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SYSTEMATIC REVIEW

The efficacy of psychosocial interventions in relieving family caregiver burden in older adults with disabilities: a systematic review and network meta-analysis

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Abstract

Background: Caregiver burden is a significant challenge for those caring for older adults with disabilities. This review aims to assess the most effective psychosocial interventions for reducing family caregiver burden, focusing on overall effectiveness, care recipients with cognitive impairment and home-based interventions.
Methods: Seven major databases (PubMed, Web of Science, Embase, Scopus, Cochrane Library, PsycINFO and CINAHL) were systematically searched until 2 October 2024. Continuous outcomes were assessed using standardised mean differences (SMDs) and 95% confidence intervals (CIs). Intervention rankings relied on surface under the cumulative ranking curve (SUCRA) values.
Results: In 31 trials with 4687 participants, comparing psychoeducation ($n = 14$), cognitive behavioural therapy (CBT) ($n = 9$), reminiscence therapy ($n = 2$), family caregiver support programmes ($n = 2$), mindfulness-based interventions (MBIs) ($n = 2$), progressive muscle relaxation ($n = 1$) and music therapy ($n = 1$), MBIs (SMD = −6.67, 95% CI: −12.94, −0.41) significantly reduced caregiver burden and ranked highest (SUCRA, 79.2%; mean rank, 2.4). In studies with care recipients with cognitive impairment, MBIs substantially reduced burden (SMD = −17.06, 95% CI: −25.02, −9.10) and held the top ranking (SUCRA, 98.7%; mean rank, 1.2). In studies conducted in caregivers' homes, CBT remained highly effective (SMD = −5.57, 95% CI: −8.59, −2.90) and ranked highest (SUCRA, 95.7%; mean rank, 1.2).
Conclusions: This network meta-analysis highlights the effectiveness of psychosocial interventions in reducing caregiver burden. MBIs were most effective, particularly for caregivers of individuals with cognitive impairment, while CBT was highly effective in home-based settings. These findings underscore the importance of context-specific strategies.

Keywords: caregiver burden; disabled older people; psychosocial interventions; systematic review; network meta-analysis; older people

Key Points

- Mindfulness-based interventions are most effective in reducing caregiver burden, particularly for caregivers of individuals with cognitive impairment.
- Cognitive behavioural therapy is highly effective in home-based settings.
- Future trials need cost-effectiveness assessments for psychosocial interventions.

Introduction

The global ageing population is on the rise, with projections indicating an increase from 12% in 2015 to an anticipated 22% by 2050 [1]. This demographic shift comes with age-related functional decline and health challenges, significantly increasing the demand for care, particularly among older adults with self-care disabilities and cognitive impairment [2]. Family caregivers, who contribute 80% of long-term care for disabled older individuals, play a crucial role in shouldering caregiving responsibilities [3, 4].

Caregiving for older adults is a dynamic process shaped by multiple factors, particularly when caring for vulnerable individuals such as those with disabilities. Caregiver burden, which includes emotional, physical and social dimensions, is a well-documented consequence of caregiving [5]. According to the stress process model, caregiver burden arises from a complex interplay of stressors, mediators and outcomes, highlighting how caregiving demands, coping resources and contextual factors collectively influence the caregiver's well-being [6]. A systematic review highlights a mild to moderate burden among caregivers of older adults with chronic illnesses [7]. Caring for the disabled older adults often leads to adverse outcomes for caregivers, including depression and poor quality of life, which can compromise care quality and heighten the risk of elder abuse [8–10]. This burden transcends individual concerns, emerging as a critical public health issue that threatens the sustainability of informal care systems [11]. Recognising these challenges, there is an urgent need to identify effective ways to alleviate caregiver burden.

Psychosocial interventions have been widely proposed as an effective strategy to alleviate caregiver burden, with various modalities explored globally. Numerous randomised clinical trials have demonstrated their positive impact on caregivers' well-being and caregiving abilities [12]. Recognizing these benefits, the 5th Canadian Consensus Conference on the Diagnosis and Treatment of Dementia recommends psychosocial interventions to enhance the quality of life for family caregivers of dementia patients [13]. However, the effectiveness of these interventions varies, and there remains no consensus on the most effective approaches for specific caregiver populations or care-recipient conditions.

In particular, caregivers of older adults with cognitive impairment, such as dementia, often experience significantly higher levels of caregiver burden compared to other caregiving groups [14]. This is primarily due to the complex needs of care recipients, including memory loss, behavioural disturbances and progressive functional decline [15]. Additionally, the home environment, where ∼90% of individuals with disabilities receive care, is the most common caregiving setting [16]. Caregivers in the home environment may encounter unique stressors that differ from those in institutional settings [17]. These challenges underscore the critical need for interventions that are both condition-specific and context-sensitive to effectively alleviate caregiver burden.

To bridge these gaps, network meta-analysis (NMA) offers a robust methodological approach, enabling the simultaneous evaluation of both direct and indirect comparisons across randomised controlled trials (RCTs) [18]. Additionally, NMA facilitates a comprehensive comparison of multiple interventions, generating a ranking of their effectiveness and offering insights into which interventions are most beneficial for specific subgroups of caregivers [19].

Thus, this systematic review and NMA aim to answer the following research questions: (i) which psychosocial interventions are most effective in reducing caregiver burden among family caregivers of older adults with disabilities? (ii) For caregivers of older adults with cognitive impairment, which interventions yield the greatest reductions in caregiver burden? (iii) Among home-based interventions, which are most effective in alleviating caregiver burden?

By addressing these questions, this NMA will fill the identified research gap and provide valuable insights into optimal strategies for supporting family caregivers dealing with the unique challenges of older adults with disabilities.

