



Review Article

Psychological interventions for symptoms of depression among informal caregivers of older adult populations: A systematic review and meta-analysis of randomized controlled trials[☆]

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ABSTRACT

Background: Symptoms of depression are commonly experienced by informal caregivers of older adults, however there is uncertainty concerning effectiveness of psychological interventions targeting symptoms of depression in this population. Further, there is uncertainty concerning important clinical moderators, including intervention type and care recipient health condition. This review examined the effectiveness of psychological interventions targeting symptoms of depression in informal caregivers of older adults.

Methods: PubMed, CINAHL, Embase, PsycINFO, Cochrane Library and Web of Science were searched. Risk of bias was assessed using the Cochrane Risk of Bias tool version 2.

Results: Fifteen studies were identified and twelve (1270 participants) provided data for the meta-analysis. Interventions included cognitive behavioral therapy (4 studies), problem-solving therapy (4 studies); non-directive supportive therapy (4 studies) and behavioral activation (3 studies). A small effect size favouring the intervention was found for symptoms of depression ($g = -0.49$, $CI = -0.79, -0.19$, $I^2 = 83.42\%$) and interventions were effective in reducing incidence of major depression ($OR = 0.177$, $CI = 0.08, 0.38$), caregiver burden ($g = -0.35$, $CI = -0.55, -0.15$) and psychological distress ($g = -0.49$, $CI = -0.70, -0.28$). Given high heterogeneity, findings should be interpreted with caution. Overall risk of bias was high.

Limitations: Studies were limited to those in English or Swedish.

Conclusion: Psychological interventions may be effective in reducing symptoms of depression among informal caregivers of older adults. However, evidence is inconclusive due to heterogeneity, high risk of bias, and indirectness of evidence.

1. Introduction

People over the age of 65 is the fastest growing age group worldwide (United Nations Department of Economic and Social Affairs Population Division, 2019), with consequences such as a decreased proportion of people of working age and strained social and healthcare systems (Broese van Groenou and De Boer, 2016). Increases in an aged population, combined with reduced residential care provision for older adults, has resulted in an increased reliance on family and kin to provide

informal care for community-dwelling older adults with age-related diseases or frailty (Ulmanen and Szebehely, 2015). However, the provision of informal care is associated with a range of negative outcomes in terms of physical and mental health, including depression (Bom et al., 2019), which may lead to lower quality of care and risk of abusive behavior towards the care recipient (Stall et al., 2019). The prevalence of elevated symptoms of depression has been found to vary by health condition of the care recipient, and is about 31 % among informal caregivers of people with dementia (Collins and Kishita, 2020) and

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about 40 % among informal caregivers to stroke survivors (Loh et al., 2017). Despite the prevalence of depression, and the existence of evidence-based psychological interventions for adult depression, including cognitive behavioral therapy, behavioral activation, and problem-solving therapy (Cuijpers et al., 2021a), access to evidence based psychological treatments remains limited, and informal caregivers of older adults express a need for effective psychological interventions (Plöthner et al., 2019).

Whilst existing systematic reviews and meta-analyses provide some evidence for psychological interventions for informal caregivers of older adults, reviews tend to target caregivers of persons with specific health conditions, e.g. dementia (Cheng and Zhang, 2020; Huo et al., 2021; Sun et al., 2022) or stroke (Chin et al., 2021; Panzeri et al., 2019). To the best of our knowledge, there is only one existing systematic review and meta-analysis that specifically examined the effectiveness of psychological interventions for symptoms of depression among informal caregivers of older adults more generally (Sørensen et al., 2002). This review was conducted in 2002, and an updated systematic review and meta-analysis is warranted given currently there is a knowledge gap regarding the effectiveness of psychological interventions for informal caregivers of older adults more generally, including those with multimorbidity and less common health conditions. Furthermore, little is known about whether and how the care recipients' health condition moderates intervention effectiveness.

In addition, a number of existing systematic reviews and meta-analyses of interventions to support informal caregivers of older adults are very broad and include a range of interventions targeting a variety of mental health related outcomes (e.g. caregiver burden, stress, well-being; Guay et al., 2017; Lopez-Hartmann et al., 2012; Verreault et al., 2021; Wang et al., 2021). Indeed, the broad nature of the existing reviews of interventions targeting caregiver-related health outcomes in informal caregivers has been identified as a limitation of the existing literature (Calderón-Larrañaga et al., 2021). Conversely, other recent systematic reviews and meta-analyses have focused on the effectiveness of one intervention type, for example behavioral activation for depression in informal caregivers (Zabihí et al., 2020a).

Therefore, given the high prevalence of symptoms of depression among informal caregivers of older adults and its negative outcomes (Stall et al., 2019), alongside evidence suggesting interventions targeting a specific mental health problem (i.e. depression) instead of several mental health problems are more effective (Karyotaki et al., 2018), we aimed to assess interventions primarily targeting symptoms of depression. Furthermore, the review adopted a commonly used classification of psychological interventions using specific therapeutic principles and techniques to target symptoms of depression (e.g. cognitive behavior therapy, behavioral activation therapy, problem-solving therapy, non-directive supportive therapy; Cuijpers et al., 2020). This classification includes eight major types of psychological intervention, developed by experts, and is commonly used in systematic reviews and meta-analyses of psychological interventions for adult depression (Cuijpers et al., 2008; Cuijpers et al., 2020; Cuijpers et al., 2021b) and facilitates better comparison of effect sizes across populations. Conducting a review of psychological interventions for symptoms of depression in informal caregivers of older adults may also allow us to examine a number of potentially important clinical moderators (e.g. intervention type, method of delivery, individual versus dyadic intervention, care recipient health condition) to inform future directions concerning the development of interventions targeting symptoms of depression for informal caregivers of older adults.

This review extends previous reviews by: (a) providing an updated review of the effectiveness of psychological interventions for symptoms of depression in informal caregivers of a general older adult population; (b) including interventions designed to target symptoms of depression specifically, (c) using a narrower and commonly used classification of psychological interventions (Cuijpers et al., 2020) to facilitate a comparison of findings with the existing evidence-base for psychological

interventions for adult depression more generally, (d) assessing the quality of included studies (Sterne et al., 2019) and the quality of review evidence (Guyatt et al., 2008), (e) excluding studies assessed as high risk of bias in terms of random sequence generation and allocation concealment (Sterne et al., 2019), (f) allowing other types of comparators than no-treatment controls (Mohr et al., 2009), and (g) examining clinical and methodological moderators. Furthermore, mental health related secondary outcomes (e.g. anxiety, stress, and quality of life) are examined.

The overall aim of the review was to examine the effectiveness of psychological interventions for symptoms of depression and mental health related secondary outcomes among informal caregivers of community-dwelling older adults, alongside potential clinical and methodological moderators.

2. Methods

Methods are informed by Centre for Reviews and Dissemination (Centre for Reviews and Dissemination, 2009) and Cochrane (Higgins and Green, 2011) guidance. Reporting followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; see Supplementary material Appendix A; Page et al., 2021) and the extension to the PRISMA Statement for Reporting Literature Searches in Systematic Reviews (PRISMA-S; see Supplementary material Appendix B; Rethlefsen et al., 2019). The review protocol has been published (Mårtensson et al., 2020) and registered in PROSPERO (CRD42020157763).

2.1. Search strategy

PubMed, Cochrane Library, Excerpta Medica DataBase (Embase), Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycINFO and ISI Web of Science were searched from inception to November 22, 2021. Searches were updated by running the search strategies in the same databases again at two time-points (May 2021, November 2021). Where possible, search filters were applied, e.g. to exclude records in MEDLINE (Embase, CINAHL) covered by PubMed. Complete search strategies for each database are published (Mårtensson et al., 2020) and the PubMed search strategy is shown in Supplementary material Appendix C. Other methods included reference lists of systematic reviews, reference lists and forward citations of studies included in this review, and expert contact. Cited/citing references were identified by browsing reference lists and using citation indexes. OpenGrey was searched for grey literature. Search strategies were developed with assistance from librarian Agnes Kotka at Uppsala University and were reviewed following the PRESS Peer Review of Electronic Search Strategies guidelines (McGowan et al., 2016) by Professor Mariët Hagedoorn and information specialist Truus van Ittersum from University of Groningen. Due to time constraints, full dissertations were not included and clinical trial registers were not searched.

2.2. Eligibility criteria

Studies available in English or Swedish were eligible with no limitation placed on publication year.

2.2.1. Participants

Adults (≥ 18 years old) providing informal care to community-dwelling older adults with a mean age of ≥ 65 years. Care recipients were anticipated to be experiencing an age-related disease given the prevalence of age-related disease in older adults receiving informal care (Chang et al., 2019). Such age-related diseases may include cardiovascular diseases, cerebrovascular diseases, chronic respiratory diseases, neoplasms, neurodegenerative disorders, and sense organ disorders (Chang et al., 2019). Presence of an age-related disease was not required for study inclusion (Mårtensson et al., 2020).

Participants with and without symptoms of depression were

included. Studies including informal caregivers or care recipients with comorbid severe mental health problems (e.g., post-traumatic stress disorder and psychosis) or mood disorders other than depression (e.g. bipolar affective disorder) were excluded, given some challenges experienced by informal caregivers of people living with severe mental health problems may be different to informal caregivers of older adults with age-related physical health conditions (Diminic et al., 2019; Hielscher et al., 2019). Studies including informal caregivers of people with dementia were eligible for inclusion. Although it is acknowledged that behavioral and psychological symptoms of dementia (BPSD) may have some overlap with symptoms of some severe mental health problems, prevalence rates of more severe symptoms of BPSD, such as disinhibition, elation, and mania are estimated to be <10 % within community persons with dementia (Kwon and Lee, 2021), and therefore informal caregivers of persons with dementia were eligible for inclusion.

2.2.2. Interventions

Studies evaluating psychological interventions using specific therapeutic principles and techniques to target symptoms of depression (e.g. cognitive behavior therapy, behavioral activation therapy, problem-solving therapy, non-directive supportive therapy; Cuijpers et al., 2020), and using a measurement of symptoms of depression as the primary outcome were eligible. Studies with interventions targeting more than one primary mental-health related outcome were excluded. For example, while symptoms of depression and anxiety are commonly comorbid, there is significant debate about the validity and clinical usefulness of a mixed anxiety and depression disorder diagnosis (Mulder et al., 2019). Instead, only psychological interventions designed to primarily target depressive symptoms were eligible for inclusion. However, interventions were anticipated to target secondary outcomes relating to a number of mental health related outcomes (e.g., anxiety, psychological distress, caregiver burden, and mental health-related quality of life). These interventions were available for inclusion as long as the primary intervention target was depression. Purely psychoeducational interventions (e.g. focused on developing skills and knowledge related to caregiving) were excluded.

2.2.3. Comparators

Studies with active and inactive comparators were eligible if they allowed for the isolation of intervention effect. Examples include intervention versus control (i.e. waitlist control, treatment as usual), or intervention plus medication versus medication.

2.2.4. Outcomes

Studies using a self, clinician, or proxy administered standardized valid and reliable measurement of depression symptom severity were eligible. Secondary outcome measures included incidence of major depression (operationalized as meeting diagnostic criteria or scoring above clinical cut-off scores on self-report measures) and self, clinician, or proxy administered standardized measurements of anxiety, stress, caregiver burden, psychological distress, quality of life, well-being, and self-efficacy. Outcome data was extracted for all measurements, time points, and analyses.

2.2.5. Study designs

Individually-randomized, parallel group-controlled trials were included. Cluster randomized controlled trials (RCTs), non-randomized, and uncontrolled designs were excluded. Studies assessed as high risk of bias in terms of random sequence generation and allocation concealment following the Cochrane Risk of Bias tool (RoB) version 2 (Sterne et al., 2019) were excluded. Whilst the exclusion of studies specifically with high risk of bias for sequence generation and allocation concealment is not in line with the Cochrane Handbook (Higgins et al., 2022a), this method has been adopted in previous systematic reviews and meta-analyses (Farrand and Woodford, 2013; Pettman et al., 2019) and may minimize the risk of an inflated overall effect size resulting from the

inclusion of low-quality studies (Cuijpers et al., 2010).

2.3. Study selection

Study titles and abstracts screening, and full-paper checks was conducted independently by two reviewers including two review authors (E. M. and C. C./J. W.) and one intern. Disagreements were resolved by discussion between the two review authors, or consulting a third review author.

2.4. Data extraction

E. M. and C. C. extracted data from included studies using a standardized data extraction form, with disagreements resolved by consulting J. W. Extracted data included (1) study characteristics (e.g., inclusion criteria); (2) sample characteristics (e.g., age, gender); (3) intervention characteristics (e.g., theory); and (4) quantitative data for meta-analysis (e.g. sample size, mean outcome scores at baseline and follow-up, standard deviation, and/or standard error). Where relevant, standard errors were converted into standard deviations in preparation for data analysis. Intervention components were extracted following the Template for Intervention Description and Replication (TIDieR) checklist (Hoffmann et al., 2014). Study authors were contacted a maximum of two times over a four-week period in the event of missing data.

2.5. Quality assessments

Studies were assessed by E. M. and C. C. independently for risk of bias, following Cochrane RoB tool version 2 (Sterne et al., 2019) on the following domains: (a) randomization process, (b) deviations from intended interventions, (c) missing outcome data, (d) measurement of the outcome, and (e) selection of reported results. Ratings were categorized as being of low, unclear, or high risk of bias. Overall risk of bias is reported as *low* if all domains are rated as low risk of bias, *moderate* if one domain is rated as unclear risk of bias, and *high* if one domain is rated as high risk of bias or if two or more domains are rated as unclear risk of bias. The Robvis tool was used to visualize risk of bias (McGuinness and Higgins, 2020). Confidence in evidence across studies was assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) tool (Guyatt et al., 2008).

2.6. Data synthesis and statistical analysis

2.6.1. Meta-analyses

Meta-analyses were performed using Comprehensive Meta-Analysis version 3. Post-treatment between-group standardized mean effect sizes were calculated separately for primary and secondary outcomes were calculated using Hedges' *g* (Higgins and Green, 2011), while incidence of depression was calculated using Odds Ratio (OR), alongside 95 % confidence intervals (CIs). Given a number of studies examined multiple time-points, we selected the longest follow-up time period ≤6 months post-treatment for each study as the primary time-point.

In cases where studies included more than one intervention group with one control group, analysis of comparisons were planned to be conducted separately, with the control group sample size split in half. In cases where studies included more than one control group, analysis of comparisons were planned to be conducted separately, with the intervention group sample size split in half. (Higgins et al., 2019).

2.6.2. Assessment of heterogeneity

Between-study heterogeneity was measured with Cochrane's test of heterogeneity (*Q*) and *I*² statistics, alongside CIs, were used to measure the proportion of total variability due to between-study heterogeneity (Rücker et al., 2008). Heterogeneity was high, with the *Q*-test indicating statistically significant heterogeneity ($Q = 72.40, I^2 = 83.42 \%, p < 0.001$) and a random effects model was adopted (Deeks et al., 2022).

2.6.3. Subgroup analyses

Subgroup analyses (Higgins et al., 2003) examined the moderating effects of:

- Care recipient's health condition
- Individual or dyadic intervention
- Intervention delivery
- Length of follow-up
- Multicomponent intervention or not
- One-to-one or group intervention
- Recruitment setting
- Severity of symptoms of depression at baseline
- Theory informing intervention
- Type of control condition

2.6.4. Meta-regression

Moderating effects of percent adult-child caregivers and percent women caregivers were examined using meta-regression analyses.

2.6.5. Sensitivity analyses

Sensitivity analyses examined overall effect size for depression

symptom severity by temporarily removing: (a) each study individually, (b) studies with sample sizes ≤ 20 across conditions, (c) studies with attrition rates $\geq 30\%$ in at least one trial arm, and (d) studies in each rating category of overall risk of bias (low, moderate, high).

2.6.6. Funnel plot asymmetry

Egger's test of the Intercept examined funnel plot asymmetry for potential publication bias or other sources of asymmetry (e.g. poor design of small studies, fraud, language bias; Egger et al., 1997). Duval and Tweedie's trim-and-fill procedure was used to calculate effect sizes for each outcome while taking potential publication bias into account (Duval and Tweedie, 2000).

2.7. Changes to protocol

The following changes were made to the published protocol prior to analysis (Mårtensson et al., 2020):

- Moderating effect of type of support was not analysed given significant between study variations.

