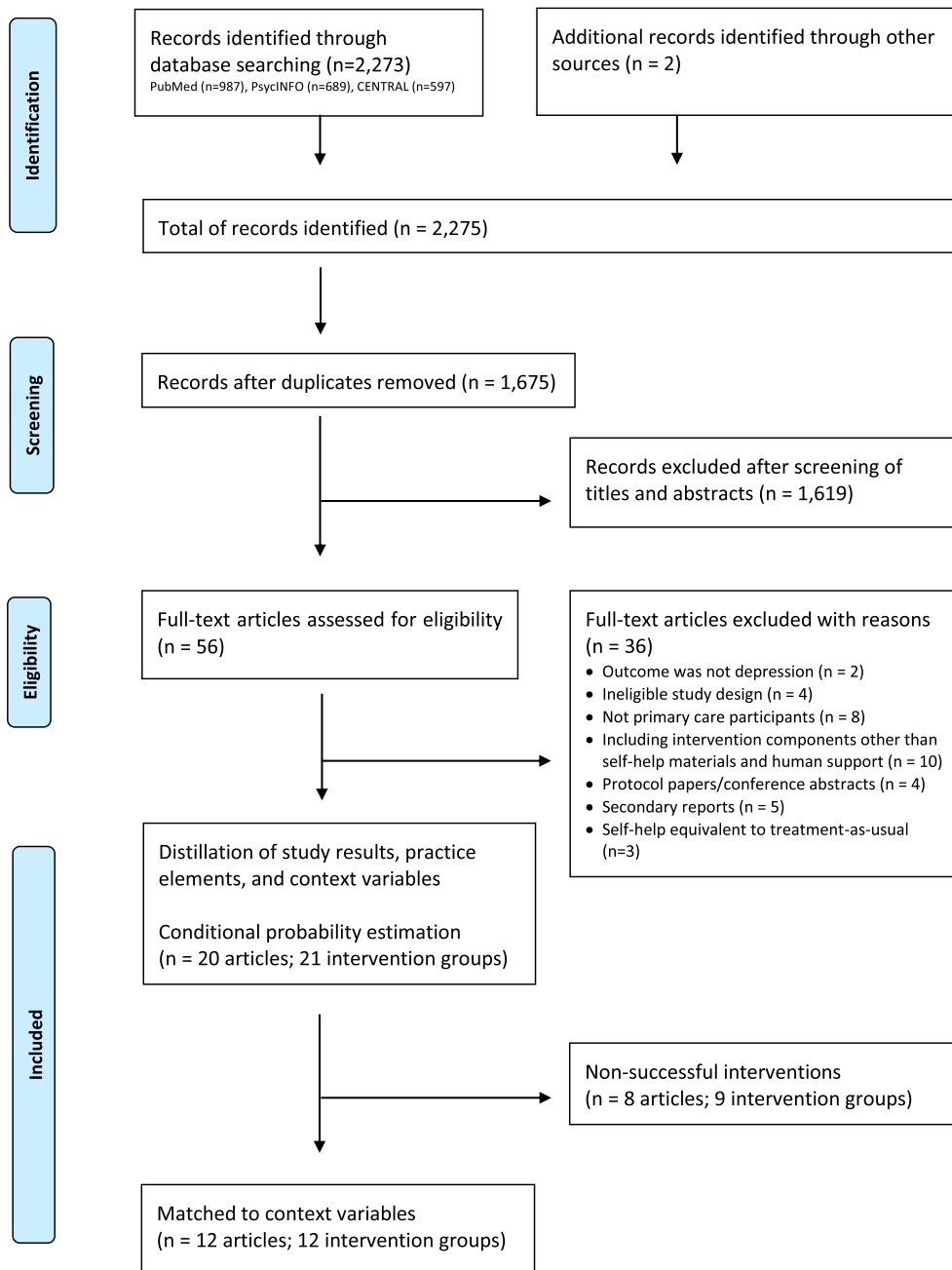


Figure 1 Flow diagram for eligible article identification.

The first author applied the initial code set to extract elements from self-help manuals, worksheets, homework, and topics to be discussed in human support. Elements were identified regardless of the detail with which they were described; in many cases, only titles or keywords were used to describe components of the intervention. Additional codes for commonly used self-management skills that did not fit into a cognitive-behavioral classification, such as social support activation, were also created.