Methods

Our NMA protocol was preregistered with the International Prospective Register of Systematic Reviews (PROSPERO) (registration number: CRD42023469377) to enhance research transparency. We maintained adherence to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines and its extension for NMA, ensuring standardised reporting to uphold methodological rigour [20].

Search strategy

PubMed, Web of Science, Embase, Scopus, Cochrane Library, PsycINFO and CINAHL were systematically searched from their inception to 2 October 2024. The search strategies employed a combination of subject headings (MeSH) and free-text terms for the five key concepts: disability, family caregivers, psychosocial interventions, burden and RCTs. Detailed search strategies for the PubMed database are presented in Appendix 1. Additionally, manual examination of reviews, scrutiny of trial references and contacting corresponding authors of studies with insufficient information were conducted for eligibility assessment.

Inclusion and exclusion criteria

Population

Family caregivers, aged 18 or above, providing informal care to older individuals (mean age ≥ 60) with disabilities and care recipients with one of six disability types (hearing, vision, cognition, mobility, self-care and dependent living) or any age-related diseases that can lead to disability, such as dementia, were included [21]. Formal caregivers (e.g. healthcare professionals) and patient–carer dyads receiving hospice/palliative care were excluded.

Interventions

The intervention group included any psychosocial interventions or their combinations designed to alleviate caregiver burden symptoms. Interventions targeting care recipients or those without psychosocial components (e.g. exercise programmes) were excluded.

Comparisons

Any other types of psychosocial interventions or control group were included. The control group comprised participants receiving care as usual (e.g., routine care, waiting list) or assessment-only interventions.

Outcomes

The primary outcome was caregiver burden, measured using a valid questionnaire, such as the Zarit Burden Interview, at both baseline and postintervention assessments. Insufficient information for effect size calculation was excluded.

Study design

RCTs in English were included, while reviews, case reports, conference abstracts, trial protocols and articles that have not been peer reviewed were excluded.

Data extraction

Two reviewers (Y.D.C. and S.C.Y.) independently screened titles and abstracts, assessed full texts of potentially eligible studies and extracted data using a customised table. Disagreements were resolved through consensus or adjudication by a third investigator. The extracted data included author, publication year, country, setting, sample size, participant characteristics, intervention and control details, measurement tools, outcomes and assessment timeline. In cases of insufficient or ambiguous data, we contacted study authors via email for additional information. For studies with three or more arms, the most comprehensive intervention and control groups were included in the analyses.

Risk of bias and quality appraisal

Two independent reviewers (Y.D.C. and S.C.Y.) assessed the quality of the selected studies using version 2 of the Cochrane risk of bias tool for randomised trials (RoB 2) [22]. The following five domains were assessed: randomization process, deviations from intended interventions, missing outcome data, measurement of the outcome and selection of reported results. The overall risk of bias was categorised as low risk, some concerns or high risk. Discussion ensued in case of disagreement.

For an assessment of the overall quality of evidence across studies, the Confidence In Network Meta-Analysis (CINeMA) software was used. This web application is based on the Grading of Recommendations Assessment, Development, and Evaluation framework and considers six domains: within-study bias, reporting bias, indirectness, imprecision, heterogeneity and incoherence. The resulting level of evidence quality was identified as very low, low, moderate or high [23].

Statistical analyses

The study data were analysed using Stata 15.1. A random-effects NMA evaluated the effects of psychosocial interventions on reducing caregiver burden. Subgroup analyses assessed the following: (i) the most effective interventions for caregivers of individuals with cognitive impairment and (ii) the most effective home-based interventions. Standardised mean differences (SMDs) with 95% confidence intervals (CIs) were calculated as effect sizes for continuous outcomes. The first postintervention assessment served as the primary analysis point.

In network diagrams, each node represents a different intervention, with lines indicating direct comparisons. The line width represents study numbers, while the node size indicates population numbers. Intervention rankings were estimated using the surface under the cumulative ranking curve (SUCRA).

Heterogeneity was assessed using the I^2 statistic, with values categorised as low (0–40%), moderate (30%–60%), substantial (50%–90%) or high (75%–100%) [24]. Sensitivity analysis excluded studies with a sample size $\leq$20 or only female caregivers. Inconsistency network models assessed global consistency for both pairwise and multiarm comparisons. The consistency assumption was evaluated using the node-splitting method and loop-specific approach [25]. Comparison-adjusted funnel plots and Egger's test were used to assess publication bias [26].

Results

Studies included

From 13 026 records, 5743 duplicates were removed. After screening 7283 titles and abstracts, 6946 records were excluded. Following a full-text review, 272 records were excluded, and three more were identified from previous reviews. To acquire essential data, six emails were sent to the study authors, but only two responded. In total, 31 RCTs [26–56] were included (Figure 1).

Study characteristics

Table 1 details studies in the NMA, with 4687 participants and sample sizes ranging from 20 to 969. The 31 included studies are distributed as follows: 8 from the USA [28, 36, 39, 42, 43, 49–51], 5 from Spain [35, 41, 45, 53, 54], 4 from China [30–32, 37] and 2 each from Germany [42, 55], the UK [34, 56] and Turkey [28, 57], with the remaining 8 studies being from Australia [48], Sweden [27], Brazil [30], Korea [36], the Netherlands [39], Japan [46], Egypt [49] and Portugal [47].