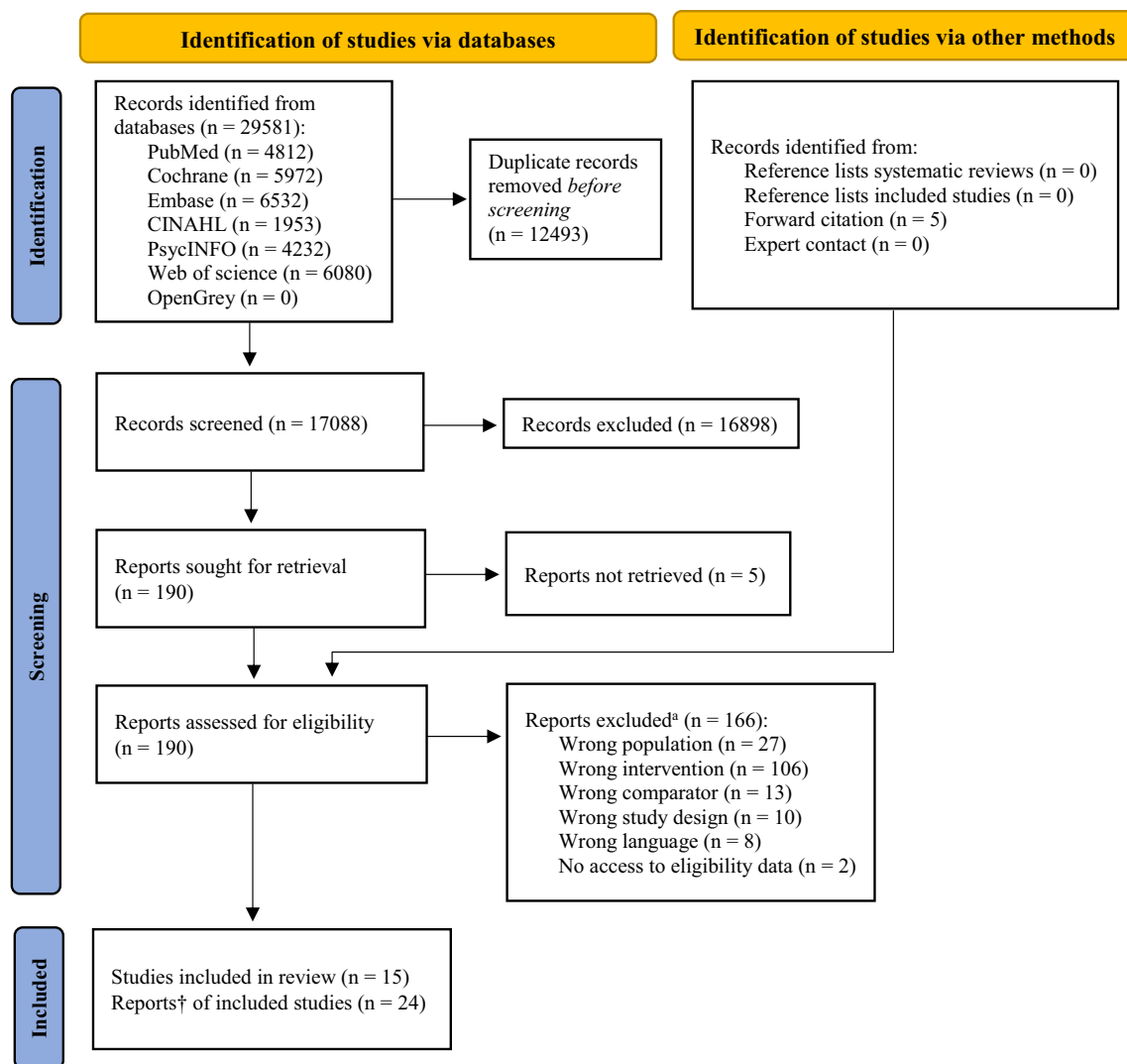


Fig. 1. PRISMA flow diagram.

[†]Reports refer to journal articles or other document (e.g. study report, unpublished manuscript) that provides data relevant to the studies included within the review.

^aWhere possible, primary reasons for exclusion are categorised by population, interventions, comparators, outcomes and study design (PICOS). For detailed reasons for study exclusion, see Supplementary material Appendix D.

- Moderating effect of method of delivery was divided into two subgroups “intervention delivery” (e.g. face-to-face, telephone) and “one-to-one or group intervention”.
- Continuous measurements of baseline depression were not used in the meta-regression due to heterogeneity in depression measurements. Instead, baseline depression was categorised based on established cut-offs for depression outcome measurements (Beck et al., 1996; Kroenke et al., 2001; Radloff, 1977; Yesavage et al., 1983; Zigmond and Snaith, 1983) and included in subgroup analyses.
- Continuous measurements of care recipient's health condition severity at baseline was not used in the meta-regression due to heterogeneity in health condition measurements.

3. Results

3.1. Study selection

Fifteen studies met inclusion criteria (see Fig. 1 for PRISMA flow diagram). Database searches and other methods revealed 29,581 records with 190 full-text articles screened. For detailed reasons for study exclusion, see Supplementary material Appendix D.

3.2. Study characteristics

The main characteristics of included studies are presented in Table 1. Across the 15 studies included within the systematic review, a total of 1621 participants were included. Sample sizes ranged from 9 to 202. The mean age of informal caregivers ranged from 53.9 to 73.3 years, and for care recipients 67.9 to 80.9 years. In two studies all caregivers were women (Vázquez et al., 2016; Vázquez González et al., 2013), with the percentage of women in other studies ranging from 56 to 92.5 %. Two studies included only spouse caregivers (Mittelman et al., 2008; Werner et al., 2020), and in the remaining studies the percentage of adult-child caregivers ranged from 10 % to 67 %. Depression symptom severity at baseline was minimal in four studies (Bruvik et al., 2013; Charlesworth et al., 2008a, b; Mittelman et al., 2008; Werner et al., 2020), mild in six (Au, 2015; Au et al., 2014, 2015; Garand et al., 2014; LeLaurin et al., 2021; Pan and Chen, 2019), moderate in four (Losada et al., 2011; Pillemer and Suito, 2002; Vázquez et al., 2016; Vázquez González et al., 2013), and moderately severe in one study (Farrand et al., 2020). Inclusion/exclusion criteria related to levels of depressive symptoms at baseline was only present in four studies (Farrand et al., 2020; Pan and Chen, 2019; Vázquez et al., 2016; Vázquez González et al., 2013).

Care recipient health condition was dementia or mild cognitive impairment (MCI) in eleven studies, (Au, 2015; Au et al., 2014, 2015; Bruvik et al., 2013; Charlesworth et al., 2008a, b; Garand et al., 2014; Losada et al., 2011; Mittelman et al., 2008; Pan and Chen, 2019; Pillemer and Suito, 2002; Werner et al., 2020), stroke in two (Farrand et al., 2020; LeLaurin et al., 2021), and care recipient health condition was not specified in two studies (Vázquez et al., 2016; Vázquez González et al., 2013). In nine studies participants were recruited in a clinical setting (Au, 2015; Au et al., 2014, 2015; Garand et al., 2014; LeLaurin et al., 2021; Pan and Chen, 2019; Pillemer and Suito, 2002; Vázquez et al., 2016; Vázquez González et al., 2013), and from mixed clinical and community settings in five studies (Bruvik et al., 2013; Charlesworth et al., 2008a, b; Farrand et al., 2020; Losada et al., 2011; Werner et al., 2020).

Intervention characteristics as per TIDieR checklist (Hoffmann et al., 2014) can be seen in Table 2. Interventions were based on cognitive behavioral therapy (CBT) in four studies (Farrand et al., 2020; Losada et al., 2011; Pan and Chen, 2019; Vázquez et al., 2016), problem solving therapy (PST) in four (Bruvik et al., 2013; Garand et al., 2014; LeLaurin et al., 2021; Vázquez González et al., 2013), non-directive supportive therapy (SUP) was used in four (Charlesworth et al., 2008a, b; Mittelman et al., 2008; Pillemer and Suito, 2002; Werner et al., 2020), and

behavioral activation therapy (BA) in three studies (Au, 2015; Au et al., 2014, 2015). In three studies interventions were considered multicomponent (Au, 2015; Au et al., 2015; Bruvik et al., 2013), i.e. involving different intervention techniques (Laver et al., 2017). Two multicomponent interventions included education about dementia and communication and was delivered over the telephone by a social worker in both trial arms (Au, 2015; Au et al., 2015). The third multicomponent intervention included education about dementia in a community-based program or in seminars, and was only provided to the intervention group (Bruvik et al., 2013). Interventions including ‘passive’ psychoeducation (e.g. information via leaflets, e-mails or websites) or education about depression or intervention content were not deemed multicomponent (Donker et al., 2009; Piquart and Sørensen, 2006).

The intervention was delivered one-to-one in nine studies (Au, 2015; Au et al., 2014, 2015; Charlesworth et al., 2008a, b; Farrand et al., 2020; Garand et al., 2014; LeLaurin et al., 2021; Pan and Chen, 2019; Pillemer and Suito, 2002), in groups (i.e. together with other caregivers) in three (Losada et al., 2011; Vázquez et al., 2016; Vázquez González et al., 2013), and delivery was mixed with both one-to-one and in groups in three studies (Bruvik et al., 2013; Mittelman et al., 2008; Werner et al., 2020). In one study the intervention was partly dyadic, i.e. including some elements where caregivers and their care recipient received the intervention together (Bruvik et al., 2013). In seven studies the intervention was delivered face-to-face (Bruvik et al., 2013; Charlesworth et al., 2008a, b; Losada et al., 2011; Pillemer and Suito, 2002; Vázquez et al., 2016; Vázquez González et al., 2013; Werner et al., 2020), in two by telephone (Au, 2015; Au et al., 2015), in two mixed face-to-face and telephone (Mittelman et al., 2008; Pan and Chen, 2019), in one by telephone and written materials (Au et al., 2014), two were delivered face-to-face, by telephone, and written materials (Farrand et al., 2020; Garand et al., 2014), and one by telephone, website, and written materials (LeLaurin et al., 2021). The control condition was treatment as usual (TAU) in nine studies (Au et al., 2014; Bruvik et al., 2013; Charlesworth et al., 2008a, b; Farrand et al., 2020; Mittelman et al., 2008; Pillemer and Suito, 2002; Vázquez et al., 2016; Vázquez González et al., 2013; Werner et al., 2020), specific treatment component control (STC) plus attention (Mohr et al., 2009) in two (Au, 2015; Au et al., 2015), attention in one (Garand et al., 2014), waitlist control (WLC) in one (Losada et al., 2011), and non-specific treatment component control (NSTC; Mohr et al., 2009) in one (Pan and Chen, 2019). One study used both TAU and attention control groups (LeLaurin et al., 2021).

Five measurements of symptoms of depression were used across studies. The CES-D (Radloff, 1977) was used in ten studies (Au, 2015; Au et al., 2014, 2015; Garand et al., 2013; LeLaurin et al., 2021; Losada et al., 2011; Pan and Chen, 2019; Pillemer and Suito, 2002; Vázquez et al., 2016; Vázquez González et al., 2013), GDS (Yesavage et al., 1983) in two (Bruvik et al., 2013; Werner et al., 2020), HADS-D (Zigmond and Snaith, 1983) in one (Charlesworth et al., 2008a, b), PHQ-9 (Kroenke et al., 2001) in one (Farrand et al., 2020), and BDI-II (Beck et al., 1996) in one (Mittelman et al., 2008). The longest follow-up time-point was ≤2 months post-treatment in six studies (Au, 2015; Au et al., 2014, 2015; Bruvik et al., 2013; Losada et al., 2011; Pan and Chen, 2019), 3–6 months in three (Farrand et al., 2020; LeLaurin et al., 2021; Pillemer and Suito, 2002), 7–11 months in one (Charlesworth et al., 2008a, b), and ≥12 months in five studies (Garand et al., 2014; Mittelman et al., 2008; Vázquez et al., 2016; Vázquez González et al., 2013; Werner et al., 2020). Regarding secondary outcomes, data was available for incidence of major depression in two studies (Vázquez et al., 2016; Vázquez González et al., 2013), anxiety in three (Charlesworth et al., 2008a, b; Farrand et al., 2020; Garand et al., 2014), caregiver burden in four (Farrand et al., 2020; LeLaurin et al., 2021; Vázquez et al., 2016; Vázquez González et al., 2013), psychological distress in three (Farrand et al., 2020; Vázquez et al., 2016; Vázquez González et al., 2013), quality of life in two (Charlesworth et al., 2008a, b; Farrand et al., 2020), and self-efficacy in one (Au et al., 2014).

Overall risk of bias was high for all studies (Sterne et al., 2019).

Table 1
Study characteristics (15 studies, 24 reports).

Studies	Country	Participants	Depressive symptom inclusion/exclusion criteria	Care recipients	Recruitment setting	Intervention	Control	Outcomes (measurement)	Length of follow-up	Ethical considerations (funding source)
Au, 2015	China	N: 93 Age: 56 ± 10.6 % women: 81.7 % adult-children: 66.7 Years caring: NR Baseline depression: mild (CES-D, M = 13.5)	None	Condition: dementia Age: 80.9 ± 6.6	Clinical (hospital settings)	BA + PsyEd	STC + Attention	Primary: depression (CES-D)	Post-treatment	NR (Food and Health Bureau of the Hong Kong SAR Government)
Au et al., 2015	China	N: 59 Age: 56.6 ± 10.8 % women: 83.1 % adult-children: 59.3 Years caring: 3.1 Baseline depression: mild (CES-D, M = 14.1)	None	Condition: dementia Age: 80.6 ± 7.0	Clinical (hospital settings)	BA + PsyEd	STC + Attention	Primary: depression (CES-D)	Post-treatment	NR (Food and Health Bureau of the Hong Kong SAR Government)
Au et al., 2014	China	N: 60 Age: 56.6 ± 11.9 % women: 76.7 % adult-children: 48.3 Years caring: 3.3 Baseline depression: mild (CES-D, M = 14.1)	None	Condition: dementia Age: 80 ± 7.4	Clinical (hospital settings)	BA	TAU (standard care provided by the psychogeriatric team with regular psychiatric follow-up for the care recipients and support from social workers upon request)	Primary: depression (CES-D) Secondary: self-efficacy (RSCS)	Post-treatment	NR (Health and Health Services Research Fund, Food and Health Bureau, Hong Kong SAR Government)
Bruvik et al., 2013	Norway	N: 195 Age: 63.5 ± 12 % women: 77 % adult-children: 40 Years caring: NR Baseline depression: minimal (GDS, M = 6.5)	None	Condition: dementia Age: 78.4 ± 7.5	Clinical and community (e.g., memory clinics, GP offices, home care offices, adult day care canters, or the National Dementia Care Association)	PST + PsyEd	TAU (no detail reported)	Primary: depression (GDS)	Post-treatment	Regional Ethics Committee for medical research. (the Research Council of Norway, the Centre for Dementia Research, Aging and Health, the National Dementia Care Association, the Kavli Research Centre for Aging and Dementia, and the Civitan Norway)
Charlesworth et al., 2008a, b	UK	N: 202 Age: 68 ± 11.4 % women: 64 % adult-children: <67 Years caring: 3.8 Baseline depression: minimal	None	Condition: dementia Age: 78.2 ± 8.7	Clinical and community (e.g., GPs, libraries, social services, mental health services for older people, pharmacies, day services, supermarkets and voluntary organizations, radio, press, voluntary organization mailouts)	SUP	TAU (typical services: community psychiatric services, day hospitals, day centres, home care or personal care, respite care, and carers' information or support groups. All participants sent information on local services for carers).	Primary: depression (HADS-D) Secondary: anxiety (HADS-A); QoL (EQ-5D VAS)	Mid-treatment Post-treatment 9 months	Eastern Multi Regional Ethics Committee, the five local ethical research committees in Norfolk and Suffolk, and Barking and Havering local ethical research committee. (Health Technology Assessment Programme, Norfolk and Suffolk Social

(continued on next page)

Table 1 (continued)