The revised code set (Supplement 2) was tested for inter-rater reliability using the kappa statistic²³. A doctoral student assistant independently coded all 269 excerpts from trial materials, and agreement with the first author’s codes was evaluated. Inconsistent coding was discussed between the two

raters. A final code set was completed after excluding codes with unsatisfactory reliability ($\text{kappa} < 0.65$) or low prevalence (i.e., included in < 3 successful interventions).²³ Further analysis was performed using Stata 13.³⁴

Context Variables. Context variables²⁴ are selected variables that characterize aspects of the clinical population and intervention procedures within which the elements are successfully used and therefore within which it is valid to assume a treatment effect. Among several potential study characteristics, we chose human support dose, effective symptom domain, and severity of depression because of their relevance in primary care practice as summarized in

Text Box 1. A single intervention could contribute to multiple context codes. For example, when inclusion of diagnosed major and sub-threshold depression was allowed, both codes were assigned to the intervention. Categorization of the total human support dose was based on the distribution of amounts of support provided in the studies included in the review.

Text Box 1. Context variables

HUMAN SUPPORT DOSE

- **Rationale:** CBT was originally developed for a face-to-face treatment format. It is possible that some CBT techniques might be fully translatable into a self-help format, while others may be effective only when sufficient human support is provided. Human support has been shown to be associated with effectiveness of self-help interventions^{20,35,36}. Exploring the interaction of practice elements with human support dose allows for selecting practice elements that may work within a given support capacity.
- **Coding:** Human support dose was calculated as the sum of the actual number of minutes of human involvement (i.e. face-to-face, telephone or personalized email contact) incorporated in the protocol to facilitate subjects' self-help activity. Automated emails and human contact involved in evaluating study eligibility and outcomes were not counted as human support. Total human support dose was categorized into **a) no support** (0 minutes), **b) briefer support** (1-119 minutes), and **c) longer support** (≥ 120 minutes).

EFFECTIVE SYMPTOM DOMAIN

- **Rationale:** Depression often co-occurs with anxiety³⁷ in primary care, and treatment often needs to be initiated before it is clear which set of symptoms might be the primary target of treatment. Comorbid anxiety increases drop-out in self-help interventions for depression³⁸. Subjects with comorbid anxiety may gain more benefit from tailored than standardized self-help CBT for depression³⁹.
- **Coding:** Intervention effects on depression and anxiety may be evaluated separately by using symptom-specific scales or globally by using general psychological distress scales. To integrate multiple outcome patterns, we assigned the effective symptom domain code (depression and/or general psychological distress) to each intervention according to the following criteria. **a) Depression** was assigned when benefit of the intervention was validated on depression-specific measures. Practice elements frequently used in this context can be applied when depression is the primary target of treatment. **b) General psychological distress** was assigned when benefit of the intervention was validated on general psychological distress measures or depression- and anxiety-specific measures concurrently. Practice elements frequently used in this context can be applied when it is unclear whether depression or anxiety is the primary target of treatment.

SEVERITY OF DEPRESSION

- **Rationale:** Patients with sub-threshold depression are common in primary care and are those for whom self-help interventions are most frequently recommended⁵. Effect of self-help intervention or optimal coordination of intervention components may vary by baseline severity of depression^{43,40}.

- **Coding:** Either or both codes of major depression and sub-threshold depression were assigned to each intervention according to whether eligibility criteria of the study allowed inclusion of such participants. **a) Major depression** was assigned when study eligibility criteria allowed inclusion of participants with diagnosis of major depression or depressive symptoms regardless of severity. **b) Sub-threshold depression** was assigned when the study eligibility criteria allowed inclusion of participants with sub-threshold depression or depressive symptoms regardless of severity.

(3) Conditional Probability of Intervention Success

CP of intervention success was defined as the proportion of times each element appeared in a successful intervention compared to the number of times it was used overall (i.e., regardless of the intervention's success).²⁵ CP estimates the relative contribution of individual practice elements to the outcome,

thereby discriminating between elements associated with favorable outcomes and those that are commonly used but have minimal impact on outcomes. CPs were calculated for identified practice elements and for each human support dose category. The trend of CPs across human support dose categories was evaluated using the Stata *nptrend* command (an extension of the Wilcoxon rank-sum test for nonparametric linear trends). To remove possible confounding of human support dose and practice elements, we assessed CPs for practice elements stratified by human support conditions.