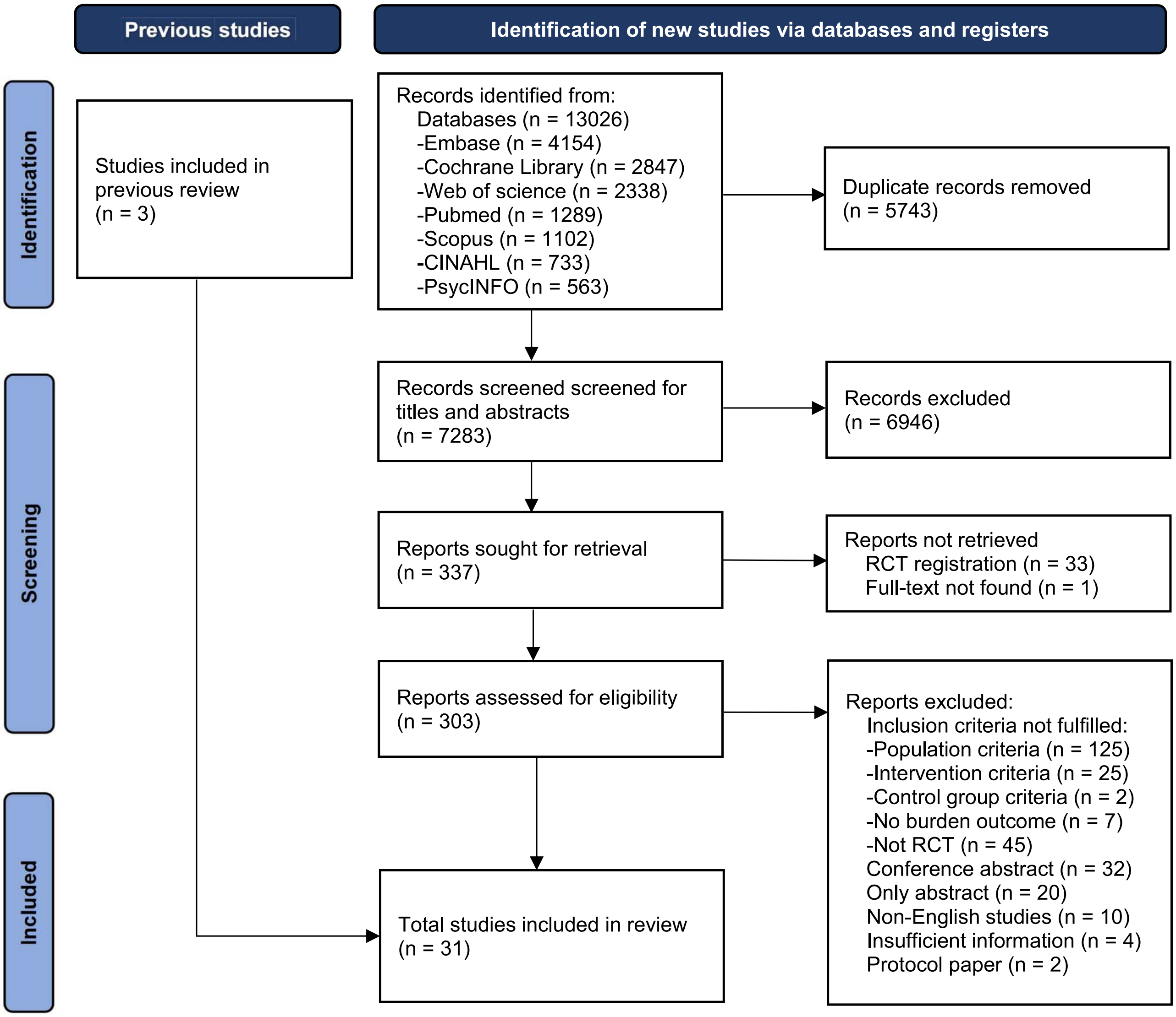


Figure 1. PRISMA flowchart.

Sample characteristics

The average age of family caregivers ranged from 37.4 to 69.7 years, and for care recipients it was 67.2 to 82.0 years. The majority of caregivers were female (77.0%), with three studies having exclusively female caregivers and the percentages in other studies ranging from 41.1% to 92.6%. Most caregivers experienced a moderate to high burden. All care recipients had a mean age above 60 years. Disabilities were attributed to various health conditions: 19 studies on dementia [28, 29, 31, 32, 36–38, 40, 41, 43, 45–51, 54, 55], 3 on stroke [34, 40, 57], 1 on advanced cancer [31], 1 on chronic heart failure [27] and 7 unspecified [28, 35, 36, 43, 45, 53, 54].

Intervention characteristics

Seven types of psychosocial interventions were included: psychoeducation (PE), cognitive behavioural therapy (CBT), reminiscence therapy (RT), family caregiver support programmes (FCSP), mindfulness-based interventions (MBIs), progressive muscle relaxation (PMR) and music therapy (MT). Delivery modes was face to face in 21 studies [26–36, 38–41, 43–56] and the phone or internet in 7 studies [37, 40, 42, 43, 51, 52, 55], with 3 studies using a combination of both [34, 36, 38]. Thirteen studies were conducted in caregivers' homes or community settings (29, 31, 35, 36, 39, 41–43, 47, 49, 50, 53, 55). Only two interventions were delivered to caregiver–patient dyads [27, 48]. No adverse effects were reported. Appendices 2 and 3 provide detailed intervention information.

Risk of bias of included studies

Fourteen studies had high bias risk, 10 had some concerns and 7 were low risk. Common reasons for high bias included missing outcome data and bias in outcome measurement (e.g. lack of blinding for participants and intervention providers and reliance on self-report scales for caregiver burden) (Appendix 4).