Studies	Country	Participants	Depressive symptom inclusion/exclusion criteria	Care recipients	Recruitment setting	Intervention	Control	Outcomes (measurement)	Length of follow-up	Ethical considerations (funding source)
		(HADS-D, M = 6.8)								Services, the King's Lynn and West Norfolk Branch of the Alzheimer's Society and the Department of Health)
Farrand et al., 2020	UK	N: 9 Age: 62.9 ± 10.3 % women: 65 % adult-children: 10 Years caring: 8.2 Baseline depression: moderately severe (PHQ-9, M = 15.1)	Participants required to meet criteria for major depressive disorder as determined by the Clinical Interview Schedule (CIS-R; Lewis et al., 1992); and score between 10 and 22 on the PHQ-9"	Condition: stroke Age: 67.9 ± 12	Clinical and community (e.g., GP mailout, GP referrals, acute and community based stroke clinical teams, voluntary organization posters, flyers, newsletters and social media)	CBT	TAU (support provided by a GP or other healthcare provider)	Primary: depression (PHQ-9) Secondary: anxiety (GAD-7); burden (CBS); distress (CIS-R); QoL (EQ-5D VAS)	4 months 6 months	National Research Ethics Committee South West for Cornwall and Plymouth (the Dunhill Medical Trust)
Garand et al., 2013, 2014, 2019	US	N: 73 Age: 65 ± 11.3 % women: 78.1 % adult-children: <24.7 Years caring: NR Baseline depression: mild (CES-D, M = 10.1)	None	Condition: MCI or early dementia Age: 75.2 ± 8.8	Clinical (University of Pittsburgh Alzheimer's Disease Research Center patient registry)	PST	Attention	Primary: depression (CES-D) Secondary: anxiety (STAI)	1 month 3 months 6 months 12 months	NR (the National Institute of Health and the UPMC Endowment in Geriatric Medicine.)
LeLaurin et al., 2021	US	N: 36 Age: 60.3 ± 10.1 % women: 92.5 % adult-children: 13.2 Years caring: NR Baseline depression: mild (CES-D, M = 13.2)	None	Condition: stroke Age: 70.6 ± 10.7	Clinical (Veterans Health Administration facility)	PST	Control 1: TAU (access to existing caregiving resources, e.g. social worker support, self-help materials, caregiver support line) Control 2: attention	Primary: depression (CES-D) Secondary: burden (ZBI)	Post-treatment 4 months	North Florida/South Georgia Veterans Health System Research & Development Committee, the University of Florida Institutional Review Board (Small Projects in Rehabilitation Research (SPiRE) Award from the US Department of Veterans Affairs Rehabilitation Research & Development Service)
Losada et al., 2011	Spain	N: 118 Age: 60 ± 12 % women: 82.8 % adult-children: 59.2 Years caring: 4.6 Baseline depression: moderate (CES-D, M = 18.7)	None	Condition: dementia Age: 79 ± 8	Clinical and community (e.g., social and health centers and announcements in the media (online, television, or radio)	CBT	WLC	Primary: depression (CES-D)	Post-treatment	NR (the Spanish Ministry of Education and the Spanish Ministry of Science and Innovation)
Brody et al., 2009; Burns	Australia, UK, US	N: 155 Age: 71.8 ^a	None	Condition: dementia	NR	SUP			Post-treatment	Ethics committee/ institutional review board <i>(continued on next page)</i>

Table 1 (continued)

Studies	Country	Participants	Depressive symptom inclusion/exclusion criteria	Care recipients	Recruitment setting	Intervention	Control	Outcomes (measurement)	Length of follow-up	Ethical considerations (funding source)
et al., 2010; Mittelman et al., 2008		(Australia), 72.2 ^a (UK), 70.2 ^a (US) % women: 56.3 % adult-children: 0 Years caring: NR Baseline depression: minimal (BDI-II, M = 8.6)		Age: 75 ^a (Australia), 72.7 ^a (UK), 73.6 ^a (US)			TAU + pharmacological treatment for care recipients	Primary: depression (BDI-II)	3 months 6 months 9 months 15 months 21 months	approval at each site. (Pfizer, Inc. and NYU Alzheimer's Disease Center)
Pan et al., 2019; Pan and Chen, 2019	China	N: 82 Age: 62.7 ± 10.9 % women: 62.5 % adult-children: <51.8 Years caring: 5.3 Baseline depression: mild (CES-D, M = 13.6)	Participants required to have a CES-D score of ≥10 or greater and <20	Condition: dementia Age: 79.5 ± 9.5	Clinical (Community health centers and tertiary hospital)	CBT	NSTC	Primary: depression (CES-D)	Post-treatment 2 months	NR (Jin Hua Science and Technology Bureau)
Pillemer and Sutor, 2002	US	N: 115 Age: 58 ^a (range 35–87) % women: 71 % adult-children: 60 Years caring: NR Baseline depression: moderate (CES-D, M = 18.8)	None	Condition: dementia Age: 77 ^a (range 59–90)	Clinical	SUP	TAU (no detail reported)	Primary: depression (CES-D)	4 months	NR (the National Institute on Aging)
Vázquez et al., 2014; Vázquez et al., 2016	Spain	N: 170 Age: 55.1 ± 9 % women: 100 % adult-children: 49.4 Baseline depression: moderate Years caring: 10.1 (CES-D, M = 23.3)	Participants required to score ≥ 16 on the CES-D and have no current/past major depressive episode as determined by DSM-IV criteria ⁷	Condition: non-specified (not terminal or severe disease prognosis) Age: 80.4 ± 17.7	Clinical (Official register of caregivers)	CBT	TAU (possibility of accessing any type of psychological, medical, or social services available in the community in public or private centers)	Primary: depression (CES-D) Secondary: major depression diagnosis (SCID-CV); distress (GHQ-28); burden (ZBI)	Post-treatment 1 month 3 months 6 months 12 months	Bioethics committee at the University of Santiago de Compostela. (the Ministry of Labor and Social Affairs of Spain)
Lopez et al., 2020; Otero et al., 2015; Vázquez González et al., 2013	Spain	N: 173 Age: 53.9 ± 9.2 % women: 100 % adult-children: 50.9 Years caring: 9.5 Baseline depression:	Participants required to score ≥ 16 on the CES-D, and with no history of major depression according to the Structured Clinical Interview for DSM Disorders. ⁷	Condition: non-specified (not terminal or severe disease prognosis) Age: 78.6 ± 19.1	Clinical (Official register of caregivers)	PST	TAU (unrestricted access to standard social and health care services for treatment of depression symptoms)	Primary: depression (CES-D) Secondary: major depression diagnosis (SCID-CV); distress	Post-treatment 1 month 3 months 6 months 12 months 8 years	Committee for Ethical Research of the University of Santiago de Compostela <i>Other:</i> caregivers meeting criteria for the diagnosis of a major depressive episode were referred to

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Table 1 (continued)

Studies	Country	Participants	Depressive symptom inclusion/exclusion criteria	Care recipients	Recruitment setting	Intervention	Control	Outcomes (measurement)	Length of follow-up	Ethical considerations (funding source)
		moderate (CES-D, M = 23.8)						(GHQ-28); burden (CBI)		the health services available in their community to receive appropriate psychological or psychiatric treatment (the Ministry of Labour and Social Affairs of Spain)
Werner et al., 2020	Israel	N: 81 Age: 73.3 ± 9.5 % women: 69 % adult-children: 0 Years caring: NR Baseline depression: minimal (Intervention, GDS, M = 5.8; Control, GDS, M = 6.0)		Condition: dementia Age: 75.3 ± 9.7	Clinical and community (Israeli Alzheimer's Association hot line, support groups and from the local health and social services)	SUP	TAU (referred to support groups and were told that they could call the counsellor if advice or information was needed)	Primary: depression (GDS)	Post-treatment 4 months 8 months 14 months 20 months	Study conducted at a university openly supporting the Israeli military's documented human rights transgressions against Palestinians. Ethics Committee of the Faculty of Health and Welfare Sciences of the University of Haifa. (grant from the National Insurance Institute to the Israeli Alzheimer's Association)

Note: BA, behavioral activation therapy; CBI, caregiver burden interview; CBS, caregiver burden scale; CIS-R, the clinical interview schedule-revised; CES-D, Center for Epidemiological Studies Depression Scale; CBT, cognitive behavioral therapy; DSM, Diagnostic and Statistical Manual for Mental Disorders; EQ-5D VAS, EuroQol-5 dimension visual analogue scale; GAD-7, Generalized anxiety disorder scale; GDS, Geriatric depression scale; GHQ-28, The general health questionnaire; HADS-A, Hospital anxiety and depression scale (anxiety subscale); HADS-D, Hospital anxiety and depression scale (depression subscale); MCI, mild cognitive impairment; NR, not reported; NSTC, non-specific treatment component control; PHQ-9, patient health questionnaire; PST, problem-solving therapy; PsyEd, psychoeducation; QoL, quality of life; RSCS, revised scale for caregiving self-efficacy; SCID-CV, Structured clinical interview for DSM-IV Axis I disorders-clinical version; STAI, The state-trait anxiety inventory; STC, specific treatment component control; SUP, non-directive supportive therapy; TAU, treatment as usual; ZBI, Zarit burden interview; WLC, waitlist control.

^a Standard deviation not reported.

Table 2
Intervention characteristics as per TIDieR.

Authors	Name of intervention	Theory/rationale	Materials	Procedures	Provider	Delivery	Location	Duration and frequency	Tailoring	Modification	Planned fidelity/adherence	Actual fidelity/adherence
Au et al. (2015)	A multi-component telephone-based BA intervention for dementia CGs	– BA based on behavioural theory of depression (Lewinsohn, 1974) – Intervention structure based on PES module in ‘Coping with Caregiving’ (CWC; Gallagher-Thompson et al., 2010)	– Printed copy of PsyEd – Information packet on local organizations, community resources and social and mental issues related to dementia	1. PsyEd: – Four weekly phone calls (30 min) – Printed copy of PsyEd, information packet – Week 1: dementia; week 2: stress; week 3: PE scheduling; week 4: communication 2. BA: – Four sessions on PES (15–20 min) over two months – Four sessions on communication (15–20 min) over two months – Homework: activity (PE/communication) monitoring, activity scheduling, reinforce/modify activity, activity rescheduling based on modifications	PsyEd: professional (social workers) BA: non-professional (trained paraprofessionals; senior citizens and students)	Individually by telephone	– Hong Kong, China – Setting: telephone	Duration: 21 weeks N sessions: 12 Session duration: 30 min (PsyEd), 15–20 min (BA)	No	Compared to the pilot study (Au et al., 2015) the study also included students as intervention providers	Intervention providers tried a mock case before delivering the programme and received weekly supervision by a psychologist and social worker	– 100 % received intervention – 3.9 % discontinued intervention
Au et al. (2015)	A multi-component telephone-based BA intervention for dementia CGs	Same as above	Same as above	Same as above	PsyEd: professional (social workers) BA: non-professional (trained paraprofessionals; senior citizens)	Same as above	Same as above	Same as above	Same as above	Compared to the previously tested CWC (Au et al., 2010, Au et al., 2014) the study used telephone for delivery, paraprofessionals as providers and had more focus on teaching coping and communication skills	Same as above	– 100 % received intervention – 6.5 % discontinued intervention – Senior citizens were successfully engaged as paraprofessionals
Au et al. (2014)	A telephone-assisted pleasant-event scheduling intervention (TAPES) for dementia CGs	– BA based on behavioral theory of depression (Lewinsohn, 1974) – Structure	– Information package on social and psychological services in community – PE schedule	1. Materials – Information package, PE schedule – Choose 1–2 activities to work with over next	NR	Individually by telephone and written	– Hong Kong, China – Setting: telephone – CGs’ filled out written materials which	Duration: four weeks N sessions: six Session duration: 20 min	No	Compared to the previously tested CWC (Au et al., 2010) the present study used telephone as means	Intervention providers met weekly to review CGs’ progress	NR

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Table 2 (continued)

Authors	Name of intervention	Theory/rationale	Materials	Procedures	Provider	Delivery	Location	Duration and frequency	Tailoring	Modification	Planned fidelity/adherence	Actual fidelity/adherence
		based on PES module in CWC tailored for Chinese CGs (Au et al., 2010)	(to rate engagement frequency and pleasure) – PE worksheet – PE tracking form – Daily mood record	two weeks 2. PES – Two sessions (20 min) during one week – Learn to use PE worksheet – Homework: track progress in PE tracking form and the daily mood record 3. Coping – Four sessions (20 min) over three weeks (two calls per week during week one, one call per week during remaining weeks) – Discuss concepts of adaptive coping (active/passive coping, goodness of fit between coping and situations, problem-solving coping, emotion-regulation coping, using situation-appropriate strategies)			were e-mailed back to intervention providers			of delivery and focus on PES		
Bruvik et al. (2013)	A multi-component psychosocial PST intervention for dementia CGs	Multi-component intervention based on review showing multi-component interventions may reduce depression in dementia CGs (Pinquart and Sørensen, 2006)	Booklet about dementia	1. PST counselling – Five sessions (60 min) (two individual sessions, two sessions with care recipient, one session with family network) over three months – Identify needs and family resources – PS 2. PsyEd – Community-based educational programme or two	Professional (trained local intervention providers; nurses, occupational therapists) – If <6 CGs in group meetings, PI led the meeting	Individually and in dyads, personally and in groups (max six participants per group), face-to-face	– Norway – Setting: 17 local authorities – Group meetings were held in parallel for CGs and care recipients, to address transportation needs and that some care recipients could not stay at home alone	Duration: 52 weeks N sessions: 14–15 Session duration: 60 min (PST counsel-ling), 2 h (group meetings)	No	Eligibility of one PwD was assessed using the Clinical Dementia Rating instead of the Mini Mental State Examination, due to aphasia after stroke	– Intervention providers received supervision, newsletters, and ad hoc support from PI – Treatment manuals were used for each PST counselling and group meeting – Intervention providers registered any	– 100 % received intervention – 18.3 % discontinued intervention

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Table 2 (continued)

Authors	Name of intervention	Theory/rationale	Materials	Procedures	Provider	Delivery	Location	Duration and frequency	Tailoring	Modification	Planned fidelity/adherence	Actual fidelity/adherence
				half-day seminars (optional if CGs had participated in a dementia education programme) – Booklet 3. PST group meetings – Six group meetings (2 h) over three months – PS to identify and implement coping strategies – Care recipients received PsyEd and PES intervention – Two follow-up booster sessions 12 months post-randomization							deviations from the treatment manual	
Charlesworth et al. (2008a)	A voluntary sector based befriending programme (BECCA) for dementia CGs	Social support intervention based on evidence demonstrating an association between social support and well-being (Bowling, 1991)	Booklet about intervention	– Weekly home visits over 6–15 months – Befriending focusing on emotional support, companionship, conversation – When appropriate, signposting to information and services – Without instrumental support or advice	Non-professional (trained volunteers)	Individually face-to-face	– UK (Norfolk, Suffolk and London Borough of Havering) – Setting: CGs' homes	Duration: 6–15 months N sessions: at least 12 Session duration: flexible	Location, and frequency of contact was negotiated as necessary by each CG-volunteer pairing	NR	– A consultation group met every six months to discuss intervention progress, assist with decision-making and solutions – Befrienders met every six months to get support, training and information about volunteering and CG support – An experienced volunteer reviewed activity and the quality of the befriender-CG relationship	– 100 % received intervention – 26.7 % discontinued intervention – 81.7 % of volunteers completing screening and training became befrienders

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Table 2 (continued)