(4) Matching

Matching uses an algorithm to create a classification tree that associates clusters of elements with the contexts in which they appear in successful interventions.^{23,24} First, elements are associated with a context variable and its sub-categories (e.g., human support, with long and short subcategories). Then, the sub-categories are collapsed two at a time and a test of intra-class correlation (ICC) is conducted for the elements in the merged group. If the ICC is significant at a pre-determined level (meaning that the elements tend to occur similarly in both sub-categories), the subcategories are merged. This process is repeated with additional pairs of context variable sub-categories or previously merged groupings until no further merging is possible. When all groupings have been identified, they are used to create a tree (Fig. 3a) representing different, clinically relevant contexts in which different clusters of elements are associated with successful intervention outcomes. The process seeks to find the set of context variables that result in the fewest branches.

The matching process was conducted with a range of criteria for determining if the ICC for merged groups was significant. Results with alpha-to-merge/split = 10^{-4} , 10^{-6} , or 10^{-8} were compared, and the final tree was chosen based on its consistency with CBT theory and likely clinical application.²⁴ Practice element profiles (i.e., a graphical presentation of relative frequency counts for the use of each practice element in a given context) were then created for each node of the final tree (Fig. 3b).

RESULTS

Included Studies and Outcomes (Table 1)

We identified 21 self-help interventions (depression only, $n = 7$; general psychological distress only, $n = 1$; both depression and general psychological distress, $n = 13$) in 20 RCTs. Twelve interventions were successful. Five interventions were successful for depression only, and five were successful for both depression and general psychological distress. Two interventions were successful only for general psychological distress: one that had targeted only general psychological distress and one that targeted both depression and general

psychological distress but that was successful only for general psychological distress.

Median intervention period (i.e., the period between the time self-help materials became available to participants and the time final outcomes were measured) was 24 weeks for all interventions (which are analyzed in the distillation and CP phases) and successful interventions (which are analyzed in the matching phase).

Distillation

A total of 21 distinct practice elements were identified that had coding kappa values > 0.65 and appeared in at least three interventions (Table 2). Total human support dose over the entire intervention period was categorized into no support ($n = 5$), 1–119 min of support ($n = 10$), and ≥ 120 min of support ($n = 6$). Weekly median support dose was 5.4 min in the 1–119-min support group and 16.9 min in the ≥ 120 -min support group. The type of human support varied and included technical support only, assessing how many pages of the materials clients had read, answering questions on self-help techniques, or providing individual feedback on homework. Of the 16 human-supported interventions (11 successful), nine interventions (6 successful) assigned psychotherapists to self-help supporters while seven interventions (5 successful) designated non-psychologist care providers or research staff.

Conditional Probability of Intervention Success for Practice Elements and Contexts

Because only one intervention among those without human support was successful, we combined the no support and 1–119 min of support groups into a brief support group before beginning the subsequent analyses. This avoids overrepresentation in the distillation tree of the practice elements supported by only one study as well as potentially improves accuracy of support-dose-stratified CP estimation.

Human support dose was associated with intervention success in a significant linear trend (CPs; 0.20, 0.60, and 0.83; no support, 1–119 min of support, and ≥ 120 min of support, respectively, $z = 2.03$, $p = 0.042$).

CPs for individual practice elements (Fig. 2) ranged from 0.50 to 0.78 (median, 0.60) when brief and long support categories were combined. For the longer support condition, all elements but social support activation had CPs ≥ 0.60 . In contrast, for briefer support, only social support activation, homework assignment, and interpersonal skills had CPs ≥ 0.60 . For all practice elements except social support activation, CPs were higher for elements in the longer support condition than for the same elements when they were present in the briefer support condition.

Matching Practice Elements to Context Variables (Fig. 3)

Twelve successful interventions were subject to the matching analysis.

A matching tree was first constructed using an alpha-to-merge/split = 10^{-6} or 10^{-8} with the following results:

Severity of depression (diagnosed vs. sub-threshold) was merged into a single group because of a P_{ICC} smaller than the alpha-to-merge/split value ($ICC = 0.96$, $P_{ICC} = 1.1 \times 10^{-12}$). Amount of human support ($ICC = 0.62$, $P_{ICC} = 1.0 \times 10^{-3}$) gave the first split (into briefer and longer amounts of support) because its P_{ICC} was larger than that of the test of merging categories of the effective symptom domain ($ICC = 0.81$, $P_{ICC} = 3.1 \times 10^{-6}$).

Severity of depression was merged into a single group on both the briefer ($ICC = 0.90$, $P_{ICC} = 4.1 \times 10^{-9}$) and longer ($ICC = 0.95$, $P_{ICC} = 1.1 \times 10^{-12}$) human support branches because of P_{ICC} values smaller than the alpha-to-merge/split value. Effective symptom domain remained unmerged and formed the second splits on both briefer ($ICC = 0.70$, $P_{ICC} = 1.5 \times 10^{-4}$) and longer ($ICC = 0.76$, $P_{ICC} = 2.3 \times 10^{-5}$) human support branches because of P_{ICC} values larger than the alpha-to-merge/split value.