Table 1. Main characteristics of all the eligible studies

Author (year)	Country	Sample size (*n*)	Comparator/ intervention	Setting	Care recipients' condition	Caregivers			Time points assessed	Outcome measure	Intention to treat analysis
						Age (mean ± SD)	Men (%)	Care duration (mean ± SD)			
Agren *et al.* (2012)	Sweden	C = 84 I = 71	UC/PE	Home/heart failure clinic	Chronic heart failure (NYHA functional class II–IV)	I: 67.0 ± 12.0 C: 70.0 ± 10.0	24.52	NR	B, 3 m follow-up and 12 m follow-up	CBS	NR
Boyacıoğlu and Kutlu (2016)	Turkey	C = 33 I = 33	UC/PE	Primary healthcare centre	Dependent older adults	I: 49.7 ± 10.8 C: 52.1 ± 8.2	9.09	≥6 m	B, postintervention, 3 m follow-up and 6 m follow-up	ZBI	NR
Brewster *et al.* (2020)	USA	C = 53 I = 41	UC/PE	NR	Dementia	I1: 55.4 ± 9.3 I2: 53.5 ± 9.7 C: 56.3 ± 10.0	14.08	NR	B and 6 m follow-up	ZBI	NR
Caparrol *et al.* (2021)	Brazil	C = 21 I = 21	UC/PE	Home	AD	I: 52.2 ± 15.3 C: 55.1 ± 18.2	7.89	≥1 y	B and postintervention	ZBI	NR
Chen et al. (2020)	China	C = 29 I = 27	UC/RT	Hospital	Advanced cancer (with complications)	I: 69.2 ± 6.6 C: 66.4 ± 5.1	58.93	I: 11.6 ± 11.5 m C: 2.6 ± 18.3 m	B and postintervention	ZBI	ITT
Cheng *et al.* (2017)	China	C1 = 36 C2 = 33 I = 34	PE/CBT	Home	AD (mild-to-moderate stage)	I: 54.6 ± 9.4 C1: 56.4 ± 11.6 C2: 57.6 ± 10.6	13.54	I: 2.2 ± 1.8 y C1: 2.3 ± 2.2 y C2: 3.2 ± 2.6 y	B and 2 m follow-up	ZBI	NR
Chien and Lee (2011)	China (Hong Kong)	C = 46 I = 46	UC/FCSP	Dementia care centre	Dementia (mild-to-moderate stage)	I: 44.9 ± 8.5 C: 45.6 ± 9.2	33.70	≥ 3 m	B, 1 wk follow-up, 12 m follow-up and 18 m follow-up	FCBI	ITT
Farrand *et al.* (2020)	UK	C = 11 I = 9	UC/CBT	NR	Stroke (at least one ADL, cognitive or speech deficit)	I: 59.2 ± 10.8 C: 65.9 ± 9.1	35.00	8.2 ± 9.3y	B, 4 m follow-up and 6 m follow-up	CBS	NR
Fernández-Portero *et al.* (2021)	Spain	C = 58 I = 59	UC/MBI	NR	Dependent older adults	52.1 ± 9.3	0.00	NR	B and postintervention	ZBI	NR
Han et al. (2020)	Korea	C = 471 I = 498	UC/FCSP	Home	Long-term care insurance recipients	NR	26.66	NR	B and postintervention	ZBI	ITT
Hepburn *et al.* (2022)	USA	C1 = 111 C2 = 54 I = 96	UC/PE	Home	Alzheimer's disease and related dementia	I: 66.0 ± 10.9 C1: 63.8 ± 11.6 C2: 63.7 ± 10.7	29.50	NR	B, 3 m follow-up and 6 m follow-up	ZBI	NR
Hu et al. (2024)	China	C = 30 I = 30	UC/MBI	Hospital	Dementia	I: 54.8 ± 8.27 C: 50.9 ± 8.91	43.33	NR	B, 8 wk	ZBI	NR
Joling *et al.* (2012)	Netherlands	C = 96 I = 96	UC/PE	NR	Dementia	I: 67.8 ± 9.8 C: 71.2 ± 10.7	29.69	NR	B, 6 m follow-up and 12 m follow-up	CRA	ITT
LeLaurin *et al.* (2021)	USA	C1 = 13 C2 = 14 I1 = 13 I2 = 10	UC/CBT	Home	Stroke (at least one ADL, cognitive or speech deficit)	60.3 ± 10.1	7.55	≥ 2.5y	I1: B, 5 wk follow-up and 19 wk follow-up; I2, C1, C2: B, 19 wk follow-up and 25 wk follow-up	Short ZBI	NR
Martín-Carrasco *et al.* (2014)	Spain	C = 123 I = 115	UC/PE	Psychogeriatric centre	Dementia (at least two instrumental activities or one ADL impaired)	I: 61.0 ± 13.6 C: 63.2 ± 14.1	22.69	I: 63.2 ± 46.3 m C: 66.0 ± 58.5 m	B and 8 m follow-up	ZBI	ITT
Meichsner, Theurer and Wilz (2019)	Germany	C = 18 I = 19	UC/CBT	Home	Dementia	I: 63.0 ± 9.4 C: 61.2 ± 10.1	21.62	4.5 y	B, 8 wk follow-up and 6 m follow-up	VAS	NR
Montoro-Rodriguez *et al.* (2024)	USA	C = 47 I = 60	UC/PE	Home	Chronic medical conditions or significant neurocognitive disorder	63.38 ± 10.21	14.81	NR	B, 8 wk	ZBI	NR

(*Continued*)