Authors	Name of intervention	Theory/rationale	Materials	Procedures	Provider	Delivery	Location	Duration and frequency	Tailoring	Modification	Planned fidelity/adherence	Actual fidelity/adherence
Farrand et al. (2020)	A written CBT self-help intervention (CEDArS) for stroke CGs	– CBT based on theory by Beck et al. (1979) – BA based on behavioral theory of depression (Lewinsohn, 1974; Hopko et al., 2003) – PS based on theory by Nezu (1986) and Nezu and D’Zurilla (1979).	– Introduction workbook – Workbooks for each single stand intervention (BA, PS, goal setting)	1. Assessment – One session (35 min) – Understand CG’s difficulties – Information about depression, caregiving, and CBT – Information about the three single strand CBT based interventions (BA, PS, goal setting) – Choose a single strand CBT based intervention with practitioner – Introduction workbook – Workbook for the chosen single strand CBT based intervention 2. CBT – Up to 12 sessions (25–35 min) over 13 weeks – Guidance, encouragement, and PS around the chosen single strand CBT based intervention	Psychological professional (trained psychological practitioner)	Individually face-to-face, by telephone, and written	– UK – Setting: CGs could choose to receive support sessions face-to-face (in a psychological-therapies service provided in a primary care setting) or by telephone	Duration: 13 weeks N sessions: up to 12 Session duration: 25–35 min	– CGs were able to choose to work with BA, PS or goal setting – CGs were able to choose to receive support sessions face-to-face or by telephone	No methodological or procedural changes were made	every six months – Befrienders and CGs were encouraged to contact the experienced volunteer in case of intervention issues – Routine case-management and clinical skills supervision – Monthly group supervision session (45 min) specific to the intervention provided by a clinical educator trained in the intervention	– 98.9 % received intervention – 44 % discontinued intervention
Garand et al. (2014)	A PST intervention for MCI/dementia CGs	– Stress and coping theory (Lazarus and Folkman, 1984) – PST content based on work	– Written education about intervention, MCI/dementia, link between	1. PST – Six home visits (1.5 h) over 12 weeks – Session 1: verbal and written	Professional (trained social workers)	Individually face-to-face, by telephone, and written	– US – Setting: CGs’ homes and by tele-phone	Duration: 18 weeks N sessions: nine Session duration: 1.5 h	No	NR	– Intervention providers used a treatment manual, attended a workshop on	– 93.2 % received intervention – 12.3 % discontinued intervention – Intervention

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Table 2 (continued)

Authors	Name of intervention	Theory/rationale	Materials	Procedures	Provider	Delivery	Location	Duration and frequency	Tailoring	Modification	Planned fidelity/adherence	Actual fidelity/adherence
		by Arean et al. (1993)	problems/stress/depression/anxiety, PE, PST – Written instructions in application of PST (describe problem, goal-setting, brainstorm, solution-planning, action plan, evaluating)	education (see Materials); session 2–6 included coaching and provision of written instructions on application of PST (see Materials) – Solve at least one problem before moving to next step of intervention – Homework: keep record of PS efforts between sessions 2. Reinforcement – Three phone calls (45 min) over six weeks – Reinforce principles taught in step 1				(PST), 45 min (reinforcement)			PST-MCI/AD, and role-played the intervention with PI before intervention – Training sessions were audio-taped for random review by PI – Protocol adherence was assessed using the Problem-Solving Treatment Provider Adherence Checklist	providers demonstrated 98 % adherence (SD = 2.6) to items on the Checklist
LeLaurin et al. (2021)	A PST intervention (RESCUE) for stroke CGs	– Relational/problem-solving model of stress (D’Zurilla and Nezu, 1999) – Stress and coping theory (Lazarus and Folkman, 1984)	– RESCUE website (factsheets, additional resources, self-management tools, glossary, PST module, PS diary) – Workbook including PS diary and study information	– Eight weekly phone calls (30–60 min) – For each session, CGs reviewed the website factsheets and discussed their application to their lives – Week 1: introduction and examples; week 2: developing a tailored PS plan; week 3–7: individualized practice; week 8: summary	Professional (nurses)	Individually by telephone, website and written	– US – Setting: telephone	Duration: eight weeks N sessions: eight Session duration: 30–60 min	No	NR	– CGs completed an acceptability and enactment tool for stroke CG interventions – CGs completed a fidelity checklist regarding intervention providers’ adherence to protocol – Data collectors completed blinding assessments – CGs’ attendance was registered – CGs’ knowledge and competence	– 84.6 % received intervention – 0 % discontinued intervention – Fidelity checks did not show major issues with protocol adherence – Blinding assessments showed data collectors correctly guessed group assignment more often than expected by chance, often due to revealing comments by CGs – 98.3 % received intervention – 6.8 % discontinued intervention
Losada et al. (2011)	A CBT intervention for dementia CGs	CBT based on theory by Beck et al. (1979)	NR	– 12 weekly sessions (1.5–2 h) – In each session, first 20–30 min: homework review; the following 20–30	Psychological professional (psychologist with support from occupational therapist)	Groups (max eight participants per group) face-to-face	– Spain – Setting of intervention delivery NR	Duration: 12 weeks N sessions: 12 Session duration: 1.5–2 h	No	Compared to the previously tested CBT intervention (Márquez-González et al., 2007) the study devoted more time to BA and	– CGs’ attendance was registered – CGs’ knowledge and competence	– 98.3 % received intervention – 6.8 % discontinued intervention

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Table 2 (continued)

Authors	Name of intervention	Theory/rationale	Materials	Procedures	Provider	Delivery	Location	Duration and frequency	Tailoring	Modification	Planned fidelity/adherence	Actual fidelity/adherence
				min: exposure/description of basic concepts; the rest of the session: exercises and practice of CBT techniques and skills – Homework: describe agreed leisure activities done day by day						information about dementia	with regard to the contents and skills included in the programme were assessed at pre- and post-intervention	
Mittelman et al. (2008)	Psychosocial counselling (NYUCI) combined with pharmacotherapy (donepezil) for dementia spouse CGs	Intervention content based on intervention strategy at NYU-ADRC, showing reductions in depression among dementia CGs	NR	– At least five sessions over three months – Session 1: individually; session 2–4: in group (with family members); session 5: individually – Ad hoc counselling on demand by telephone ^a – Emotional support and assistance ^b – Could include education about AD or resources in the community	Psychological professional (counsellors)	Individually and in groups (at least two participants per group) face-to-face and by telephone	– Australia (Sydney), the UK (Manchester), the US (New York) – Setting: outpatient research clinics – CGs were given a 3-month supply of donepezil at each assessment	Duration: 12 weeks N sessions: at least five Session duration: NR	CGs were able to choose to receive ad hoc support	Compared to the preciously tested interventions at NYU-ADRC the study included pharmacotherapy for the PwD	NR	– 100 % received intervention – 14 % discontinued intervention
Pan and Chen (2019)	A CBT intervention for dementia CGs	– Coping-centered intervention based on the stress and coping literature (Lewinsohn, 1974) – Intervention content based on work by Aboulafia-Brakha et al. (2014), Cheng et al. (2017) and Schinköthe and Wilz (2014)	NR	1. CBT: – Five monthly sessions (60 min) face-to-face – Understanding CG's difficulties, stressors, appraisals and coping strategies – Cognitive and coping behavioral training – Relaxation and self-maintenance – Homework 2. Consultation – Five monthly sessions (20–30 min) by telephone	Professional (trained nurses)	Individually face-to-face and by telephone	– Southeast China – Setting of intervention delivery NR	Duration: 21 weeks N sessions: 10 Session duration: 1 h (CBT), 20–30 min (consultation)	CGs were able to choose to consult with nurse regarding strategies	NR	– Nurses were instructed to follow the intervention protocol – Intervention providers used a Wechat group to discuss procedural issues and maintain consistency – CGs were reminded to keep each appointment; a new appointment	– 100 % received intervention – 1.8 % discontinued intervention

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Table 2 (continued)

Authors	Name of intervention	Theory/rationale	Materials	Procedures	Provider	Delivery	Location	Duration and frequency	Tailoring	Modification	Planned fidelity/adherence	Actual fidelity/adherence	
Pillemer and Suito (2002)	Peer Support Project (PSP); a social support enhancement intervention for dementia CGs	Peer support intervention based on theory of experiential similarity by Thoits (1986)	NR	after each CBT session (feedback from CG, strategy reinforcement, nurse answering questions) – Eight weekly home visits (2 h) – Support from persons in the same life situation – Focused on emphatic listening and reassurance regarding the CG's strengths and coping abilities	Non-professional (trained community volunteers; peers)	Individually face-to-face	– US – Setting: mostly in CGs' homes, some sessions in restaurants	Duration: eight weeks N sessions: eight Session duration: 2 h	CGs were able to choose to receive less than eight sessions	NR	was scheduled over the subsequent days if one was missed	Activities were monitored by weekly calls to the volunteers	NR
Vázquez et al. (2016)	A CBT intervention for female CGs	Based on the model of depression by Lewinsohn et al. (1985)	NR	– Five weekly sessions (90 min) – Week 1: concept of depression and diaphragmatic breathing; week 2: pleasant activity scheduling; week 3: changing depressive thoughts; week 4: training on increasing interpersonal contact; week 5: relapse prevention – Homework: monitor mood, practice breathing techniques, PES, thought management	Psychological professional (trained psychologists)	Groups (five participants per group) face-to-face	– Spain (Galicia) – Setting of intervention delivery NR	Duration: five weeks N sessions: five Session duration: 1.5 h	No	NR	– To minimize loss of subjects, participants likely to drop out were excluded – Sessions were videotaped and intervention providers' adherence to the protocol reviewed	– 98.9 % received intervention – 0 % discontinued intervention – Intervention providers' protocol adherence was 97 % – No significant differences in outcomes between intervention providers	
Vázquez González et al. (2013)	A PST intervention for female CGs	Based on the depression PS model by Nezu et al. (1989)	NR	– Five weekly sessions (90 min) – Week 1: concept of depression and PST; week 2: problem definition and goal setting; week 3: decision-taking and solution-planning; week 4: repetition of PST steps; week 5: review concepts	Psychological professional (trained psycho-therapists)	Groups (five participants per group) face-to-face	– Spain (Galicia) – Setting: centres near CGs' homes	Duration: five weeks N sessions: five Session duration: 1.5 h	No	NR	– To minimize loss of subjects, participants likely to drop out were excluded – Sessions were recorded and observed by one of the expert clinicians, while the	– 100 % received intervention – 3.4 % discontinued intervention	

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Table 2 (continued)

Authors	Name of intervention	Theory/rationale	Materials	Procedures	Provider	Delivery	Location	Duration and frequency	Tailoring	Modification	Planned fidelity/adherence	Actual fidelity/adherence
				and address relapse prevention							other expert supervised intervention providers weekly	
Werner et al. (2020)	Psychosocial counselling (Israeli NYUCI; Lituf) for dementia spouse CGs	Intervention content based on intervention strategy at NYU-ADRC, tailored for an Israeli context	NR	– Six weekly sessions (60–90 min) – Week 1: individually; week 2–5: in group (with family members); week 6: individually – Ad hoc counselling on demand	Professional (counsellors with education in social work, psychology or related disciplines)	Individually and in groups (at least two participants per group) face-to-face	– Israel – Setting: in counsellor's office or where CGs prefer	Duration: 17 weeks N sessions: at least six Session duration: 60–90 min	– CGs were able to choose location of counselling sessions – CGs were able to choose to receive ad hoc support	As not all participants wanted four sessions with family members, the intervention was adapted to allow for those CGs to receive individual sessions instead	Intervention providers received a two-day training and role-played the intervention with a NYU clinician before intervention	– 68 % received intervention/control – 30 % discontinued intervention/control – Some data collectors chose to not collect outcome data for all participants

Note: AD, Alzheimer's disease; BA, behavioural activation; CG, caregiver; CBT, cognitive behavioural therapy; IAPT, the Improving Access to Psychological Therapies programme; NR, not reported; NYU-ADRC, New York University – Alzheimer's Disease Research Center; PE, pleasant event; PES, pleasant event scheduling; PS, problem solving; PST, problem-solving therapy; PsyEd, psychoeducation; PwD, person/people with dementia; STC, specific treatment component control; SUP, non-directive supportive therapy; TAU, treatment as usual.

^a And/or face-to-face in Australia.

^b Counsellors were more responsive to caregiver needs in the US and Australia and more structured in content in the UK.

Ratings for each domain can be seen in Fig. 2 (McGuinness and Higgins, 2020). Bias due to missing outcome data (for example, high rates of missingness and inappropriate data analysis strategies to handle missing data) and bias in the measurement of the outcome (e.g., lack of participant and intervention provider blinding and bias arising from outcome assessors being unblinded, e.g., use of self-report measures of symptoms of depression) were the domains most frequently rated as high risk of bias.

3.3. Data synthesis

3.3.1. Meta-analysis

Among the fifteen included studies, primary outcome data was available for twelve studies ($n = 1270$, $n = 639$ in treatment conditions and $n = 631$ in control conditions) and included in the meta-analysis. One study included more than one control condition, leading to thirteen comparisons being included in total. Results from studies without outcome data (Mittelman et al., 2008; Pillemer and Suito, 2002; Werner et al., 2020) are synthesised narratively. Heterogeneity was high ($Q = 72.40$, $I^2 = 83.42\%$, $p < 0.001$) and a random effects model was adopted (Higgins et al., 2003). A small effect size (Cohen, 1988) of psychological

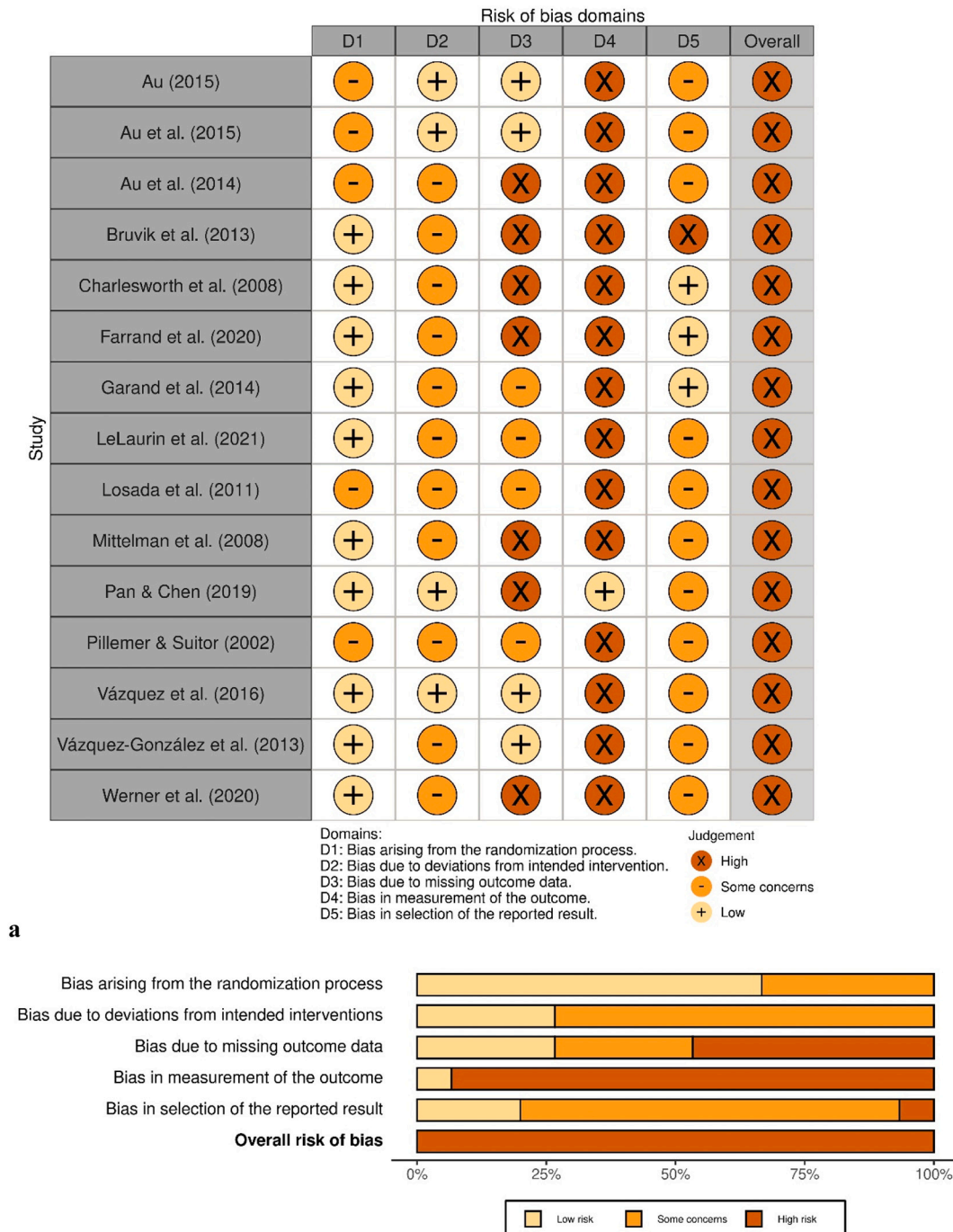


Fig. 2. Risk of bias ratings for each domain presented for each study ($n = 15$) and as percentages across all included studies. Domains are reported in line with Cochrane RoB tool version 2.

interventions on depression symptom severity was found ($p = 0.001$, Hedges' $g = -0.49$, 95 % CI = $-0.79, -0.19$; see Fig. 3). A meta-analysis with a fixed-effects model was also conducted, and resulted in a small effect size ($p < 0.001$, Hedges' $g = -0.45$, 95 % CI = $-0.56, -0.34$).