We did not create a third split because practice element profiles were identical across the subgroups of depression severity (i.e., $ICC = 1$) on all second-order branches.

A second matching tree was created using an alpha-to-merge/split = 10^{-4} :

As with the more stringent criteria, a first split was found by the amount of human support. However, a second split by the effective symptom domain was found only on the briefer human support branch. A second split on the longer support branch was not supported because of a P_{ICC} smaller than the alpha-to-merge/split value ($ICC = 0.76$, $P_{ICC} = 2.3 \times 10^{-5}$). For the purposes of matching elements with the contexts in which they were successful, we adopted the results of this second tree (Fig. 3a) because the second split by the effective symptom domain on the longer support branch created practice element profiles that were so similar that they would not be different in clinical practice.

In the second tree (Fig. 3b, relative frequency counts for the use of each practice element in a given context), cognitive restructuring, behavioral activation, and homework assignment (hereafter referred to as “core common elements”) were present in successful interventions regardless of the duration of human support (the “trunk” of the matching tree). Beyond these core common elements, however, the profiles for the longer and briefer support branches differed. Longer support programs commonly included problem solving, psychoeducation, relaxation, daily stress management, and self-help assessment while briefer support programs commonly included self-monitoring/recording.

For the second branches of briefer support, the practice element profile for depression commonly included the core common elements plus self-monitoring/recording. The profile for general psychological distress commonly included the core common elements and self-monitoring/recording, problem solving, and interpersonal skills.

Table 1 Characteristics of Interventions Included in the Study (n = 21)

First author, year of publication, country	Characteristics of participants (self-help arm)	Intervention vs control	Study success*	Context variables			Format of self-help materials, relevant outcome measure, points of evaluation
				Human support (min)	Severity of depression	Effective symptom domain	
Proudfoot, 2004, UK ³⁵	Primary care N = 146 Mean age, 43.6 Female, 73%	SH + TAU vs TAU	Yes	1–119	Diagnosed and sub-threshold	Depression	Computerized, BDI-II, BAI, 8, 12, 20, 32 weeks
Willemse, 2004, Netherlands ⁴⁷	Primary care N = 107 Mean age, 39.4 Female, 66%	SH + TAU vs TAU	Yes	1–119	Sub-threshold	Depression	Printed, CES-D, 48 weeks
Lucock, 2011, UK ⁴⁸	Primary care N = 63 Mean age, 38.8 Female, 60%	SH vs no treatment	Yes	≥ 120	Diagnosed and sub-threshold	General psychological distress	Printed, CORE-OM, 8 weeks
Levesque, 2011, USA ⁴⁹	Primary care N = 174 Approximate median age, 47 Female, 67.2%	SH vs no treatment	Yes	1–119	Diagnosed and sub-threshold	Depression	Printed, BDI-II, 36 weeks
Levin, 2011, USA ⁵⁰	Primary care N = 100 Mean age, 44 Female, 78%	SH + TAU vs TAU	Yes	1–119	Diagnosed and sub-threshold	Depression and general psychological distress	Computerized, SCID, STAI, 6, 36 weeks
Songprakun, 2012, Thailand ⁵¹	Psychiatric outpatients N = 27 Mean age, 39.4 Female, 81.5%	SH + TAU vs TAU	Yes	1–119	Diagnosed	Depression	Printed, CES-D, 8, 12 weeks
Watkins, 2012, UK, Relaxation arm ⁴⁷	Primary care N = 39 Mean age, 46.1 Female, 74.4%	SH + TAU vs TAU	Yes	≥ 120	Diagnosed and sub-threshold	Depression and general psychological distress	Printed, HAMD-17, BDI-II, GAD-7, 8, 12, 24 weeks
Williams, 2013, UK ⁴⁸	Primary care N = 141 Mean age, 40.4 Female, 73.0%	SH + TAU vs TAU	Yes	≥ 120	Diagnosed and sub-threshold	Depression and general psychological distress	Printed, BDI-II, CORE-OM, 16, 48 weeks
Hoifødt, 2013, Norway ⁴⁹	Primary care N = 52 Mean age, 38.3 Female, 71.2%	SH vs TAU	Yes	≥ 120	Diagnosed and sub-threshold	Depression and general psychological distress	Computerized, BDI-II, HADS, 7, 24 weeks
Naeem, 2014, Pakistan ⁵⁰	Psychiatric outpatient N = 96 Mean age, 33.2 Female, 58.5%	SH + TAU vs TAU	Yes	1–119	Diagnosed	Depression and general psychological distress	Printed, HADS, 12 weeks
Twomey, 2014, UK ⁵¹	Public mental health service N = 101 Mean age, 37.3 Female, 89.3%	SH vs no treatment	Yes	0	Diagnosed and sub-threshold	General psychological distress	Computerized, DASS-21, 32 days, 12 weeks
Hallgren, 2015, Sweden ⁴⁶	Primary care N = 317 Mean age, 43 Female, 73%	SH vs TAU	Yes	≥ 120	Diagnosed and sub-threshold	Depression	Computerized, MADRS, 12 weeks
Holdsworth, 1996, UK ⁴⁷	Primary care N = 30 Age, 16–65 Female, not available	SH + TAU vs TAU	No	0	Diagnosed and sub-threshold	Not applicable	Printed, HADS, 4, 12 weeks
Fletcher, 2005, UK ⁴⁸	Primary care N = 15 Mean age, 39.5 Female, 80%	SH + TAU vs TAU	No	0	Diagnosed and sub-threshold	Not applicable	Printed, HADS, CORE-OM, 6, 12 weeks
Mead, 2005, UK ⁴⁹	Primary care N = 57 Mean age, 38.7 Female, 71.9%	SH + TAU vs TAU	No	1–119	Diagnosed and sub-threshold	Not applicable	Printed, HADS, BDI, CORE-OM 12 weeks
Salkovskis, 2006, UK ⁵⁰	Primary care N = 50 Mean age, 39.2 Female, 78.3%	SH + TAU vs TAU	No	0	Diagnosed and sub-threshold	Not applicable	Written, BDI, 4, 12, 26 weeks
	Primary care		No	≥ 120		Not applicable	Printed,

