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Journal article

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Psychosocial interventions for stroke survivors, carers and survivor-carer dyads: a systematic review and meta-analysis

Cover title: Stroke psychosocial interventions: a review

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Abstract

Objective: To evaluate the effectiveness of psychosocial interventions on depressive symptoms, anxiety symptoms, quality of life, self-efficacy, coping, carer strain and carer satisfaction among stroke survivors, carers and survivor-carer dyads.

Data sources: MEDLINE, CINAHL, PsycINFO, SocINDEX, Cochrane Library, Web of Science and Scopus databases and the grey literature were searched up to September 2018.

Methods: A systematic review and meta-analysis of randomized controlled trials of psychosocial interventions for stroke survivors, carers and survivor-carer dyads, compared to usual care. Outcomes measured were: depressive symptoms, anxiety symptoms, quality of life, coping, self-efficacy, carer strain and carer satisfaction.

Results: Thirty-one randomized controlled trials (n=5715) were included in the systematic review which found improvements in depressive symptoms, anxiety symptoms, quality of life and coping, though the number of trials assessing each outcome varied. A meta-analysis (11 trials; n=1280) focusing on depressive symptoms found that in seven trials psychosocial interventions reduced depressive symptoms in stroke survivors (SMD: -0.36, 95% CI -0.73 to 0.00; p =0.05) and in six trials reduced depressive symptoms in carers (SMD: -0.20, 95% CI -.40 to 0.00; p = 0.05).

Conclusion: Psychosocial interventions reduced depressive symptoms in stroke survivors and their carers. There was limited evidence that such interventions reduced anxiety symptoms, or improved quality of life and coping for stroke survivors and carers and no evidence that they improved self-efficacy, carer strain or carer satisfaction.

Introduction

Stroke can profoundly impair the psychosocial health of stroke survivors and their carers.¹⁻³

Psychosocial interventions for stroke survivors, carers and survivor-carer dyads (stroke survivor and carer as single unit)¹ are yet to be comprehensively reviewed. In reality,

psychosocial interventions are rarely defined in stroke literature. As a result, past

‘psychosocial’ reviews have included behavioural,⁴ psychological^{3,4} or social³ interventions.

This review defines psychosocial interventions as those comprised of both psychological and

social components.⁵ Psychological components address an individual's thought processes and

behaviours (e.g., motivational interviewing, counselling), measured using tools that contain

psychological sub-scales or questions.⁶ Social components relate to an individual's

relationship with others, including spouses, family, friends and the broader community (e.g.

family counseling, service links), often measured by sub-scales or questions within validated

quality of life scales.⁷ Recent reviews of psychosocial interventions consistent with this

definition for coronary heart disease,⁸ chronic kidney disease⁹ and diabetes¹⁰ have been

shown to reduce depression and anxiety.⁵

This is the first review to examine the effectiveness of psychosocial interventions for stroke

survivors, carers and survivor-carer dyads. Dyadic theory posits that the patient and carer

outcomes are inter-related and inter-dependant,^{11,12} therefore, to comprehensively evaluate

this literature it is essential to review stroke, carer and dyad using a uniform method.

Previously, the fragmented approach to reviewing psychosocial interventions within the

stroke population (e.g. survivor, carer, or dyad only reviews)¹⁻⁴ risked omitting key trails

from previous reviews and obscuring potential inter-related dyadic outcomes.¹³ Limited meta-

analysis of this topic makes it difficult to ascertain if psychosocial interventions are

effective.¹⁴

The objective of this systematic review and meta-analysis was to evaluate the effectiveness of psychosocial interventions on depressive symptoms, anxiety symptoms, quality of life (QoL), coping, self-efficacy, carer strain and carer satisfaction among stroke survivors, their carers and survivor-carer dyads.

Methods

The systematic review and meta-analysis of randomized controlled trials (RCTs) was conducted in accordance with Cochrane Collaboration systematic review methodology and Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines.¹⁵ The review is registered with the PROSPERO database (CRD42017071129).

Criteria

This review included RCTs of interventions that contained both psychological⁶ and social⁷ components.