3.3.2. Narrative synthesis

Among the three studies not included in the meta-analysis, one reported a significant decrease in depression symptom severity from baseline to 21 months follow-up in the intervention group (SUP) compared with TAU and adjusted for gender and country (Mittelman et al., 2008). The second study reported no significant effects on depression symptom severity of the psychological intervention (SUP) compared with TAU (Pillemer and Suito, 2002). The third study reported significantly less depression symptoms in the intervention group (SUP) compared with TAU and adjusted for caregivers' education and care recipients' condition severity, at the one-year follow-up time point (Werner et al., 2020).

3.3.3. Moderator analyses

3.3.3.1. Subgroup analyses. Subgroup effects were significant for care recipients' health condition ($Q = 16.15$, $df = 3$, $p = 0.001$), recruitment setting ($Q = 7.22$, $df = 1$, $p = 0.007$), individual/dyadic intervention ($Q = 3.91$, $df = 1$, $p = 0.048$), and length of follow-up ($Q = 8.46$, $df = 3$, $p = 0.037$; see Table 3).

The effect size was larger for the one study in which care recipients' health condition was MCI or early dementia (1 study $n = 73$, $I^2 = 0\%$) than in studies in which care recipients' health condition was dementia (7 studies, $n = 809$, $I^2 = 71\%$), stroke (2 studies, 3 comparators, $n = 45$, $I^2 = 0\%$), or non-specified (2 studies, $n = 343$, $I^2 = 0\%$). However, confidence intervals were wide and this finding should be interpreted with caution. Recruiting participants in clinical settings (8 studies, 9 comparators, $n = 746$, $I^2 = 65\%$) yielded a larger effect size than recruiting in both clinical and community settings (4 studies, $n = 524$, $I^2 = 62\%$). Interventions delivered individually (11 studies, 12 comparators, $n = 1075$, $I^2 = 74\%$) yielded a larger effect size than interventions delivered both individually and in dyads (1 study, $n = 195$, $I^2 = 0\%$). The effect estimate was larger at ≥ 12 months follow-up (3 studies, $n = 416$, $I^2 = 0\%$) than at ≤ 2 months (11 studies, 12 comparators, $n = 1261$, $I^2 = 86\%$), 3–6 months (5 interventions, 6 comparators, $n = 461$, $I^2 = 60\%$), and 7–11 months (1 study, $n = 190$, $I^2 = 0\%$). Subgroup analysis for theory informing intervention was statistically insignificant, however interventions informed by CBT and BA yielded medium effect sizes, whilst PST and SUP yielded small effect sizes.

3.3.4. Meta-regressions

Meta-regression analyses showed no moderating effect of percent of caregivers being women (12 studies, 13 comparators, $p = 0.348$) or adult children (9 studies, 10 comparators, $p = 0.349$) on symptoms of depression when analysed in separate models. Post-hoc meta-regression analysis with percent women and percent adult-children in the same model yielded a significant moderating effect of percent women when holding percent adult-children constant ($B = -0.0268$; 95 % CI, -0.05 to -0.00 ; $p = 0.019$).

3.3.5. Secondary outcomes

Forest plots from meta-analyses on secondary outcomes are presented in Supplementary material Appendix E. Incidence of major depression was reported in two studies of indicated-prevention interventions for caregivers presenting with pre-clinical levels of depression symptoms (Vázquez et al., 2016; Vázquez González et al., 2013). A significant effect was found for incidence of major depression ($p < 0.001$, OR = 0.177, 95 % CI = 0.08, 0.38; Vázquez et al., 2016; Vázquez González et al., 2013). In the first trial (Vázquez et al., 2016), incidence of major depression was 0 post-treatment for both the intervention and control groups, and at post-treatment $n = 3$ in the intervention versus $n = 18$ in the control met criteria for incidence of major depression. In the second study (Vázquez González et al., 2013), incidence of major depression was 0 post-treatment for both the intervention and control groups, and at post-treatment $n = 6$ in the intervention versus $n = 21$ in the control met criteria for incidence of major depression. Significant, however small effect sizes were found for caregiver burden ($p = 0.001$, Hedges' $g = -0.35$, 95 % CI = $-0.55, -0.15$; Farrand et al., 2020; LeLaurin et al., 2021; Vázquez et al., 2016; Vázquez González et al., 2013) and psychological distress ($p < 0.001$, Hedges' $g = -0.49$, 95 % CI = $-0.70, -0.28$; Farrand et al., 2020; Vázquez et al., 2016; Vázquez González et al., 2013). In one study, a large effect size favoring the control condition compared to the intervention on self-efficacy in controlling upsetting thoughts was found ($p = 0.002$, Hedges' $g = 0.80$, 95 % CI = 0.28, 1.32; Au et al., 2014). Meta-analyses showed no significant effects of interventions on anxiety (Charlesworth et al., 2008a, b; Farrand et al., 2020; Garand et al., 2014), quality of life (Charlesworth et al., 2008; Farrand et al., 2020), or self-efficacy in obtaining respite (Au et al., 2014).

3.3.6. Sensitivity analyses

Sensitivity analyses with each study temporarily removed resulted in an increased effect size from small to medium when removing a study informed by BA (Hedges' $g = -0.52$; Au et al., 2014), two studies with three comparators informed by PST (Hedges' $g = -0.58, -0.52, -0.52$;

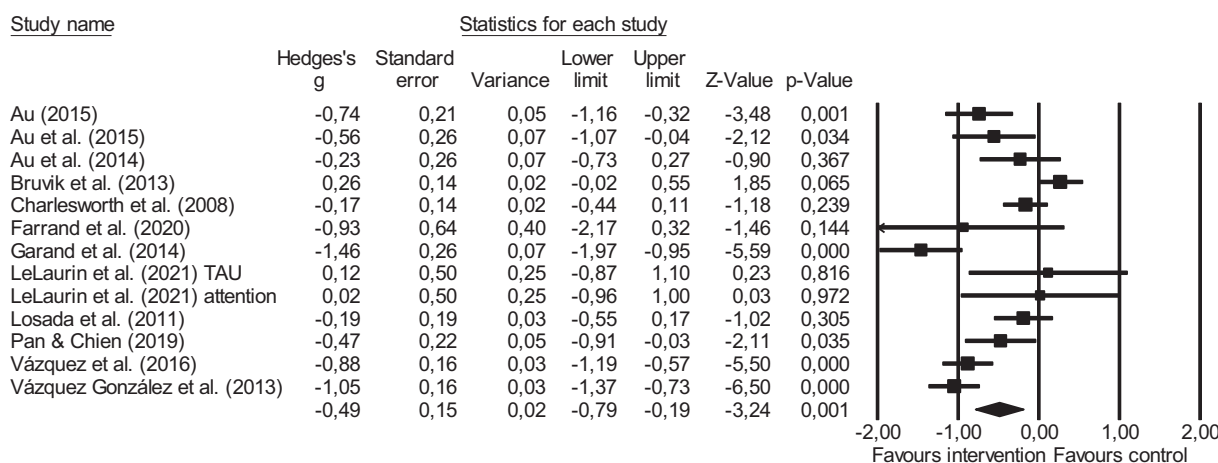


Fig. 3. Forest plot of effect sizes (Hedges' g) and 95 % CI for symptoms of depression. Results from LeLaurin et al. (2021) are divided into comparisons with each control group, with intervention sample size halved.

Table 3
Subgroup analyses.

Moderators	<i>N_c</i>	<i>N_p</i>	ES	95 % CI	I ²	Q	<i>p</i> -Value
Severity of depression at baseline						5.30	0.151
Minimal	2	397	0.05	−0.48, 0.58	78 %		
Mild	7	403	−0.56	−0.91, −0.21	65 %		
Moderate	3	461	−0.72	−1.16, −0.27	85 %		
Moderately severe	1	9	−0.93	−2.36, 0.50	0 %		
Care recipient's health condition						16.15	0.001
Dementia	7	809	−0.27	−0.51, −0.02	71 %		
MCI or early dementia	1	73	−1.46	−2.19, −0.74	0 %		
Stroke	3	45	−0.18	−0.86, 0.49	0 %		
Non-specified	2	343	−0.97	−1.39, −0.54	0 %		
Recruitment setting						7.22	0.007
Clinical	9	746	−0.69	−0.95, −0.44	65 %		
Clinical and community	4	524	−0.08	−0.42, 0.26	62 %		
Theory informing intervention						0.36	0.948
CBT	4	379	−0.58	−1.24, 0.09	65 %		
BA	3	212	−0.51	−1.25, 0.23	15 %		
PST	5	477	−0.48	−1.07, 0.10	93 %		
SUP	1	202	−0.17	−1.39, 1.06	0 %		
Multicomponent intervention						0.49	0.485
Yes	3	347	−0.32	−0.89, 0.26	89 %		
No	10	923	−0.55	−0.89, −0.22	79 %		
Intervention delivery						4.93	0.425
Face-to-face	5	858	−0.40	−0.86, 0.06	92 %		
Telephone	2	152	−0.65	−1.41, 0.11	0 %		
Face-to-face and telephone	1	82	−0.47	−1.54, 0.59	0 %		
Telephone and written	1	60	−0.23	−1.32, 0.86	0 %		
Face-to-face, telephone and written	2	82	−1.29	−2.19, −0.39	0 %		
Telephone, written and website	2	36	0.07	−0.90, 1.03	0 %		
One-to-one or group intervention						4.31	0.116
One-to-one	9	614	−0.51	−0.84, −0.19	67 %		
Group	3	461	−0.72	−1.20, −0.24	85 %		
One-to-one and group	1	195	0.27	−0.55, 1.08	0 %		
Individual or dyadic intervention						3.91	0.048
Individual	12	1075	−0.58	−0.84, −0.31	74 %		
Individual and dyadic	1	195	0.27	−0.53, 1.05	0 %		
Control condition						1.30	0.861
TAU	7	827	−0.40	−0.85, 0.04	88 %		
STC + attention	2	152	−0.65	−1.44, 0.13	0 %		
Attention	2	91	−0.88	−1.78, 0.02	85 %		
WLC	1	118	−0.19	−1.26, 0.88	0 %		
NSTC	1	82	−0.47	−1.57, 0.63	0 %		
Length of follow-up†						8.46	0.037
≤2 months	12	1261	−0.44	−0.72, −0.16	86 %		
3–6 months	6	461	−0.82	−1.26, −0.38	60 %		
7–11 months	1	190	−0.02	−0.91, 0.87	0 %		
≥12 months	3	416	−1.19	−1.72, −0.65	0 %		

Note. BA, behavioral activation; CBT, cognitive behavioral therapy; ES, effect size reported as Hedges' *g*; MCI, mild cognitive impairment; *N_c*, number of comparators in subgroup; *N_p*, number of participants in subgroup; NSTC, non-specific treatment component control; PST, problem-solving therapy; *Q*-value, between-group heterogeneity; STC, specific treatment component control; SUP, non-directive supportive therapy; TAU, treatment as usual; WLC, waitlist control.

† Some studies provided data from multiple time-points, which are treated as independent data points in this analysis.

Bruvik et al., 2013; LeLaurin et al., 2021), one informed by SUP (Hedges' *g* = −0.53; Charlesworth et al., 2008), and one by CBT (Hedges' *g* = −0.52; Losada et al., 2011). The *p*-value remained <0.01 regardless of study removed. No significant change in effect size or *p*-value was found when removing (a) the study with a sample size ≤20 across conditions (Farrand et al., 2020), or (b) studies with attrition rates ≥30 % in at least one trial arm (Farrand et al., 2020; Losada et al., 2011; Pan and Chen, 2019). Since all included studies were assessed as high risk of bias a sensitivity analysis removing studies from each risk of bias category could not be performed.

3.3.7. Funnel plot asymmetry

Funnel plot is presented in Supplementary material Appendix F. Egger's test of the intercept indicated no possible publication bias for symptoms of depression ($\beta = -0.87$, $SE = 1.89$, $t = 0.46$, $p = 0.33$). Duval and Tweedie's trim-and-fill method suggested no missing studies due to publication bias.

3.4. Quality assessment (GRADE)

The GRADE assessment tool indicated very low quality of evidence across studies due to heterogeneity, high risk of bias, and indirectness of evidence (Appendix G).

4. Discussion

Including 12 RCTs, this meta-analysis found a small effect size ($g = -0.49$) for psychological interventions for symptoms of depression among informal caregivers of older adults with a variety of age-related diseases, including dementia, MCI, stroke, and non-specified health conditions requiring informal care. Results are in line with previous reviews of psychological interventions for informal caregivers of care recipients with specific health conditions (Cheng and Zhang, 2020; Chin et al., 2021; Panzeri et al., 2019; Sun et al., 2022) and yield a larger effect size than a previous meta-analysis of interventions for symptoms of depression for informal caregivers of older adults more generally (Sörensen et al., 2002). Interventions were effective in reducing

incidence of major depression (OR = 0.177) as well as caregiver burden ($g = -0.35$) and psychological distress ($g = -0.49$), which is of particular importance given the high comorbidity between depression, distress, and caregiver burden (Borsje et al., 2016; Collins and Kishita, 2020). Therefore, results show support for psychological treatment of symptoms of depression in informal caregivers of older adults. However, high risk of bias, heterogeneity, and indirectness of evidence among included studies resulted in very low quality of review evidence in accordance with the GRADE assessment tool (Guyatt et al., 2008) and potential overestimation of effect sizes (Cuijpers et al., 2020).

High risk of bias in included studies was mainly due to lack of blinding of specific key persons, including participants and therapists, and bias arising from outcome assessors being unblinded (e.g., use of self-report measures of symptoms of depression). Challenges associated with blinding participants and other key personnel in RCTs of psychological interventions are well documented, and suggestions have been made regarding how blinding of participants and treatment providers may be possible (Juul et al., 2020). However, methods to achieve blinding of participants and treatment providers (e.g., adopting active control groups, and using treatment providers with no or limited knowledge of psychotherapy) may limit the generalizability of findings (Juul et al., 2020). Future studies may also look to adopt individual clinical interviews as well as self-report measures of symptoms of depression. Other sources of bias included missing outcome data, and insufficient information about intervention characteristics. Future research should seek to enhance retention (Cooper and Conklin, 2015), and report intervention characteristics in detail, e.g. using the TIDieR checklist (Hoffmann et al., 2014). Finally, a number of studies had 'some concerns' regarding biases associated with the 'selection of the reported result' due to studies failing to have a registered study protocol or pre-specified analysis plan available. This finding is supported by wider literature highlighting that very few clinical trial protocols are registered prospectively for RCTs published in high-impact clinical psychology journals (Cybulski et al., 2016).

High heterogeneity may suggest intervention effectiveness depends on methodological and clinical factors. No moderating effect was found for type of intervention, consistent with research indicating no significant differences between types of psychological interventions for symptoms of depression (Cuijpers et al., 2020). However, the pooled effect sizes for CBT and BA interventions yielded larger effect sizes than for PST and SUP. This finding is in line with recent reviews demonstrating the efficacy of BA (Zabihi et al., 2020b) and CBT interventions (Kaddour et al., 2018) for informal caregivers. Subgroup analyses also showed larger effect sizes for (a) interventions in which care recipient's health condition was MCI or early dementia, (b) clinical recruitment settings versus mixed clinical and community, (c) individually delivered interventions versus mixed dyadic and individual, and (d) follow-up time points at ≥ 12 months. However, all subgroup analyses showed large within-subgroup heterogeneity, suggesting uncertain validity of the effect estimates (Richardson et al., 2019). Furthermore, an uneven number of studies within each subgroup indicates analyses are unlikely to have yielded useful results (Richardson et al., 2019). In addition, given the number of RCTs available in subgroup analyses the analysis was likely underpowered and at greater risk of type II error (Cuijpers et al., 2021a). Therefore, moderator analyses should be interpreted with caution and potential sources of heterogeneity remain to be identified. Given moderator analyses are commonly underpowered, future similar studies may look to plan an a priori power analyses before performing the meta-analyses (Harrer et al., 2021). An important source of heterogeneity not examined is the variability of depression symptom measurements used which have been found to impact results of reviews of psychological interventions for depression more generally (Cuijpers, 2019). Moreover, the depression treatment literature has been criticized for generally overestimating intervention effectiveness, largely due to overlooking various types of biases in analyses (Ormel et al., 2022). Given the high risk of bias across studies included in this review, this

may have impacted heterogeneity in review results.