(continued on next page)

Table 1. (continued)

First author, year of publication, country	Characteristics of participants (self-help arm)	Intervention vs control	Study success*	Context variables			Format of self-help materials, relevant outcome measure, points of evaluation
				Human support (min)	Severity of depression	Effective symptom domain	
Lovell, 2008, UK ⁵¹	N = 29 Mean age, 35.3 Female, 69%	SH + TAU vs TAU			Diagnosed and sub-threshold		BDI-II, PHQ-9, CORE-OM
de Graaf, 2009, Netherlands ⁵²	Primary care N = 100 Mean age, 45.2 Female, 63%	SH + TAU vs TAU	No	0	Diagnosed and sub-threshold	Not applicable	12 weeks Computerized, BDI-II, 8, 12, 24 weeks
Schlögelhofer, 2014, Austria ⁵³	Psychiatric outpatient N = 49 Mean age, 48.3 Female, 68.3%	SH + TAU vs TAU	No	1–119	Diagnosed	Not applicable	Printed, BDI, HAMD-17, 6 weeks
Gilbody, 2015, UK, Beating the Blue arm ⁵⁴	Primary care N = 210 Mean age, 39.6 Female, 68%	SH + TAU vs TAU	No	1–119	Diagnosed and sub-threshold	Not applicable	Computerized, PHQ-9, CORE-OM, 4, 12, 24 weeks
Gilbody, 2015, UK, Mood Gym arm ⁵⁴	Primary care N = 242 Mean age, 39.4 Female, 65%	SH + TAU vs TAU	No	1–119	Diagnosed and sub-threshold	Not applicable	Computerized, PHQ-9, CORE-OM, 4, 12, 24 weeks

Abbreviations: BAI Beck Anxiety Inventory; BDI Beck Depression Inventory; BDI-II Beck Depression Inventory-II; CES-D Center for Epidemiologic Studies-Depression scale; CORE-OM Clinical Outcomes in Routine Evaluation-Outcome Measure; DASS-21 Depression, Anxiety, and Stress Scales-21; GAD-7 General Anxiety Disorder-7; HADS Hospital Anxiety and Depression Scale; HAMD-17 Hamilton Depression rating scale-17; MADRS Montgomery Åsberg Depression Rating Scale; PHQ-9 Patient Health Questionnaire-9; SCID structured clinical interview for DSM-IV; SH self-help; STAI State-Trait Anxiety Inventory; TAU treatment as usual

*Self-help interventions that showed statistically significant improvement versus control conditions or had significant time-by-group interaction in one or more depression-specific or general psychological distress outcome measures were deemed successful