Inclusion criteria: clinical diagnosis of ischaemic or haemorrhagic stroke, or carer for a stroke survivor; aged 18 years or over; psychosocial intervention (i.e. comprised of at least one psychological and one social component);^{6,7} usual care comparison group; one or more outcomes: depressive symptoms, anxiety symptoms, QoL, coping, self-efficacy, carer strain or carer satisfaction; and RCT. Exclusion criteria: non-English publications, review papers, conference proceedings, dissertations and books.

Search strategy

Databases searched: MEDLINE, CINAHL, PsycINFO, SocINDEX, Cochrane Library, Web of Science and Scopus databases and grey literature. Search conducted in September 2018 with no year restriction. Relevant unpublished data were requested from authors.

Search terms

Broad search terms were used to capture as many interventions as possible that could contain psychological and social components. For the same reason, the search strategy forewent the use of the term ‘RCT’ or its synonyms.

Search terms: (Stroke OR “cerebrovascular accident*” OR CVA OR “cerebral vascular accident*” OR apoplex*) OR (brain OR cerebr* OR intracran*) N2 (vascular OR ischemi* OR infarct* OR thrombo* OR emboli* OR hemorrhag*) AND (carer* OR caregiver* OR “care giver*” OR caring OR spouse OR famil* OR partner* OR sibling*) AND (Depress* OR melencholi* OR dysthemi* OR mood OR affective disorder OR anxiety OR anxious OR “quality of life” OR coping OR stress OR strain OR satisfaction OR “mental health” OR wellbeing* OR stress* OR strain* OR burden).

Study selection

Results were uploaded into Covidence online software (<http://www.covidence.org>) after screening for duplication. Two reviewers screened studies via title, abstract and full text (CM, ZJ) and independently assessed them for inclusion. Authors were contacted if it was unclear if the intervention included psychological or social components; trials in which the authors that did not respond could not be assessed for inclusion. Disagreements were resolved through discussion or consultation with a third reviewer (CFS).

Data extraction

Means and standard deviations for the meta-analysis of psychosocial interventions were extracted using a customized spreadsheet.

Grades of recommendation, assessment, development and evaluation (GRADE)

Studies were evaluated as per GRADE recommendations including: risk of bias, heterogeneity, participants, intervention, comparison group, outcome/s, study design (PICOS)

criteria, precision and publication bias.¹⁶ Risk of bias was assessed by the two reviewers using Covidence-risk of bias proformas (<https://www.covidence.org>).

Statistical measures

For the meta-analysis, the standard mean differences (SMD) of study outcomes were reported as studies used different outcome measures for depressive symptoms and therefore were unable to be converted into a common form. A small effect size was considered to be Hedges' $G = 0.2$, medium was $= 0.5$ and large was $= 0.8$.¹⁷ Results using completers only were used only when intention-to-treat (ITT) analysis was not reported.

The p -value used to determine statistical significance was 0.05. The Q -statistic tests the null hypothesis that all of the studies in the meta-analysis have a common effect size. The I^2 statistic reports the proportion of observed variance that reflects differences in true effect-sizes as opposed to sampling error. T^2 is the difference between the study variance or variance of true effect sizes. The standard deviation of true-effects is T .

Data analysis

Meta-analysis utilized Comprehensive Meta-Analysis (CMA) software version 3. A random-effects model was applied. This is because a fixed effect model is only appropriate when it can be assumed the true effect size is identical for all studies,¹⁸ which is not possible for psychological studies that have variations in their delivery and format (e.g., differences in age, socioeconomic factors, length of intervention).¹⁹ Included studies were weighted by sample size/standard error. We compared the outcomes of the intervention group to usual care.

Publication bias was assessed using a funnel plot. 'One study removed' analyses were used to assess the impact of each study on the combined effect¹⁸ and the results of this analysis are only reported in text where the removal of a study affected the outcome.

Results

Study selection

The PRISMA flow diagram¹⁵ is shown in Figure 1.

Figure 1 about here

Figure 1. PRISMA flow diagram of included studies.

Study characteristics

Thirty-one RCTs were identified; 12 targeted stroke survivors,²⁰⁻³¹ 10 carers,³²⁻⁴¹ and 11 survivor-carer dyads.^{31,39,42-50} Overall, 3636 stroke survivors and 2079 carers were included between 1997-2018. Sample sizes was 20 to 1008. The mean age of stroke survivors was 57 to 77 years, carers 49 to 76 years. Psychosocial interventions varied in form/content e.g. components, length (Table 1 and Supplementary Table).