Another important finding was the relatively small number of studies examining the effect of psychological interventions primarily targeting symptoms of depression among informal caregivers of older adults. The majority of studies excluded during full-text screening were of psychological interventions that did not target symptoms of depression (see Supplementary material Appendix C), but other or mixed mental health related outcomes. The lack of studies investigating interventions designed to specifically target symptoms of depression is noteworthy given indications that the modification of existing treatments for depression to address both anxiety and depression are not associated with improved outcomes compared with depression focused treatments (Mulder et al., 2019; Shafran et al., 2018). Given, recommendations remain to use simple and focused interventions to target depression (Shafran et al., 2018), results of the current review indicate a need for more high quality RCTs of interventions targeting symptoms of depression for informal caregivers of older adults. Moreover, the design and conduct of more high quality RCTs in the area, may aid in the identification of intervention components effective in improving symptoms of depression specifically would provide more informative guidance for practitioners (Corry et al., 2015).

A further important findings was that only four studies included participants with moderate or moderately severe symptoms of depression at baseline, whereas the majority of studies included participants with mild ($n = 8$ studies) or minimal symptoms of depression at baseline ($n = 4$ studies), when using conventionally adopted clinical cut-offs. Commonly, studies examining the effectiveness of psychological interventions for depression adopt an inclusion criterion related to level of psychological morbidity and restrict participation to those experiencing clinical symptoms of depression. Indeed, higher symptoms of depression at baseline are associated with better outcomes (Andersson et al., 2019; Buckman et al., 2021; Cuijpers et al., 2022). However, inclusion of participants with mild or minimal symptoms of depression at baseline has been identified in other reviews, for example of CBT self-help in the treatment of depression and anxiety in people with long-term conditions (Farrand and Woodford, 2015) and psycho-oncology interventions for adults with cancer (Faller et al., 2013). If participants are not experiencing elevated symptoms of the target primary outcome, there is an elevated risk of floor effects, where no effect is found however the intervention is potentially efficacious. Recruitment of participants not experiencing elevated levels of psychological distress has been identified as a common weakness within the field of behavioral medicine more generally (Linden and Satin, 2007). It is important that future informal caregiver psychological intervention research pays increased attention to designing high quality clinical trials, including the recruitment of participants who are experiencing elevated symptoms of the psychological problem being targeted.

The final source of very low evidence quality was indirectness of evidence due to the majority of informal caregivers included within the studies potentially differing from the wider informal caregiver population, limiting the applicability of findings (Guyatt et al., 2008). The majority of included studies targeted informal caregivers of older adults with dementia or MCI, with only two targeting caregivers of stroke survivors (Farrand et al., 2020; LeLaurin et al., 2021) and two studies targeting caregivers of older adults more generally (Vázquez et al., 2016; Vázquez González et al., 2013). Given the rapidly increasing number of community dwelling older adults receiving informal care for a multitude of health conditions (Nordin et al., 2019), future research should develop and evaluate psychological interventions targeting symptoms of depression in informal caregivers of older adult populations with different health conditions and multimorbidities.

4.1. Limitations

First, whilst considered a strength and novel aspect of this review, only including psychological interventions specifically targeting

symptoms of depression may also be considered a limitation. The dominance of classification systems such as the Diagnostic and Statistical Manual of Mental Disorders and the International Classification of Diseases, and subsequent focus on core symptoms of specific mental health disorders (e.g. depression) as the target and primary outcome of psychological interventions, has been criticized (Cuijpers, 2019). Instead, there have been calls to examine broader outcomes, such as quality of life (Cuijpers, 2019) or develop indirect interventions, targeting problems related to depression as opposed to treating depression directly (Cuijpers, 2021). Second, while only studies evaluating psychological interventions targeting symptoms of depression were included, this review did not use any population-based selection criteria for depression, e.g. operationalized as meeting diagnostic criteria or elevated scores on self-report measures (Furukawa et al., 2021). Third, selected studies were limited to those in English or Swedish, which may have introduced language bias. Fourth, due to the limited number of studies included within the review, results of the moderator analysis can only be considered preliminary. Fifth, we did not include dissertations or search clinical trial registers, which may have introduced publication bias, especially given evidence to suggest unpublished clinical trials of psychological interventions are more likely to have null or negative effects (Driessen et al., 2015; de Vries et al., 2018). Finally, although we used the RoB 2.0 tool, as per the recommendation in the current Cochrane Handbook for Systematic Reviews of Interventions (Higgins et al., 2022b), we acknowledge this tool has been reported to have low interrater reliability (Minozzi et al., 2020) and challenges in using the tool consistently may make it difficult to interpret the risk of bias ratings.

A further limitation of the meta-analysis was how potential dependency of effects was managed. A simplistic approach (Gucciardi et al., 2021) was adopted, by conducting separate meta-analyses, analyzing potentially dependent effects as if they were non-independent (e.g., multiple outcomes of potentially related outcomes and outcomes collected at more than one time point). This simplistic approach may increase the risk of Type I errors (Cheung, 2014) and future meta-analyses should seek to utilize approaches that account for sources of dependence both within and between studies, such as adopting three-level meta-analytic models (Cheung, 2014; Van den Noortgate et al., 2013).

4.2. Implications for research and practice

This review highlights an urgent need for the design and conduct of higher quality research in the area. There is a need to conduct prospectively registered RCTs of psychological interventions for informal caregivers, with larger sample sizes and the recruitment of caregivers who are experiencing clinical levels of depressive symptoms. Further, there is a need to consider ways to achieve participant and treatment provider blinding, enhance retention, and improve the reporting of intervention characteristics, for example by following the TIDieR checklist (Hoffmann et al., 2014). Potential sources of heterogeneity should be further examined by conducting individual patient data meta-analyses.

Although the review includes a small number of RCTs, and overall informal caregivers had non-clinical or mild depressive symptoms, results suggest psychological interventions targeting symptoms of depression may effectively support informal caregivers of older adults. Results also suggested BA, CBT, and PST interventions were more effective than SUP and larger effect sizes were yielded for individually delivered interventions versus mixed dyadic and individual interventions. However, more high quality RCTs are required to further examine these important potential clinical moderators of effect.

Further, to the best of our knowledge, only one of the interventions included within the review is available to access (Farrand et al., 2020). Globally, access to evidence-based psychological interventions for depression remains low, with only one third of people with depression

receiving treatment (Mekonen et al., 2021). Evidence suggests informal caregivers have a preference to receive psychological interventions that are tailored and personalized towards their unique needs and caregiving situation (Biliunaite et al., 2021a; Biliunaite et al., 2021b). Therefore, general psychological interventions available for access, may not be suitable or acceptable for informal caregivers given they will not be tailored and personalized towards an informal caregiving population.

5. Conclusions

Importantly, this review represents the first systematic review and meta-analysis of psychological interventions targeting symptoms of depression in informal caregivers of older adults with a variety of age-related diseases in the last two decades (Sörensen et al., 2002). Overall, the review found a small effect size for psychological interventions targeting symptoms of depression in informal caregivers of older adults, and in reducing incidence of major depression as well as caregiver burden and psychological distress. The review adopted a well-recognized and commonly used categorization of psychological interventions (Cuijpers et al., 2008; Cuijpers et al., 2020; Cuijpers et al., 2021b) and examined a number of novel clinical and methodological moderators of effect. Furthermore, important mental health related secondary outcomes (e.g. anxiety, stress, and quality of life) were examined. However, due to high heterogeneity, risk of bias, and the indirectness of evidence, confidence in review evidence is very low.

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CRediT authorship contribution statement

Erika Mårtensson: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Data curation, Writing – original draft, Visualization. **Chelsea Coumoundouros:** Validation, Investigation, Writing – review & editing. **Renita Sörensdotter:** Writing – review & editing, Supervision. **Louise von Essen:** Resources, Writing – review & editing, Supervision, Funding acquisition. **Joanne Woodford:** Conceptualization, Methodology, Investigation, Writing – original draft, Supervision, Project administration, Funding acquisition.

Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jad.2022.09.093>.

References

- Aboulafia-Brakha, T., Suchecki, D., Gouveia-Paulino, F., Nitrini, R., Ptak, R., 2014. Cognitive-behavioural group therapy improves a psychophysiological marker of stress in caregivers of patients with Alzheimer's disease. *Aging Ment. Health* 18 (6), 801–808. <https://doi.org/10.1080/13607863.2014.880406>.
- Andersson, G., Carlbring, P., Rozental, A., 2019. Response and remission rates in internet-based cognitive behavior therapy: an individual patient data meta-analysis. *Front. Psychiatry* 10, 749. <https://doi.org/10.3389/fpsy.2019.00749>.
- Arean, P.A., Perri, M.G., Nezu, A.M., Schein, R.L., Christopher, F., Joseph, T.X., 1993. Comparative effectiveness of social problem-solving therapy and reminiscence therapy as treatments for depression in older adults. *J. Consult. Clin. Psychol.* 61 (6), 1003–1010. <https://doi.org/10.1037/0022-006X.61.6.1003>.
- Au, A., 2015. Developing volunteer-assisted behavioral activation teleprograms to meet the needs of chinese dementia caregivers. *Clin. Gerontol.* 38 (3), 190–202. <https://doi.org/10.1080/07317115.2015.1008118>.
- Au, A., Gallagher-Thompson, D., Wong, M.K., Leung, J., Chan, W.C., Chan, C.C., Lu, H.J., Lai, M.K., Chan, K., 2015. Behavioral activation for dementia caregivers: scheduling pleasant events and enhancing communications. *Clin. Interv. Aging* 10, 611–619. <https://doi.org/10.2147/CLIA.S72348>.
- Au, A., Li, S., Leung, P., Pan, P.-C., Thompson, L., Gallagher-Thompson, D., 2010. The Coping with Caregiving Group Program for Chinese caregivers of patients with Alzheimer's disease in Hong Kong. *Patient Educ. Couns.* 78 (2), 256–260. <https://doi.org/10.1016/j.pec.2009.06.005>.
- Au, A., Wong, M.K., Leung, L.M., Leung, P., Wong, A., 2014. Telephone-assisted pleasant event scheduling to enhance well-being of caregivers of people with dementia: a randomised controlled trial. *Hong Kong Med. J.* 20 (3), 30–33.
- Beck, A.T., Rush, A.J., Shaw, B.F., Emery, G., 1979. *Cognitive Therapy of Depression*, 1st ed. The Guilford Press, New York.
- Beck, A., Steer, R., Brown, G., 1996. *Beck Depression Inventory*, 2nd ed. Psychological Corporation.
- Biliunaitė, I., Dumarkaite, A., Kazlauskas, E., Sanderman, R., Andersson, G., 2021. ICBT program for improving informal caregiver well-being: a qualitative study. *Internet Interv.* 23, 100361. <https://doi.org/10.1016/j.invent.2021.100361>.
- Biliunaitė, I., Kazlauskas, E., Sanderman, R., Andersson, G., 2021. Process evaluation of internet-based cognitive behavioral therapy intervention for informal caregivers. *Front. Med.* 8, 725510. <https://doi.org/10.3389/fmed.2021.725510>.
- Bom, J., Bakx, P., Schut, F., Van Doorslaer, E., 2019. The impact of informal caregiving for older adults on the health of various types of caregivers: a systematic review. *Gerontologist* 59 (5), e629–e642. <https://doi.org/10.1093/geront/gny137>.
- Borsje, P., Hems, M.A.P., Lucassen, P.L.B.J., Bor, H., Koopmans, R.T.C.M., Pot, A.M., 2016. Psychological distress in informal caregivers of patients with dementia in primary care: course and determinants. *Fam. Pract.* 33 (4), 374–381. <https://doi.org/10.1093/fampra/cmw009>.
- Bowling, A., 1991. Social support and social networks – their relationship to the successful and unsuccessful survival of elderly people in the community – an analysis of concepts and a review of the evidence. *Fam. Pract.* 8 (1), 68–83. <https://doi.org/10.1093/fampra/8.1.68>.
- Brodsky, H., Mittelman, M., Gibson, L., Seehr, K., Burns, A., 2009. The effects of counseling spouse caregivers of people with Alzheimer disease taking donepezil and of country of residence on rates of admission to nursing homes and mortality. *Am. J. Geriatr. Psychiatr.* 17 (9), 734–743. <https://doi.org/10.1097/JGP.0b013e3181a65187>.
- Broese van Groenou, M.I., De Boer, A., 2016. Providing informal care in a changing society. *Eur. J. Ageing* 13 (3), 271–279. <https://doi.org/10.1007/s10433-016-0370-7>.
- Bruvik, F.K., Allore, H.G., Ranhoff, A.H., Ulstein, I.D., Engedal, K., 2013. The effect of psychosocial support intervention on depression in patients with dementia and their family caregivers: an assessor-blinded randomized controlled trial. *Dement. Geriatr. Cogn. Disord. Extra* 3 (1), 386–397. <https://doi.org/10.1159/000355912>.
- Buckman, J., Saunders, R., Cohen, Z.D., Barnett, P., Clarke, K., Ambler, G., DeRubeis, R. J., Gilbody, S., Hollon, S.D., Kendrick, T., Watkins, E., Wiles, N., Kessler, D., Richards, D., Sharp, D., Brabyn, S., Littlewood, E., Salisbury, C., White, I.R., Lewis, G., Pilling, S., 2021. The contribution of depressive 'disorder characteristics' to determinations of prognosis for adults with depression: an individual patient data meta-analysis. *Psychol. Med.* 51 (7), 1068–1081. <https://doi.org/10.1017/S0033291721001367>.
- Burns, A., Mittelman, M., Cole, C., Morris, J., Winter, J., Page, S., Brodsky, H., 2010. Transcultural influences in dementia care: observations from a psychosocial intervention study. *Dement. Geriatr. Cogn. Disord.* 30 (5), 417–423. <https://doi.org/10.1159/000314860>.
- Calderón-Larrañaga, A., Kirvaldiz, M., Dahlberg, L., Sacco, L.B., Morin, L., 2021. Effectiveness of interventions to address the negative health outcomes of informal caregiving to older adults: protocol for an umbrella review. *BMJ Open* 11 (e053117), 1–7. <https://doi.org/10.1136/bmjopen-2021-053117>.
- Centre for Reviews and Dissemination, 2009. *Systematic Reviews: CRD's Guidance for Undertaking Reviews in Health Care*, 3rd ed. University of York.
- Chang, A.Y., Skirbekk, V.F., Tyrovolas, S., Kassebaum, N.J., Dieleman, J.L., 2019. Measuring population ageing: an analysis of the Global Burden of Disease Study 2017. *Lancet Public Health* 4 (3), e159–e167. [https://doi.org/10.1016/S2468-2667\(19\)30019-2](https://doi.org/10.1016/S2468-2667(19)30019-2).
- Charlesworth, G., Shepstone, L., Wilson, E., Reynolds, S., Mugford, M., Price, D., Harvey, I., Poland, F., 2008. Befriending carers of people with dementia: randomised controlled trial. *BMJ* 336 (7656), 1295–1297. <https://doi.org/10.1136/bmj.39549.548831.AE>.
- Charlesworth, G., Shepstone, L., Wilson, E., Thalanany, M., Mugford, M., Poland, F., 2008. Does befriending by trained lay workers improve psychological well-being and quality of life for carers of people with dementia. *Health Technol. Assess.* 12 (4), 1–77.
- Cheng, S.T., Mak, E.P.M., Fung, H.H., Kwok, T., Lee, D.T.F., Lam, L.C.W., 2017. Benefit-finding and effect on caregiver depression: a double-blind randomized controlled trial. *J. Consult. Clin. Psychol.* 85 (5), 521–529. <https://doi.org/10.1037/ccp0000176>.
- Cheng, S.T., Zhang, F., 2020. A comprehensive meta-review of systematic reviews and meta-analyses on nonpharmacological interventions for informal dementia caregivers. *BMC Geriatr.* 20 (1), 1–24. <https://doi.org/10.1186/s12877-020-01547-2>.
- Cheung, M.W., 2014. Modeling dependent effect sizes with three-level meta-analyses: a structural equation modeling approach. *Psychol. Methods* 19 (2), 211–229. <https://doi.org/10.1037/a0032968>.
- Chin, W.J., Ho, Y.L.S., Ramazanu, S., Itoh, S., Klainin-Yobas, P., Wu, X.V., 2021. Effectiveness of technology-based interventions on psychological morbidities, quality of life for informal caregivers of stroke survivors: a systematic review and meta-analysis. *J. Adv. Nurs.* (November), 1–21. <https://doi.org/10.1111/jan.15130>.
- Cohen, J., 1988. In: *Statistical Power Analysis for the Behavioural Sciences*, 2nd ed.
- Collins, R.N., Kishita, N., 2020. Prevalence of depression and burden among informal care-givers of people with dementia: a meta-analysis. *Ageing Soc.* 40 (11), 2355–2392. <https://doi.org/10.1017/S0144686X19000527>.
- Cooper, A.A., Conklin, L.R., 2015. Dropout from individual psychotherapy for major depression: a meta-analysis of randomized clinical trials. *Clin. Psychol. Rev.* 40, 57–65. <https://doi.org/10.1016/j.cpr.2015.05.001>.
- Corry, M., While, A., Neenan, K., Smith, V., 2015. A systematic review of systematic reviews on interventions for caregivers of people with chronic conditions. *J. Adv. Nurs.* 71 (4), 718–734. <https://doi.org/10.1111/jan.12523>.
- Cuijpers, P., 2019. Targets and outcomes of psychotherapies for mental disorders: an overview. *World Psychiatry* 18 (3), 276–285. <https://doi.org/10.1002/wps.20661>.
- Cuijpers, P., 2021. Indirect prevention and treatment of depression: an emerging paradigm? *Clin. Psychol. Eur.* 3 (4), 1–9.
- Cuijpers, P., Ciharova, M., Quero, S., Miguel, C., Driessen, E., Harrer, M., Purgato, M., Ebert, D., Karyotaki, E., 2022. The contribution of "Individual Participant Data" meta-analyses of psychotherapies for depression to the development of personalized treatments: a systematic review. *J. Person. Med.* 12 (1), 93. <https://doi.org/10.3390/jpm12010093>.
- Cuijpers, P., Griffin, J.W., Furukawa, T.A., 2021. The lack of statistical power of subgroup analyses in meta-analyses: a cautionary note. *Epidemiol. Psychiatr. Sci.* 30, e78. <https://doi.org/10.1017/S2045796021000664>.
- Cuijpers, P., Karyotaki, E., de Wit, L., Ebert, D.D., 2020. The effects of fifteen evidence-supported therapies for adult depression: a meta-analytic review. *Psychother. Res.* 30 (3), 279–293. <https://doi.org/10.1080/10503307.2019.1649732>.
- Cuijpers, P., Quero, S., Noma, H., Ciharova, M., Miguel, C., Karyotaki, E., Cipriani, A., Cristea, I.A., Furukawa, T.A., 2021. Psychotherapies for depression: a network meta-analysis covering efficacy, acceptability and long-term outcomes of all main treatment types. *World Psychiatry* 20 (2), 283–293. <https://doi.org/10.1002/wps.20860>.
- Cuijpers, P., van Straten, A., Andersson, G., van Oppen, P., 2008. Psychotherapy for depression in adults: a meta-analysis of comparative outcome studies. *J. Consult. Clin. Psychol.* 76 (6), 909–922. <https://doi.org/10.1037/a0013075>.
- Cuijpers, P., van Straten, A., Bohlmeijer, E., Hollon, S.D., Andersson, G., 2010. The effects of psychotherapy for adult depression are overestimated: a meta-analysis of study quality and effect size. *Psychol. Med.* 40 (2), 211–223. <https://doi.org/10.1017/S0033291709006114>.
- Cybulski, L., Mayo-Wilson, E., Grant, S., 2016. Improving transparency and reproducibility through registration: the status of intervention trials published in clinical psychology journals. *J. Consult. Clin. Psychol.* 84 (9), 753–767. <https://doi.org/10.1037/ccp0000115>.
- de Vries, Y.A., Roest, A.M., de Jonge, P., Cuijpers, P., Munafo, M.R., Bastiaansen, J.A., 2018. The cumulative effect of reporting and citation biases on the apparent efficacy of treatments: the case of depression. *Psychol. Med.* 48 (15), 2453–2455. <https://doi.org/10.1017/S0033291718001873>.
- Deeks, J.J., Higgins, J.P.T., Altman, D.G., 2022. Chapter 10: analysing data and undertaking meta-analyses. version 6.3 (updated February 2022). Cochrane. In: Higgins, J.P.T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M.J., Welch, V. A. (Eds.), *Cochrane Handbook for Systematic Reviews of Interventions*. www.training.cochrane.org/handbook.
- Diminic, S., Hielscher, E., Harris, M.G., Lee, Y.Y., Keaton, J., Whiteford, H.A., 2019. A profile of Australian mental health carers, their caring role and service needs: results from the 2012 Survey of Disability, Ageing and Carers. *Epidemiol. Psychiatr. Sci.* 28 (6), 670–681. <https://doi.org/10.1017/S2045796018000446>.
- Donker, T., Griffiths, K.M., Cuijpers, P., Christensen, H., 2009. Psychoeducation for depression, anxiety and psychological distress: a meta-analysis. *BMC Med.* 7, 1–9. <https://doi.org/10.1186/1741-7015-7-79>.
- Driessen, E., Hollon, S.D., Bockting, C.L., Cuijpers, P., Turner, E.H., 2015. Does publication bias inflate the apparent efficacy of psychological treatment for major depressive disorder? A systematic review and meta-analysis of US National Institutes of Health funded trials. *PLoS One* 10 (9), e0137864. <https://doi.org/10.1371/journal.pone.0137864>.
- Duval, S., Tweedie, R., 2000. Trim and fill: a simple funnel-plot-based method. *Biometrics* 56 (June), 455–463.
- D'Zurilla, T.J., Nezu, A.M., 1999. *Problem-solving Therapy: A Social Competence Approach to Clinical Intervention*, 2nd ed. Springer, New York.