DISCUSSION

Perhaps the most important finding of this analysis is the marked difference in the association of treatment elements with outcomes according to the amount of human support provided. With smaller amounts of support, only three of the elements—social support activation, homework assignment, and interpersonal skills—were strongly related to positive outcomes. In contrast, all but social support was associated with positive outcomes and most elements showed strong associations ($CP \geq 0.8$) when paired with higher levels of support. Adding brief human interactions (e.g., to discuss and problem-solve) could allow patients and providers to choose from a wider range of self-help elements and thus pick the ones best suited to a given patient's needs and preferences.^{55,56} Human support may be more influential for intervention success than the use of any particular self-help practice element. This conclusion is supported by the relative importance of social support activation (as a practice element) in brief versus longer human support contexts (Fig. 2). Social support has a very high probability of intervention success in the context of brief human support from the intervention. However, it has only a moderate chance of intervention success when more human support is provided from the intervention.

Our findings do not, however, specify what kind of human support should be *prioritized* for self-help interventions. Information on the process (e.g., schedule) and quality of human

support (e.g., therapeutic alliance) was not consistently available in the included reports, and thus, we used time as a proxy measure.^{20,55} We do have a sense, though, that the support provided in these studies could be practical in primary care.^{9,12} The amount of human support for self-help CBT suggested in this study is smaller than that for traditional CBT (typically weekly face-to-face 30- to 60-min sessions),⁵⁶ and nearly half of successful human-supported interventions included in this review employed non-psychologist support staff. Moreover, a recent literature review suggested that having a fixed schedule of support may be a more important factor than therapist expertise in predicting adherence to and efficacy of internet-based self-help interventions.⁵⁷ These findings suggest the need for further studies examining whether self-help support by routinely available primary care personnel (e.g., nurses, medical assistants, receptionists)²² may be feasible and effective.

While not directly tested by the DMM methodology employed in this study,⁵⁸ our results suggest that three elements (cognitive restructuring, behavioral activation, and homework) may form a base for the effectiveness of other elements. In addition, the relative ubiquity of interpersonal skills across interventions and high probability of intervention success (suggested by high CP) when social support activation was included in briefer support condition implies that skills addressing human relationships might play a significant role in self-help treatment of depression. These findings are consistent with the theory of interpersonal psychotherapy of

Table 2 Description of Practice Elements

Practice elements	Brief description	Frequency			Inter-rater reliability (kappa)	Identified in studies
		Successful (n = 12)	Non-successful (n = 9)	All (n = 21)		
Cognitive restructuring	Modification of negative thinking that is antecedent to depression or anxiety	1.00	0.89	0.95	0.92	35–49,51–54
Behavioral activation	Gradual increase of daily activities associated with pleasurable consequences	0.92	1.00	0.95	0.92	35–51,48–54
Homework assignment	Giving self-help practice homework with specific time frame (e.g., between support sessions)	0.83	0.56	0.71	0.95	35,47,49,51–46,51–54
Problem solving	Guidance for thinking through solutions to problems associated with low mood or anxiety	0.75	0.67	0.71	0.96	35,48,50,51,48–50,54
Psychoeducation	Education on depression, anxiety, stress, and their treatment in general	0.67	0.89	0.76	0.89	35,48,49,51–48,50,46–54
Self-monitoring and recording	Repeated recording of symptoms, thoughts, emotions, or behaviors by using questionnaires, worksheets, or diaries	0.67	0.78	0.71	0.97	35–50,49–51,47,49,51–54
Daily stress management	Education on healthy lifestyles and management of stress/symptoms	0.67	0.56	0.62	0.81	48,49,51,48–46,48–51,54
Relaxation	Relaxation and breathing techniques to relieve stress and reduce autonomic arousal	0.67	0.56	0.62	1.00	47,48,50–47,49,51–48,51,52,54
Interpersonal skills	Guidance for effective interpersonal communication and interaction skills	0.58	0.22	0.43	0.93	47,50,48–46,52,54
Self-help needs assessment	Assistance for personalized assessment of self-help needs or tailored use of self-help skills	0.50	0.67	0.57	0.77	48,49,48,49,51–48,50,51,53,54
Relapse prevention	Guidance to continue self-help activities after completion of intervention programs	0.42	0.56	0.48	0.89	35,47,49,48,46,47,51–54
Exercise	Guidance for physical exercise to promote mental health	0.42	0.44	0.43	1.00	48–51,46,49–52
Beliefs modification	Modification of persistent beliefs associated with maladaptive negative thinking	0.42	0.33	0.38	0.93	35,48,49,51,46,53,54
Goal setting	Personal goal setting to enhance engagement in self-help activities	0.33	0.44	0.38	0.87	35,48,49,51,48,51,54
Sleep	Guidance to improve sleep health	0.33	0.33	0.32	1.00	35,51,48,46,47,51,54
Attention modification	Stopping dysfunctional response styles (e.g., rumination) to negative thoughts/feelings	0.33	0.22	0.29	0.86	35,48,47,46,47,54
Primary care use	Enhancing communication with primary providers or adherence to medication	0.25	0.33	0.29	0.91	48,49,48,47,50,51
Exposure	Guidance to go through graded exposure to an avoided fear-associated place or situation	0.25	0.33	0.29	1.00	35,48,46,48,49,54
Major life event	Education on major life events and their influence on mental health	0.25	0.22	0.24	1.00	48,49,51,53,54
Social support	Guidance to activate potential support from family or friends	0.25	0.11	0.20	1.00	48,49,51,51
Functional analysis	Guidance to reduce the frequency of a targeted behavior (e.g., worrying) by identifying its antecedents and consequences	0.25	0.11	0.19	1.00	49,51,46,54