Table 1. Continued

Author (year)	Country	Sample size (*n*)	Comparator/ intervention	Setting	Care recipients' condition	Caregivers			Time points assessed	Outcome measure	Intention to treat analysis
						Age (mean ± SD)	Men (%)	Care duration (mean ± SD)			
Ostwald *et al.* (1999)	USA	C = 45 I = 72	UC/PE	Community	Dementia (displayed behaviour problems)	65.6 ± 13.1	35.04	NR	B, postintervention and 5 m follow-up	ZBI	NR
Rodriguez-Sanchez *et al.* (2013)	Spain	C = 42 I = 83	UC/CBT	Healthcare centre	Dependent older adults	I: 61.1 ± 11.9 C: 65.0 ± 11.8	25.60	≥ 6 m	B and postintervention	Short ZBI	ITT
Seike *et al.* (2021)	Japan	C = 27 I = 27	UC/CBT	Memory clinic	Dementia	NR	7.41	2.5 ± 1.9y	B, 12 wk follow-up, 24 wk follow-up and 48 wk follow-up	ZBI	NR
Sousa *et al.* (2021)	Portugal	C = 15 I = 12	UC/PE	Hospital	Dementia	I: 48.0 ± 12.5 C: 55.0 ± 10.1	25.93	I: 2.5 ± 1.6 y C: 3.9 ± 2.4 y	B, postintervention and 4 m follow-up	CBS	NR
Tamplin *et al.* (2024)	Australia	C = 18 I = 16	UC/MT	Community	Dementia	NR	26.47	NR	B, 10 wk	ZBI	ITT
Tawfik *et al.* (2021)	Egypt	C = 34 I = 34	UC/PE	Psychiatry outpatient unit	Dementia	I: 37.4 ± 11.0 C: 38.3 ± 14.3	20.00	NR	B and 3 m follow-up	ZBI	NR
Terracciano *et al.* (2020)	USA	C = 36 I = 37	UC/PE	Community	Dementia (mild-to-moderate stage)	I: 68.2 ± 11.4 C: 65.7 ± 12.4	36.99	≥1 y	B, postintervention and 6 wk follow-up	ZBI	ITT
Tremont *et al.* (2008)	USA	C = 28 I = 32	UC/PE	Home	Dementia	I: 65.8 ± 13.7 C: 61.0 ± 9.6	NR	≥ 6 m	B and 12 m follow-up	ZBI	NR
Tremont *et al.* (2015)	USA	C = 117 I = 133	UC/PE	Memory clinic/ community	Dementia	I: 63.3 ± 12.3 C: 62.0 ± 13.8	22.00	≥6 m	B and 6 m follow-up	ZBI	NR
Vázquez *et al.* (2016)	Spain	C = 82 I = 88	UC/CBT	Hospital	Dependent older adults	I: 54.5 ± 8.2 C: 55.7 ± 9.7	0.00	10.1 ± 6.9 y	B, postintervention, 1 m follow-up, 3 m follow-up, 6 m follow-up and 12 m follow-up	ZBI	ITT
Vázquez González *et al.* (2013)	Spain	C = 84 I = 89	UC/CBT	Home	Dependent older adults	I: 53.6 ± 10.1 C: 54.3 ± 8.2	0.00	9.5 y	B and postintervention	ZBI	ITT
Wilz et al. (2018)	Germany	C = 134 I = 139	UC/CBT	Healthcare provision structure	Dementia	64.2 ± 11.0	19.41	4.9 ± 3.7 y	B, 6 m follow-up and 12 m follow-up	VAS	ITT
Woods *et al.* (2016)	UK	C = 220 I = 268	UC/RT	Home/community	Dementia (mild-to-moderate stage)	I: 69.6 ± 11.6 C: 69.7 ± 11.6	33.26	NR	B, 3 m follow-up and 10 m follow-up	RSS	ITT
Yilmaz *et al.* (2019)	Turkey	C = 32 I = 33	UC/PMR	Hospital	Stroke (at least one ADL, cognitive or speech deficit)	I: 47.4 ± 11.3 C: 53.4 ± 13.5	15.91	≥3 m	B and 8 wk follow-up	ZBI	NR

I = intervention; C = comparator; NR = not reported; B = baseline; m = months; y = years; UC = usual care; PE = psychoeducation; CBT = cognitive behavioural therapy; RT = reminisce therapy; MBI = mindfulness-based intervention; FCSP = family caregiver support programme; MT = music therapy; PMR = progressive muscle relaxation; NYHA = New York Heart Association; AD = Alzheimer's disease; ADL = activity of daily life; CRA = Caregiver Reaction Assessment; CBS = Caregiver Burden Scale; RSS = Relatives Stress Scale; VAS = Visual Analog Scale; ZBI = Zarit Burden Interview.

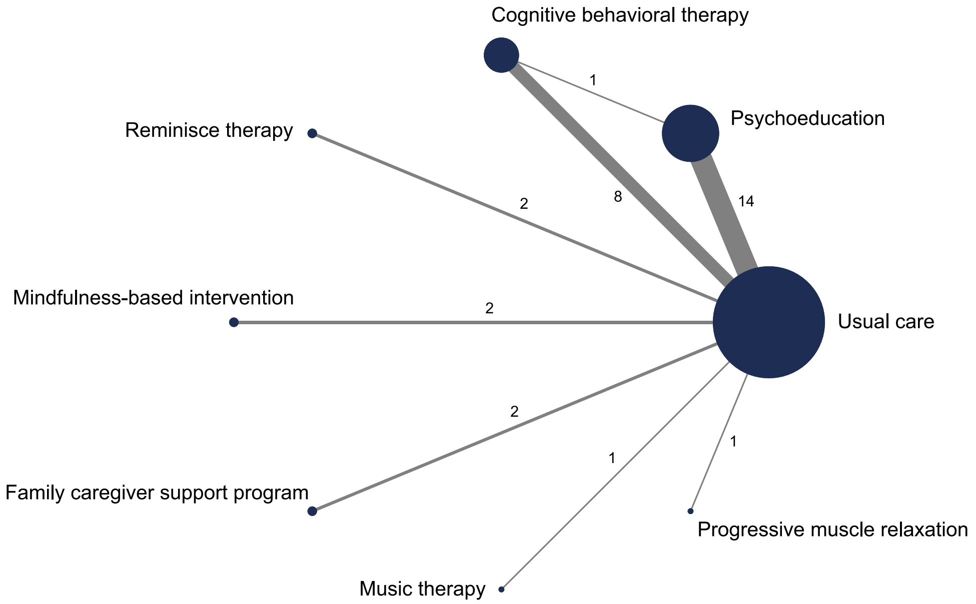


Figure 2. Network meta-analysis plot of all the included studies.