- Egger, M., Smith, G.D., Schneider, M., Minder, C., 1997. Bias in meta-analysis detected by a simple, graphical test. *BMJ* 315 (7109), 629–634. <https://doi.org/10.1136/bmj.316.7129.469>.
- Faller, H., Schuler, M., Richard, M., Heckl, U., Weis, J., Küffner, R., 2013. Effects of psycho-oncologic interventions on emotional distress and quality of life in adult patients with cancer: systematic review and meta-analysis. *J. Clin. Oncol.* 31 (6), 782–793. <https://doi.org/10.1200/JCO.2011.40.8922>.
- Farrand, P., Woodford, J., 2015. Effectiveness of cognitive behavioural self-help for the treatment of depression and anxiety in people with long-term physical health conditions: a systematic review and meta-analysis of randomised controlled trials. *Ann. Behav. Med.* 49 (4), 579–593. <https://doi.org/10.1007/s12160-015-9689-0>.
- Farrand, P., Woodford, J., 2013. Impact of support on the effectiveness of written cognitive behavioural self-help: a systematic review and meta-analysis of randomised controlled trials. *Clin. Psychol. Rev.* 33 (1), 182–195. <https://doi.org/10.1016/j.cpr.2012.11.001>.
- Farrand, P., Woodford, J., Coumoundouros, C., Svedin, F., 2020. Supported cognitive-behavioural therapy self-help versus treatment-as-usual for depressed informal caregivers of stroke survivors (CEDARs): feasibility randomised controlled trial. *Cogn. Behav. Ther.* 13, 1–15. <https://doi.org/10.1017/S1754470X20000239>.
- Furukawa, T.A., Sukanuma, A., Ostinelli, E.G., Andersson, G., Beevers, C.G., Shumake, J., Berger, T., Boele, F.W., Buntrock, C., Carlbring, P., Choi, I., Christensen, H., Mackinnon, A., Dahne, J., Huijbers, M.J.H., Ebert, D.D., Farrer, L., Forand, N.R., Strunk, D.R., Cuijpers, P., 2021. Dismantling, optimising, and personalising internet cognitive behavioural therapy for depression: a systematic review and component network meta-analysis using individual participant data. *Lancet Psychiatry* 8 (6), 500–511. [https://doi.org/10.1016/s2215-0366\(21\)00077-8](https://doi.org/10.1016/s2215-0366(21)00077-8).
- Gallagher-Thompson, D., Wang, P., Liu, W., Cheung, V., Peng, R., China, D., Thompson, L.W., 2010. Effectiveness of a psychoeducational skill training DVD program to reduce stress in Chinese American dementia caregivers: results of a preliminary study. *Aging Ment. Health* 14 (3), 263–273. <https://doi.org/10.1080/13607860903420989>.
- Garand, L., Morse, J.Q., Chia, L., Barnes, J., Dadebo, V., Lopez, O.L., Dew, M.A., 2019. Problem solving therapy reduces subjective burden levels in caregivers of family members with mild cognitive impairment or early-stage dementia: secondary analysis of a randomized clinical trial. *Int. J. Geriatr. Psychiatry* 34 (7), 957–965. <https://doi.org/10.1002/gps.5095>.
- Garand, L., Reynolds, C.F., Dew, M.A., 2013. Effects of problem solving therapy on depression and anxiety in new family caregivers of persons with cognitive impairment. In: AAGP Annual Meeting, 21(3), pp. S147–S148. <https://doi.org/10.1016/j.jagp.2012.12.194>.
- Garand, L., Rinaldo, D.E., Alberth, M.M., Delany, J., Beasock, S.L., Lopez, O.L., Reynolds, C.F., Dew, M.A., 2014. Effects of problem solving therapy on mental health outcomes in family caregivers of persons with a new diagnosis of mild cognitive impairment or early dementia: a randomized controlled trial. *Am. J. Geriatr. Psychiatr.* 22 (8), 771–781. <https://doi.org/10.1016/j.jagp.2013.07.007>.
- Guay, C., Auger, C., Demers, L., Mortenson, W.B., Miller, W.C., Gélinas-Bronsard, D., Ahmed, S., 2017. Components and outcomes of internet-based interventions for caregivers of older adults: systematic review. *J. Med. Internet Res.* 19 (9), 1–18. <https://doi.org/10.2196/jmir.7896>.
- Gucciardi, D.F., Lines, R.L.J., Ntoumanis, N., 2021. Handling effect size dependency in meta-analysis. *Int. Rev. Sport Exerc. Psychol.* <https://doi.org/10.1080/1750984X.2021.1946835>.
- Guyatt, G., Oxman, A., Vist, G., Kunz, R., Falck-Ytter, Y., Alonso-Coello, P., Schünemann, H., 2008. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 336 (April), 924–926.
- Harer, M., Cuijpers, P., Furukawa, T.A., Ebert, D.D., 2021. *Doing Meta-Analysis With R: A Hands-On Guide*. Chapman & Hall/CRC Press, Boca Raton, FL and London, ISBN 978-0-367-61007-4.
- Hielscher, E., Diminic, S., Kealton, J., Harris, M., Lee, Y.Y., Whiteford, H., 2019. Hours of care and caring tasks performed by Australian carers of adults with mental illness: results from an online survey. *Community Ment. Health J.* 55 (2), 279–295. <https://doi.org/10.1007/s10597-018-0244-x>.
- version 6.3 (updated February 2022). Cochrane. In: Higgins, J.P.T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M.J., Welch, V.A. (Eds.), 2022. *Cochrane Handbook for Systematic Reviews of Interventions*. www.training.cochrane.org/handbook.
- Higgins, J.P.T., Savović, J., Page, M.J., Elbers, R.G., Sterne, J.A.C., 2022. Chapter 8: assessing risk of bias in a randomized trial. version 6.3 (updated February 2022). Cochrane. In: Higgins, J.P.T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M.J., Welch, V.A. (Eds.), *Cochrane Handbook for Systematic Reviews of Interventions*. www.training.cochrane.org/handbook.
- Higgins, J.P.T., Thompson, S.G., Deeks, J.J., Altman, D.G., 2003. Measuring inconsistency in meta-analyses. *BMJ* 327 (7414), 557–560. <https://doi.org/10.1136/bmj.327.7414.557>.
- Higgins, J.P., Eldridge, S., Li, T., 2019. Including variants on randomized trials. In: Higgins, J.P., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M.J., Welch, V.A. (Eds.), *Cochrane Handbook for Systematic Reviews of Interventions*. John Wiley & Sons. <https://doi.org/10.1002/9781119536604.ch23>.
- Higgins, J., Green, S., 2011. *Cochrane handbook for systematic reviews of interventions*. Version 5.1.0. The Cochrane Collaboration. www.handbook.cochrane.org.
- Hoffmann, T.C., Glasziou, P.P., Boutron, I., Milne, R., Perera, R., Moher, D., Altman, D.G., Barbour, V., Macdonald, H., Johnston, M., Lamb, S.E., Dixon-Woods, M., McCulloch, P., Wyatt, J.C., Chan, A.-W., Michie, S., 2014. Better reporting of interventions: template for intervention description and replication (TIDieR) checklist and guide. *BMJ* 348 (g1687), 1–12. <https://doi.org/10.1136/bmj.g1687>.
- Hopko, D.R., Lejuez, C.W., Ruggiero, K.J., Eifert, G.H., 2003. Contemporary behavioral activation treatments for depression: procedures, principles, and progress. *Clin. Psychol. Rev.* 23 (5), 699–717. [https://doi.org/10.1016/s0272-7358\(03\)00070-9](https://doi.org/10.1016/s0272-7358(03)00070-9).
- Huo, Z., Chan, J.Y.C., Lin, J., Bat, B.K.K., Chan, T.K., Tsoi, K.K.F., Yip, B.H.K., 2021. Supporting informal caregivers of people with dementia in cost-effective ways: a systematic review and meta-analysis. *Value Health* 24 (12), 1853–1862. <https://doi.org/10.1016/j.jval.2021.05.011>.
- Juul, S., Gluud, C., Simonsen, S., Frandsen, F.W., Kirsch, I., Jakobsen, J.C., 2020. Blinding in randomised clinical trials of psychological interventions: a retrospective study of published trial reports. *BMJ Evid.-Based Med.* 1–9. <https://doi.org/10.1136/bmjebm-2020-111407>.
- Kaddour, L., Kishita, N., Schaller, A., 2018. A meta-analysis of low-intensity cognitive behavioral therapy-based interventions for dementia caregivers. *Int. Psychogeriatr.* 31 (7), 1–16. <https://doi.org/10.1017/S1041610218001436>.
- Karyotaki, E., Ebert, D.D., Donkin, L., Ripper, H., Twisk, J., Burger, S., Rozenal, A., Lange, A., Williams, A.D., Zarski, A.C., Geraedts, A., van Straten, A., Kleiboer, A., Meyer, B., Unlü Ince, B.B., Buntrock, C., Lehr, D., Snoek, F.J., Andrews, G., Cuijpers, P., 2018. Do guided internet-based interventions result in clinically relevant changes for patients with depression? An individual participant data meta-analysis. *Clin. Psychol. Rev.* 63, 80–92. <https://doi.org/10.1016/j.cpr.2018.06.007>.
- Kroenke, K., Spitzer, R.L., Williams, J.B.W., 2001. The PHQ-9: validity of a brief depression severity measure. *J. Gen. Intern. Med.* 16, 606–613.
- Kwon, C.Y., Lee, B., 2021. Prevalence of behavioral and psychological symptoms of dementia in community-dwelling dementia patients: a systematic review. *Front. Psychiatry* 12, 741059. <https://doi.org/10.3389/fpsy.2021.741059>.
- Laver, K., Milte, R., Dyer, S., Crotty, M., 2017. A systematic review and meta-analysis comparing carer focused and dyadic multicomponent interventions for carers of people with dementia. *J. Aging Health* 29 (8), 1308–1349. <https://doi.org/10.1177/0898264316660414>.
- Lazarus, R., Folkman, S., 1984. *Stress, Appraisal, and Coping*. Springer, New York.
- LeLaurin, J.H., Freytes, I.M., Findley, K.E., Schmitzberger, M.K., Eliazar-Macke, N.D., Orozco, T., Uphold, C.R., 2021. Feasibility and acceptability of a telephone and web-based stroke caregiver intervention: a pilot randomized controlled trial of the RESCUE intervention. *Clin. Rehabil.* 35 (2), 253–265. <https://doi.org/10.1177/0269215520957004>.
- Lewinsohn, P.M., 1974. A behavioral approach to depression. In: Coyle, J.C. (Ed.), *Essential Papers on Depression*. New York University Press, New York, pp. 150–172.
- Lewinsohn, P.M., Hoberman, H.M., Teri, L., Hautzinger, M., 1985. An integrative theory of depression. In: Reiss, S., Bootzin, R.R. (Eds.), *Theoretical Issues in Behavior Therapy*. Academic Press, pp. 331–359.
- Linden, W., Satin, J.R., 2007. Avoidable pitfalls in behavioral medicine outcome research. *Ann. Behav. Med.* 33 (2), 143–147. <https://doi.org/10.1007/BF02879895>.
- Loh, A.Z., Tan, J.S., Zhang, M.W., Ho, R.C., 2017. The global prevalence of anxiety and depressive symptoms among caregivers of stroke survivors. *J. Am. Med. Dir. Assoc.* 18 (2), 111–116. <https://doi.org/10.1016/j.jamda.2016.08.014>.
- Lopez, L., Vázquez, F.L., Torres, A.J., Otero, P., Blanco, V., Díaz, O., Páramo, M., 2020. Long-term effects of a cognitive behavioral conference call intervention on depression in non-professional caregivers. *Int. J. Environ. Res. Public Health* 17 (22), 1–24. <https://doi.org/10.3390/ijerph17228329>.
- Lopez-Hartmann, M., Wens, J., Verhoeven, V., Remmen, R., 2012. The effect of caregiver support interventions for informal caregivers of community-dwelling frail elderly: a systematic review. *Int. J. Integr. Care* 12 (August), 1–16.
- Losada, A., Márquez-González, M., Romero-Moreno, R., 2011. Mechanisms of action of a psychological intervention for dementia caregivers: effects of behavioral activation and modification of dysfunctional thoughts. *Int. J. Geriatr. Psychiatry* 26 (11), 1119–1127. <https://doi.org/10.1002/gps.2648>.
- Márquez-González, M., Losada, A., Izal, M., Pérez-Rojo, G., Montorio, I., 2007. Modification of dysfunctional thoughts about caregiving in dementia family caregivers: description and outcomes of an intervention programme. *Aging Ment. Health* 11 (6), 616–625. <https://doi.org/10.1080/13607860701368455>.
- Mårtensson, E., Blomberg, O., Pettman, D., Sörensdotter, R., Von Essen, L., Woodford, J., 2020. Psychological interventions for depression among informal caregivers of older adult populations: protocol of a systematic review and meta-analysis of randomised controlled trials. *BMJ Open* 10 (9), 1–9. <https://doi.org/10.1136/bmjopen-2019-036402>.
- McGowan, J., Sampson, M., Salzwedel, D.M., Cogo, E., Foerster, V., Lefebvre, C., 2016. *PRESS Peer Review of Electronic Search Strategies: 2015 Guideline Explanation and Elaboration (PRESS E & E) (Issue January)*.
- McGuinness, L., Higgins, J., 2020. Risk-of-bias VISualization (robvis): an R package and shiny web app for visualizing risk-of-bias assessments. *Res. Syn. Meth.* 1–7 <https://doi.org/10.1002/jrsm.1411>.
- Mekonen, T., Chan, G., Connor, J.P., Hides, L., Leung, J., 2021. Estimating the global treatment rates for depression: a systematic review and meta-analysis. *J. Affect. Disord.* 295, 1234–1242. <https://doi.org/10.1016/j.jad.2021.09.038>.
- Minozzi, S., Cinquini, M., Gianola, S., Gonzalez-Lorenzo, M., Banzi, R., 2020. The revised Cochrane risk of bias tool for randomized trials (RoB 2) showed low interrater reliability and challenges in its application. *J. Clin. Epidemiol.* 126, 37–44. <https://doi.org/10.1016/j.jclinepi.2020.06.015>.
- Mittelman, M., Brodaty, H., Wallen, A.S., Burns, A., 2008. A 3 country randomized controlled trial of a psychosocial intervention for caregivers combined with pharmacological treatment for patients with Alzheimer's disease: effects on caregiver depression. *Am. J. Geriatr. Psychiatr.* 16 (11), 893–904. <https://doi.org/10.1097/JGP.0b013e3181898095>.
- Mohr, D.C., Spring, B., Freedland, K.E., Beckner, V., Arean, P., Hollon, S.D., Ockene, J., Kaplan, R., 2009. The selection and design of control conditions for randomized