depression⁵⁹ and merit further investigation. We approximate practice element potency with CPs, but this is at best comparable to rank order because CPs may be inflated by publication bias or be clustered among elements frequently used concurrently. Ultimately, trials in various contexts and with various amounts of support would be needed to provide definitive guidance to element selection.

Limitations

Despite our attempts to obtain original study material, we faced many challenges commonly associated with the DMM process^{23,24}. First, there are many possible ways to classify practice elements. Our classification based on CBT mechanisms has face validity but may not truly reflect the intent of an intervention's authors. For example, we merged distraction

and mindfulness techniques into a single element (i.e., attention modification), even though they may be very different in philosophy and technique. Second, distillation is limited by the descriptions of interventions in published articles. Third, final decisions creating the distillation tree depended on our statistical criteria and qualitative judgment. Fourth, the current set of context variables were only one possible combination among many study characteristics. Using other context variables (e.g., printed versus computerized format) may have yielded different distillation trees. However, researchers need to select context variables of interest based on the study focus and theoretical likelihood of interaction with intervention effect in order to limit computational complexity.²⁴ Fifth, our study did not include studies from the past three years. While it is unlikely that new elements would have been introduced, it is possible that studies could have been conducted in different

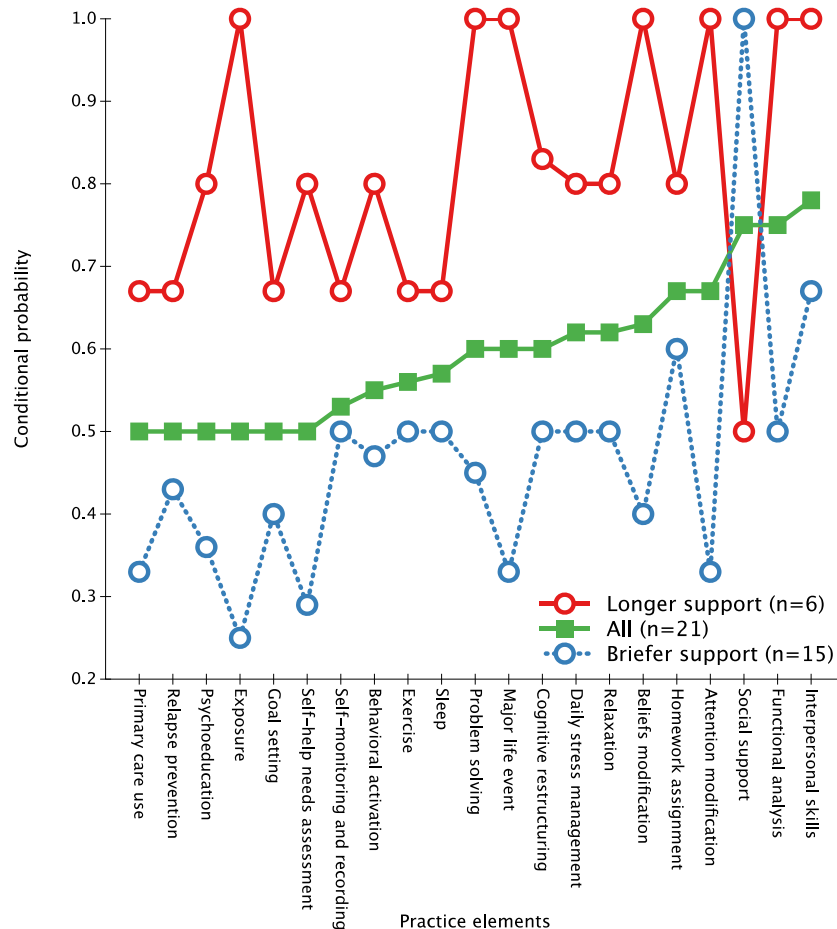


Figure 2 Conditional probabilities for individual practice elements estimated among longer, briefer, and all human support conditions. Conditional probability is the proportion of the number of times each element appeared in a successful intervention compared to the number of times it was used overall. On the x-axis, practice elements are placed in the rank order of conditional probability averaged across all human support contexts.