Assessment of inconsistency

Consistency was affirmed at the overall treatment level, supported by the node-splitting method ($P > .05$), signifying congruence between indirect and direct estimates. The loop-specific approach identified no statistically significant local inconsistency spots in the network ($P > .05$), reinforcing the consistency assumption. Detailed inconsistency assessment is provided in Appendix 5.

Results of the network meta-analysis

Total

Thirty-one studies were included in the NMA, comparing seven intervention types: PE ($n = 14$), CBT ($n = 9$), RT ($n = 2$), FCSP ($n = 2$), MBIs ($n = 2$), PMR ($n = 1$) and MT ($n = 1$). The network diagram in Figure 2 illustrates pairwise comparisons, highlighting the primary evidence for each intervention. Notably, CBT had a closed loop with PE, indicating direct evidence between them. Moderate statistical heterogeneity was observed overall ($I^2 = 62.2\%$, $P < .000$).

The NMA results revealed that MBIs (SMD = −6.67, 95% CI: −12.94, −0.41) significantly reduced caregiver burden compared to the control group. However, no other comparisons reached statistical significance (Figure 3). Efficacy rankings based on SUCRA values placed MBIs at the top (SUCRA, 79.2%; mean rank, 2.4), followed by FCSP (SUCRA, 66.4%; mean rank, 3.4) and PMR (SUCRA, 59.3%; mean rank, 3.9) (Figure 4). No statistically significant difference in efficacy was discerned among these interventions. A forest plot of pairwise NMA results is presented in Appendix 6.

Subgroup analysis: care recipients with cognitive impairment

In the subgroup analysis of caregivers for older adults with cognitive impairment, the findings remained consistent. Across 19 studies involving care recipients with cognitive impairments, MBIs showed a significant reduction in caregiver burden compared to the control group (SMD = −17.06, 95% CI: −25.02, −9.10) (Appendix 6B). MBIs ranked highest in efficacy within this subgroup (SUCRA, 98.7%; mean rank, 1.2) (Appendix 7A).

Subgroup analysis: Home-based interventions

In studies conducted in home settings (13 studies), CBT showed a significant reduction in caregivers' burden (SMD = −5.57, 95% CI: −8.59, −2.90) compared to the control group (Appendix 6C). CBT also held the top ranking in this subgroup (SUCRA, 95.7%; mean rank, 1.2), as demonstrated in Appendix 7B.

Publication bias and sensitivity analyses

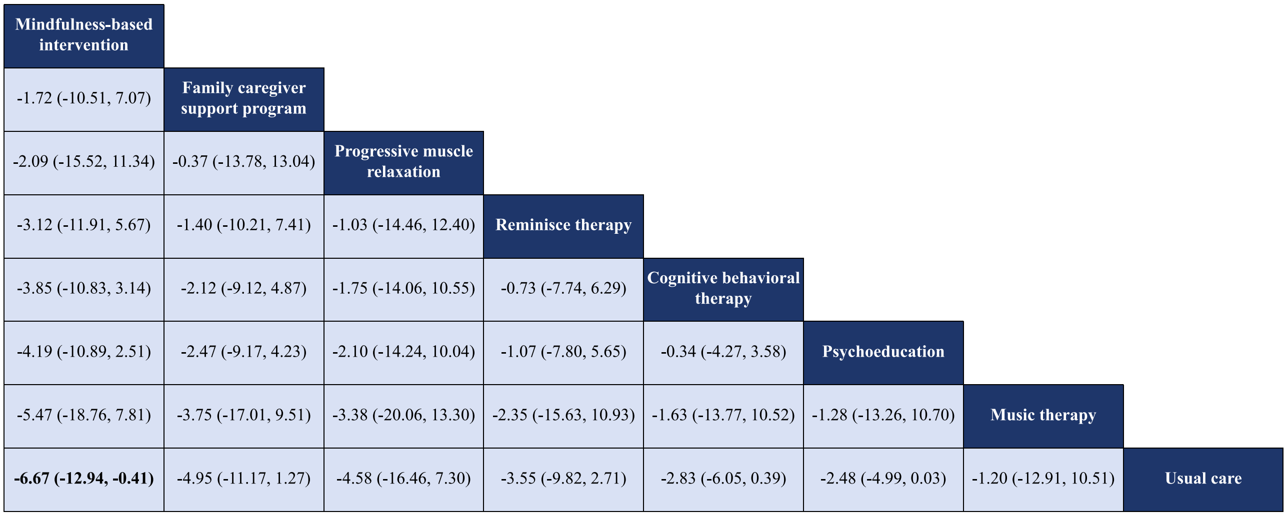
The funnel plot for caregiver burden networks exhibited relatively symmetrical distribution (Appendix 8), and Egger's test showed no publication bias ($P = .078$; Appendix 9). Sensitivity analyses, excluding studies with a sample size ≤ 20 and those with only female participants, yielded results consistent with the main analyses (Appendix 10).