- controlled trials of psychological interventions. *Psychother. Psychosom.* 78 (5), 275–284. <https://doi.org/10.1159/000228248>.
- Mulder, R., Bassett, D., Morris, G., Hamilton, A., Baune, B.T., Boyce, P., Hopwood, M., Parker, G., Porter, R., Singh, A.B., Das, P., Outhred, T., Malhi, G.S., 2019. Trying to describe mixed anxiety and depression: have we lost our way? *Depress. Anxiety* 36 (12), 1122–1124. <https://doi.org/10.1002/da.22961>.
- Nezu, A.M., 1986. Efficacy of a social problem-solving therapy approach for unipolar depression. *J. Consult. Clin. Psychol.* 54 (2), 196–202. <https://doi.org/10.1037/0022-006X.54.2.196>.
- Nezu, A.M., D'Zurilla, T.J., 1979. An experimental evaluation of the decision-making process in social problem solving. *Cogn. Ther. Res.* 3 (3), 269–277. <https://doi.org/10.1007/BF01185967>.
- Nezu, A.M., Nezu, C.M., Perri, M.G., 1989. *Problem-solving Therapy for Depression. Theory, Research, and Clinical Guidelines.* John Wiley & Sons, New York.
- Nordin, A.A., Hairi, F.M., Choo, W.Y., Hairi, N.N., 2019. Care recipient multimorbidity and health impacts on informal caregivers: a systematic review. *Gerontologist* 59 (5), e611–e628. <https://doi.org/10.1093/geront/gny072>.
- Ormel, J., Hollon, S.D., Kessler, R.C., Cuijpers, P., Monroe, S.M., 2022. More treatment but no less depression: the treatment-prevalence paradox. *Clin. Psychol. Rev.* 91 (102111), 1–17. <https://doi.org/10.1016/j.cpr.2021.102111>.
- Otero, P., Smit, F., Cuijpers, P., Torres, A., Blanco, V., Vázquez, F.L., 2015. Long-term efficacy of indicated prevention of depression in non-professional caregivers: randomized controlled trial. *Psychol. Med.* 45 (7), 1401–1412. <https://doi.org/10.1017/S0033291714002505>.
- Page, M.J., McKenzie, J.E., Bossuyt, P.M., Boutron, I., Hoffmann, T.C., Mulrow, C.D., Shamseer, L., Tetzlaff, J.M., Akl, E.A., Brennan, S.E., Chou, R., Glanville, J., Grimshaw, J.M., Hróbjartsson, A., Lalu, M.M., Li, T., Loder, E.W., Mayo-Wilson, E., McDonald, S., Moher, D., 2021. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 372 (n71), 1–9. <https://doi.org/10.1136/bmj.n71>.
- Pan, Y., Chen, R., 2019. The effect of a nurse-led cognitive behavioral protocol on depressive symptoms and coping strategies of dementia caregivers. *J. Nurs. Res.* 27 (6), 1–11. <https://doi.org/10.1097/jnr.0000000000000327>.
- Pan, Y., Chen, R., Yang, D.L., 2019. The role of mutuality and coping in a nurse-led cognitive behavioral intervention on depressive symptoms among dementia caregivers. *Res. Gerontol. Nurs.* 12 (1), 44–55. <https://doi.org/10.3928/19404921-20181212-01>.
- Panzeri, A., Ferrario, S.R., Vidotto, G., 2019. Interventions for psychological health of stroke caregivers: a systematic review. *Front. Psychol.* 10 (2045), 1–16. <https://doi.org/10.3389/fpsyg.2019.02045>.
- Pettman, D., O'Mahen, H., Skoog Svanberg, A., von Essen, L., Axfors, C., Blomberg, O., Woodford, J., 2019. Effectiveness and acceptability of cognitive-behavioural therapy based interventions for maternal peripartum depression: a systematic review, meta-analysis and thematic synthesis protocol. *BMJ Open* 9 (12), e032659. <https://doi.org/10.1136/bmjopen-2019-032659>.
- Pillemer, K., Suiitor, J.J., 2002. Peer support for Alzheimer's caregivers. *Res. Aging* 24 (2), 171–192.
- Pinquart, M., Sörensen, S., 2006. Helping caregivers of persons with dementia: which interventions work and how large are their effects? *Int. Psychogeriatr.* 18 (4), 577–595. <https://doi.org/10.1017/S1041610206003462>.
- Plöthner, M., Schmidt, K., De Jong, L., Zeidler, J., Damm, K., 2019. Needs and preferences of informal caregivers regarding outpatient care for the elderly: a systematic literature review. *BMC Geriatr.* 19 (1), 1–22. <https://doi.org/10.1186/s12877-019-1068-4>.
- Radloff, L., 1977. The CES-D scale: a self-report depression scale for research in the general population. *Appl. Psychol. Meas.* 1, 385–401.
- Rethlefsen, M., Kirtley, S., Waffenschmidt, S., Ayala, A.P., Moher, D., Page, M.J., Koffel, J., 2019. PRISMA-S: an extension to the PRISMA statement for reporting literature searches in systematic reviews. *Syst. Rev.* 10 (39), 1–19. <https://doi.org/10.1186/s13643-020-01542-z>.
- Richardson, M., Garner, P., Donegan, S., 2019. Interpretation of subgroup analyses in systematic reviews: a tutorial. *Clin. Epidemiol. Glob. Health* 7 (2), 192–198. <https://doi.org/10.1016/j.cegh.2018.05.005>.
- Rücker, G., Schwarzer, G., Carpenter, J.R., Schumacher, M., 2008. Undue reliance on I(2) in assessing heterogeneity may mislead. *BMC Med. Res. Methodol.* 8, 79. <https://doi.org/10.1186/1471-2288-8-79>.
- Schinköthe, D., Wilz, G., 2014. The assessment of treatment integrity in a cognitive behavioral telephone intervention study with dementia caregivers. *Clin. Gerontol.* 37 (3), 211–234. <https://doi.org/10.1080/07317115.2014.886653>.
- Shafraan, R., Wroe, A., Nagra, S., Pissaridou, E., Coughtrey, A., 2018. Cognitive behaviour treatment of co-occurring depression and generalised anxiety in routine clinical practice. *PLoS One* 13 (7), e0201226. <https://doi.org/10.1371/journal.pone.0201226>.
- Sörensen, S., Pinquart, M., Duberstein, P., 2002. How effective are interventions with caregivers? An updated meta-analysis. *Gerontologist* 42 (3), 356–372. <https://doi.org/10.1093/geront/42.3.356>.
- Stall, N.M., Kim, S.J., Hardacre, K.A., Shah, P.S., Straus, S.E., Bronskill, S.E., Lix, L.M., Bell, C.M., Rochon, P.A., 2019. Association of informal caregiver distress with health outcomes of community-dwelling dementia care recipients: a systematic review. *J. Am. Geriatr. Soc.* 67 (3), 609–617. <https://doi.org/10.1111/jgs.15690>.
- Sterne, J., Savović, J., Page, M., Elbers, R., Blencowe, N., Boutron, I., Cates, C., Cheng, H.-Y., Corbett, M., Eldridge, S., Hernán, M., Hopewell, S., Hróbjartsson, A., Junqueira, D., Jüni, P., Kirkham, J., Lasserson, T., Li, T., McAleenan, A., Higgins, J., 2019. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ* 366 (14898), 1–8. <https://doi.org/10.1136/bmj.14898>.
- Sun, Y., Ji, M., Leng, M., Wang, Z., 2022. Which cognitive behavioral therapy delivery formats work for depressive symptoms in dementia caregivers? - a systematic review and network meta-analysis of randomized controlled trials. *J. Affect. Disord.* 308, 181–187. <https://doi.org/10.1016/j.jad.2022.04.055>.
- Thoits, P.A., 1986. Social support as coping assistance. *J. Consult. Clin. Psychol.* 54 (4), 416–423. <https://doi.org/10.1037/0022-006X.54.4.416>.
- Ulmanen, P., Szebehely, M., 2015. From the state to the family or to the market? Consequences of reduced residential eldercare in Sweden. *Int. J. Soc. Welf.* 24 (1), 81–92. <https://doi.org/10.1111/ijsw.12108>.
- United Nations Department of Economic and Social Affairs Population Division, 2019. World population prospects (Issue 141). <https://population.un.org/wpp/Publications/>.
- Van den Noortgate, W., López-López, J.A., Marín-Martínez, F., Sánchez-Meca, J., 2013. Three-level meta-analysis of dependent effect sizes. *Behav. Res. Methods* 45 (2), 576–594. <https://doi.org/10.3758/s13428-012-0261-6>.
- Vázquez González, F.L., Otero, P., Iglesias, Á.T., García, E.H., Seoane, V.B., Fernández, O. D., 2013. A brief problem-solving indicated-prevention intervention for prevention of depression in nonprofessional caregivers. *Psicothema* 25 (1), 87–92. <https://doi.org/10.7334/psicothema2012.89>.
- Vázquez, F.L., Torres, Á., Blanco, V., Otero, P., Díaz, O., Ferraces, M.J., 2016. Long-term follow-up of a randomized clinical trial assessing the efficacy of a brief cognitive-behavioral depression prevention intervention for caregivers with elevated depressive symptoms. *Am. J. Geriatr. Psychiatr.* 24 (6), 421–432. <https://doi.org/10.1016/j.jagp.2016.02.050>.
- Vázquez, F.L., Hermida, E., Torres, Á., Otero, P., Blanco, V., Díaz, O., 2014. Efficacy of a brief cognitive-behavioral intervention in caregivers with high depressive symptoms [Eficacia de una intervención preventiva cognitivo conductual en cuidadoras con síntomas depresivos elevados]. *Psicol. Conduct.* 22 (1), 79–96.
- Verreault, P., Turcotte, V., Ouellet, M.C., Robichaud, L.A., Hudon, C., 2021. Efficacy of cognitive-behavioural therapy interventions on reducing burden for caregivers of older adults with a neurocognitive disorder: a systematic review and meta-analysis. *Cogn. Behav. Ther.* 50 (1), 19–46. <https://doi.org/10.1080/16506073.2020.1819867>.
- Wang, S., de Almeida Mello, J., Declercq, A., 2021. Assessing psychosocial interventions for informal caregivers of older people with early dementia: a systematic review of randomized controlled evidence. *Front. Biosci. Landmark* 26 (9), 556–571. <https://doi.org/10.52586/4967>.
- Werner, P., Clay, O.J., Goldstein, D., Kermel-Schifmann, I., Herz, M.K., Epstein, C., Mittelman, M.S., 2020. Assessing an evidence-based intervention for spouse caregivers of persons with Alzheimer's disease: results of a community implementation of the NYUCI in Israel. *Aging Ment. Health* 1–8. <https://doi.org/10.1080/13607863.2020.1774740>. June 4.
- Yesavage, J.A., Brink, T.L., Rose, T.L., Lum, O., Huang, V., Adey, M., Leirer, V.O., 1983. Development and validation of a geriatric depression screening scale: a preliminary report. *J. Psychiatr. Res.* 17 (1), 37–49. [https://doi.org/10.1016/0022-3956\(82\)90033-4](https://doi.org/10.1016/0022-3956(82)90033-4).
- Zabih, S., Lemmel, F.K., Orgeta, V., 2020. Behavioural activation for depression in informal caregivers: a systematic review and meta-analysis of randomised controlled clinical trials. *J. Affect. Disord.* 274, 1173–1183. <https://doi.org/10.1016/j.jad.2020.03.124>.
- Zabih, S., Lemmel, F.K., Orgeta, V., 2020. Behavioural activation for depression in informal caregivers: a systematic review and meta-analysis of randomised controlled clinical trials. *J. Affect. Disord.* 274 (February), 1173–1183. <https://doi.org/10.1016/j.jad.2020.03.124>.
- Zigmond, A.S., Snaith, R.P., 1983. The hospital anxiety and depression scale. *Acta Psychiatr. Scand.* 67 (3), 361–370.