Table 1. Psychosocial components of interventions.

Table 1 about here

GRADE quality assessment

GRADE assessment was completed for the three meta-analysis. Risk of bias (Figure 2) in the meta-analysis of ‘interventions delivered to stroke survivors or dyads and depressive symptoms measured in stroke survivors’ found that 61% of the risk of bias domains were assessed as low. The funnel plots did not indicate publication bias (Supplementary Figure). Heterogeneity was present, likely due to the diverse delivery modes, content and structure of psychosocial interventions. The PICO (i.e. population, interventions, comparison and outcomes) assessed to be satisfactory to address the research question. An assessment of precision considered the sample sizes and the confidence intervals of each trial; four of the

seven trials had less than 65 participants, therefore the level of evidence was downgraded from high to moderate.

Risk of bias in the meta-analysis of ‘interventions delivered to carers or dyads and depressive symptoms measured in carers’ found that 55% of the risk of bias domains were assessed as high or unclear; therefore the level of evidence was downgraded from high to moderate.

Funnel plots found no publication bias (Supplementary Figure) and the PICO of the included trials was suitable. An assessment of precision found that one trial⁴⁷ only had 10 participants and a large confidence interval; thus the evidence was downgraded. No unexplained heterogeneity was identified. The level of evidence for this meta-analysis was graded moderate.

Risk of bias in the meta-analysis of ‘interventions delivered to carers or dyads and depressive symptoms measured in stroke survivors’ found that 54% of the risk of bias domains were assessed as high or unclear; therefore the level of evidence was downgraded from high to moderate. There was no publication bias (Supplementary Figure), or unexplained heterogeneity and the PICO were assessed as appropriate. Precision was impacted by small participant groups (n=132). Therefore, the level of evidence for this meta-analysis was graded low.

Figure 2 about here

Figure 2. Risk of bias.

Systematic review results

Depressive Symptoms

Depressive symptoms were measured in 25 trials,^{20-25,27-30,32-34,37,39-47,49,50} of which nine interventions reported significant reductions in this outcome: four of the interventions for stroke survivors,^{22,28-30} two for carers^{33,40} and three for survivor-carer dyads.^{46,47,49} Significant

reductions in depressive symptoms were reported for interventions delivered to stroke survivors that utilized motivational interviewing,²⁹ transitional care,³⁰ problem solving and psycho education²² and anti-depressant medication with behavioural support.²⁸ Depressive symptoms increased in one trial for stroke survivors.²⁵ Two telephone-based interventions for carers reduced depressive symptoms.^{33,40} One survivor-carer dyad intervention reported a significant reduction in depressive symptoms for stroke survivors but not carers.⁴⁷ Two survivor-carer dyad trials reported a significant reduction in depressive symptoms for carers but not stroke survivors.^{46,49}

Anxiety symptoms

Anxiety symptoms were measured in 10 trials.^{22,24,25,27,32,37,39,42,44,47} One psychoeducation and service links intervention for stroke survivors reported significant reductions in anxiety symptoms.²²

Quality of life

Quality of life was measured in 16 trials,^{20,23-27,30-32,36,37,40,41,45,47,48} of which five reported significant improvements in this outcome: three for stroke survivors,^{24,27,30} one for carers³⁶ and one for survivor-carer dyads.⁴⁷ Discharge planning,³⁰ goal setting²⁴ and community rehabilitation²⁷ improved QoL in stroke survivors. A telephone and educational peer-support group³⁶ for carers improved QoL. A problem solving intervention⁴⁷ improved QoL for survivors in dyads.

Coping

Coping was measured in six trials;^{35,37,38,46,47,50} four of interventions for carers^{35,37,38,50} and two for survivor-carer dyads^{46,47} reported significant improvements. The provision of social support, psycho education and problem solving improved coping in all six trials.⁴⁷

Self-efficacy, carer strain and carer satisfaction

Self-efficacy was measured in five trials.^{23,25,26,37,47} three of interventions for stroke survivors,^{23,25,26} one for carers³⁷ and one for survivor carer-days.⁴⁷ Carer strain was measured in two trials^{34,37} and satisfaction measured in three trials.^{33,42,51} No significant improvements were found in these outcomes.