Quality assessment

Comparing interventions to passive controls, findings were downgraded due to within-study bias, heterogeneity and imprecision, resulting in 'low' and 'very low' confidence in evidence levels. CINeMA assessment rated direct comparisons of FCSP vs usual care as low and other interventions vs usual care as very low confidence in evidence. Appendix 11 details the evidence strength for each network estimate.

Discussion

This NMA is the first to evaluate psychosocial interventions for family caregivers of older adults with disabilities,



Mindfulness-based intervention							
-1.72 (-10.51, 7.07)	**Family caregiver support program**						
-2.09 (-15.52, 11.34)	-0.37 (-13.78, 13.04)	**Progressive muscle relaxation**					
-3.12 (-11.91, 5.67)	-1.40 (-10.21, 7.41)	-1.03 (-14.46, 12.40)	**Reminisce therapy**				
-3.85 (-10.83, 3.14)	-2.12 (-9.12, 4.87)	-1.75 (-14.06, 10.55)	-0.73 (-7.74, 6.29)	**Cognitive behavioral therapy**			
-4.19 (-10.89, 2.51)	-2.47 (-9.17, 4.23)	-2.10 (-14.24, 10.04)	-1.07 (-7.80, 5.65)	-0.34 (-4.27, 3.58)	**Psychoeducation**		
-5.47 (-18.76, 7.81)	-3.75 (-17.01, 9.51)	-3.38 (-20.06, 13.30)	-2.35 (-15.63, 10.93)	-1.63 (-13.77, 10.52)	-1.28 (-13.26, 10.70)	**Music therapy**	
-6.67 (-12.94, -0.41)	-4.95 (-11.17, 1.27)	-4.58 (-16.46, 7.30)	-3.55 (-9.82, 2.71)	-2.83 (-6.05, 0.39)	-2.48 (-4.99, 0.03)	-1.20 (-12.91, 10.51)	**Usual care**

Figure 3. League table showing network meta-analysis estimates of psychosocial interventions for family caregiver burden. Note: Values represent SMD and 95% CIs for caregiver burden. A negative SMD favors treatment (column header). Statistically significant results are in bold.

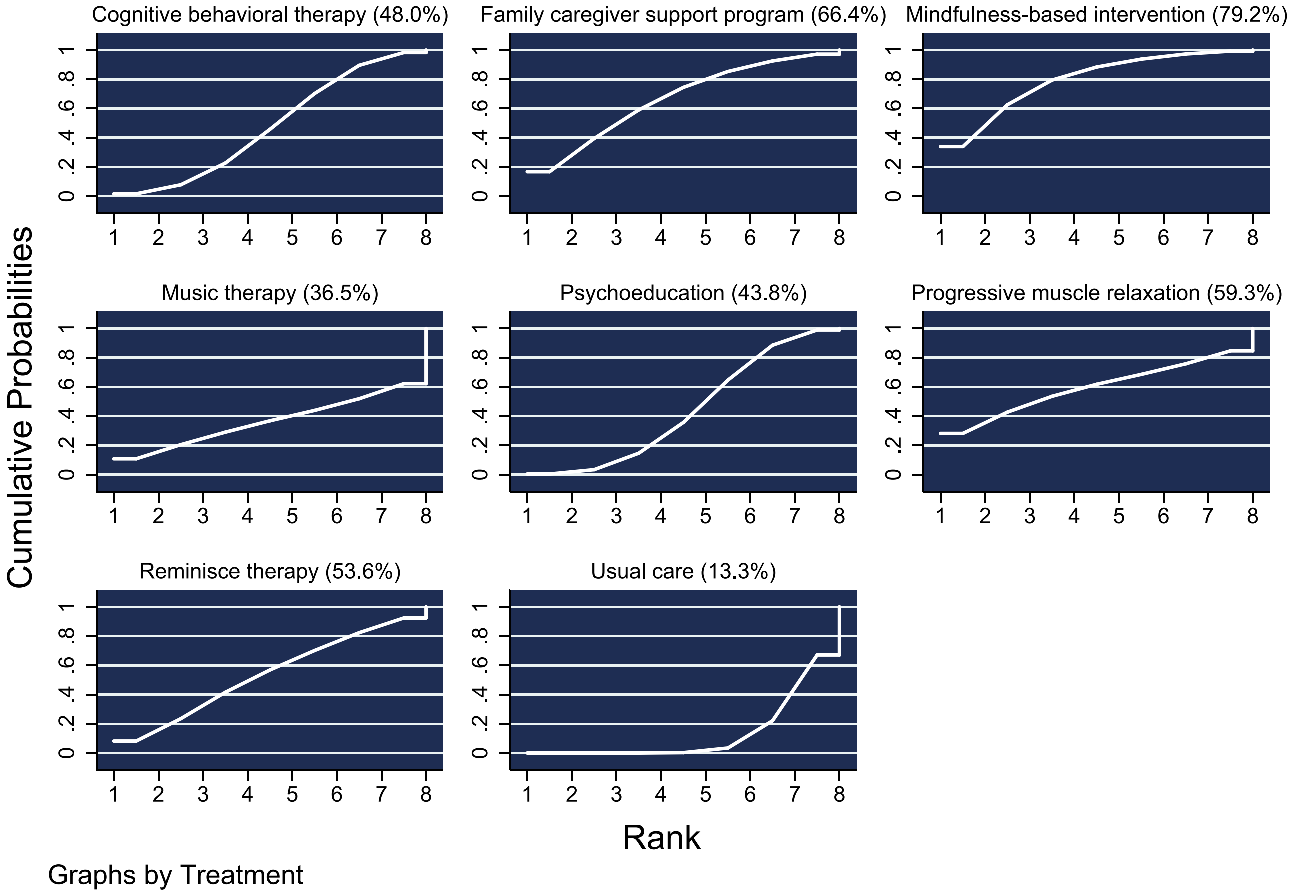


Figure 4. Cumulative ranking probability plot for psychosocial interventions in reducing family caregiver burden.

demonstrating their potential to reduce caregiver burden. The findings align with previous research on caregivers of individuals with dementia and chronic diseases [58, 59]. Among the interventions analysed, MBIs emerged as the most effective.