contexts that could have influenced CPs. The strength of the relationship we found with human support, however, makes it seem equally unlikely that its effect would substantially change. Sixth, we judged intervention success with statistical significance.²⁴ However, statistical significance is an arbitrary criterion influenced by the number of study subjects. Future studies may consider a more clinically relevant threshold for intervention efficacy such as effect size or clinically important difference. Additionally, the present study considered the intervention success to be improvement in any aspect of outcomes, either subjective or objective. However, these are not always equivalent. As research accumulates further, it may be possible to incorporate different outcome aspects such as social functioning into effective symptom domain so that the degree of empirical support for the elements could be described from multiple perspectives. Finally, our results may not be generalizable to depressed patients with chronic physical conditions. Future studies including self-help interventions for patients with chronic physical conditions may be useful to suggest elements that are most appropriate to complex needs of individual primary care patients.

Conclusion

Many individual elements from self-help CBT for adult depression are individually associated with positive treatment outcomes, offering the possibility of creating briefer self-help programs tailored to patient preferences. While the dose of human support appears critical to intervention success, the dose required was moderate and might practically be delivered in real-world primary care settings. Further studies are necessary to establish a method for providing optimal human support in self-help treatment of depression in primary care.

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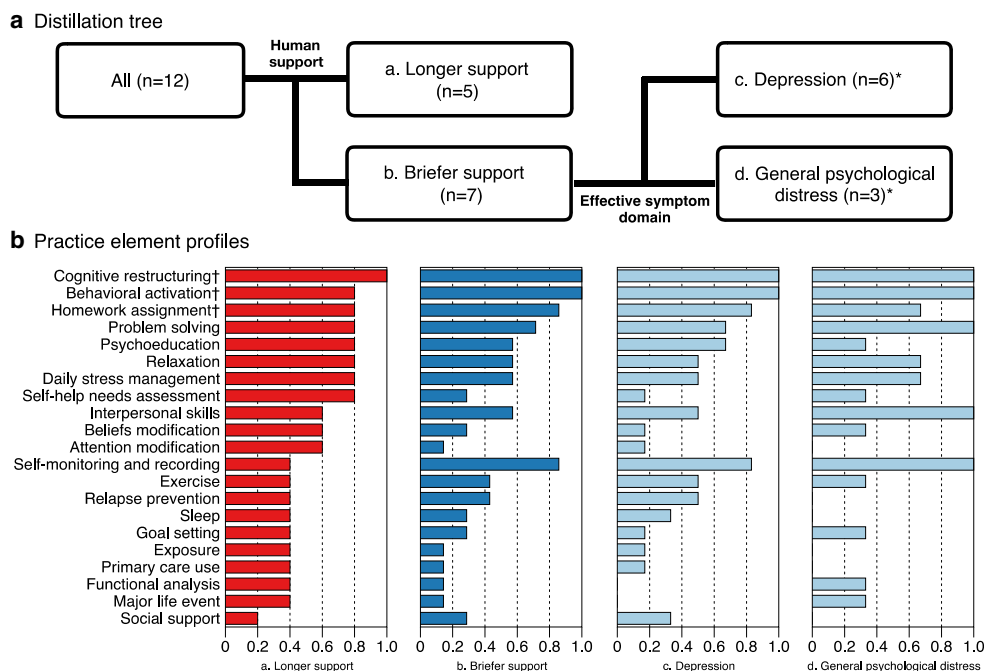


Figure 3 Distillation tree and practice element profiles of successful interventions. Each bar in the b graphs represents the proportion of interventions that include each practice element. * Two interventions contributed to both depression and general psychological distress branches. † Elements that were included highly frequently (> 0.80) regardless of the human support contexts or the symptoms targeted.

Compliance with Ethical Standards:

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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