The effectiveness of MBIs likely stems from their dual focus on stress reduction and resilience building. Key components of MBIs include mindfulness meditation to enhance awareness, relaxation techniques to reduce tension and self-compassion to alleviate guilt and frustration [60]. They also focus on emotion regulation, cognitive reframing to shift negative thoughts and meditation to foster empathy and resilience [61]. These practices equip caregivers with effective coping strategies, reducing caregiver burden [62]. Neurobiological studies further indicate that mindfulness practices enhance prefrontal cortex activation, improving emotional regulation [63]. By fostering nonjudgemental awareness of the present moment, MBIs help caregivers regulate emotional responses, enhance resilience and mitigate caregiving-related stress [64]. However, the two included RCTs on MBIs lacked long-term follow-ups, leaving the sustainability of their effects unexamined. Future studies with extended follow-ups are essential to evaluate the durability of MBIs' benefits on caregiver well-being.

The subgroup analysis revealed that MBIs were particularly effective in reducing caregiver burden among those caring for older adults with cognitive impairment, such as dementia, including Alzheimer's disease. This finding is notable given the unique challenges these caregivers face, including managing behavioural symptoms that can be particularly distressing [65]. The effectiveness of MBIs in this context likely stems from their ability to foster empathy and compassion, enhancing caregivers' capacity to cope with the emotional and behavioural demands of cognitive impairments [66]. Moreover, MBIs may encourage more adaptive cognitive appraisals of the caregiving role, reducing perceived burden and promoting overall well-being [67].

CBT demonstrated significant efficacy, particularly in home-based settings. Delivering interventions in a familiar and comfortable environment can enhance caregiver engagement and adherence [68]. The growing prevalence of home-based interventions underscores the recognition of the need to support caregivers within their natural caregiving environments. CBT's structured, problem-focused approach is particularly effective in addressing specific stressors of home-based caregiving, such as managing care recipients' symptoms [69]. The success of CBT in home-based settings highlights the importance of tailoring interventions to align with caregivers' everyday realities to maximise their impact [70]. However, the lack of studies evaluating MBIs in home-based contexts reveals a significant gap in the literature. Future research should investigate whether MBIs' strengths in emotional regulation and stress management can be effectively integrated into home-based delivery, potentially offering a more holistic approach to caregiver support.

Interventions vary in content, delivery and provider expertise, influencing study outcomes and the validity of meta-analytic conclusions [71]. Approximately 45% emphasise psychoeducation to enhance knowledge and problem-solving, 29% incorporate CBT to address cognitive and behavioural changes and 6% utilise MBIs for stress reduction. Delivery methods also differ, with around 68% conducted face to face, offering personalised support but limiting accessibility, while 32% use telephone- or internet-based formats for greater flexibility (e.g. Hepburn *et al.* [37]; LeLaurin *et al.* [40]). The intervention duration ranges from brief, intensive programs (e.g. Vázquez *et al.* [53]) to longer, spaced-out sessions (e.g. Seike *et al.* [46]), affecting sustainability. Additionally, interventionists' backgrounds vary, with ∼32% involving nurses (e.g. Agren *et al.* [27]; Boyacıoğlu and Kutlu [28]) and 23% involving psychologists (e.g. Chen *et al.* [31]; Meichsner, Theurer and Wilz [42]), each bringing distinct expertise that may influence the outcomes. Given these variations, a deeper analysis of how the intervention content, delivery and provider characteristics shape the effectiveness would enhance the precision and validity of the meta-analytic findings.

Limitations

This review has limitations. First, non-English studies were excluded, possibly missing important cultural differences. Second, diverse caregiver burden measurement tools may contribute to NMA heterogeneity. Third, interventions such as PMR and MT had limited studies, with small sample sizes, which potentially affected their applicability and accuracy. Additionally, concerns about study quality, including blinding details, may impact the review's validity. Interpretation and application of the findings should be approached with caution. Finally, variability in intervention implementation (e.g. duration, frequency and intensity) may affect result comparability. Assessing study design differences is crucial for reliable interpretation. Future research should consider component NMA to isolate the effects of specific elements.

Implications for clinical practice and future research

This study highlights the need for tailored psychosocial interventions that align with caregiving contexts and care-recipient conditions. MBIs demonstrated superior efficacy for caregivers of individuals with cognitive impairment, while CBT was most effective in home-based settings. These findings underscore the importance of targeted strategies that consider caregiver characteristics, intervention modalities and contextual dynamics. From a policy perspective, the lack of cost-effectiveness analyses poses a barrier to widespread implementation. Economic evaluations are essential to guide resource allocation, particularly in settings with constrained healthcare budgets. Moreover, the predominance of female participants in existing studies highlights a need for gender-sensitive research. While women are often primary caregivers, understanding the distinct needs of male caregivers is critical to developing inclusive support systems. Future research should address these gaps, focusing on designing interventions that account for diverse caregiving scenarios.

Conclusions

This NMA highlights the effectiveness of psychosocial interventions in reducing caregiver burden. MBIs were the most effective, particularly for caregivers of individuals with cognitive impairment, while CBT excelled in home-based settings. These findings underscore the importance of context-specific strategies. Future research should address methodological gaps and include economic evaluations to develop sustainable caregiver support solutions.

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