Meta-analysis of depressive symptoms

Only trials measuring depressive symptoms were subjected to meta-analysis because too few trials provided data, such as means and standard deviations. Thus, 11 trials were included in the meta-analysis of depressive symptoms.^{20,25,27,28,34,41,44,46,47,49,50} Four trials reported multiple time points for outcome measurements;^{25,28,41,49} in order to reduce heterogeneity between trials we included the time points most immediately after the conclusion of the intervention in our analyses.

In seven trials (n=456), the intervention was delivered to stroke survivors or dyads and depressive symptoms were measured in stroke survivors (Figure 3). Four trials used ITT analysis.^{20,25,27,46} The psychosocial intervention showed a small effect, compared to usual care, $Z=-1.95$, $p=0.05$, $Q\text{-value}=18.50(6df)$, $I^2=67.57$, $T^2=0.15$, $T=0.39$.

Insert Figure 3 about here

Figure 3. Forest plot - Interventions delivered to stroke survivors or dyads and depressive symptoms measured in stroke survivors

In six trials (n=561), the intervention delivered to carers or dyads and depressive symptoms were measured in carers (Figure 4). Data collection occurred directly after the intervention in four trials,^{41,47,49,50} at 18 weeks only in one trial³⁴ and at six months post-intervention in one trial.⁴⁶ In carers, a trend for a small effect of the psychosocial intervention compared to the usual care group was found, $Z=-1.94$, $p=0.05$, $Q\text{-value}=6.30(5df)$, $I^2=20.62$, $T^2=0.01$, $T=0.12$. Removal of the latter two trials^{34,50} resulted in a p of 0.04.

Insert Figure 4 about here

Figure 4. Forest plot - Interventions delivered to carers or dyads and depressive symptoms measured in carers

In four trials ($n=263$), the intervention was delivered to carers or dyads and depressive symptoms were measured in stroke survivors that the carers cared for (Figure 5). Two trials used ITT analysis.^{46,49} The psychosocial intervention showed no effect compared to usual care, $Z=-1.15$, $p=0.25$, $Q\text{-value}=0.31(3df)$, $I^2=0$, $T^2=0$, $T=0$.

Insert Figure 5 about here

Figure 5. Forest plot - Interventions delivered to carers or dyads and depressive symptoms measured in stroke survivors

Discussion

This systematic review and meta-analysis evaluated the effectiveness of psychosocial interventions compared to usual care on depressive symptoms, anxiety symptoms, QoL, coping, self-efficacy, carer strain and carer satisfaction among stroke survivors, carers and survivor-carer dyads. In stroke survivors, psychosocial interventions reduced depressive symptoms^{22,28-30} and anxiety symptoms²² and improved QoL,^{24,27,30} In carers, such interventions reduced depressive symptoms^{33,40} and improved QoL³⁶ and coping.^{35,37,38,50} In survivor-carer dyads, they reduced depressive symptoms,^{46,47,49} QoL,⁴⁷ and coping.^{46,47} Community-based interventions for stroke survivors reduced depressive symptoms,²⁸⁻³⁰ considering that around 90% of stroke survivors return to live in the community this is an important finding.⁵² Although major depression affects around 20% of hospital-dwelling stroke survivors⁵³ only one hospital-based trial²² was reduced depressive symptoms.

Depressive symptoms are often poorly recognized and addressed in clinical practice⁵⁴ despite the call for early intervention.⁵⁵

This review identified a small number psychosocial interventions which reduced depressive symptoms in carers^{33,40} and survivor-carer dyads.^{46,49} One intervention provided the carer with tips to help identify depressive symptoms.⁴⁰ This is important because depressive symptoms often go unrecognised by stroke survivors and carers, as well as clinicians, potentially delaying treatment.⁵⁶ Two interventions, delivered to survivor-carer dyads, reduced depressive symptoms in carers, but not in stroke survivors.^{46,49} This is not surprising as stroke survivors and carers have different support needs.^{1,2} Two interventions^{46,49} delivered to survivor-carer dyads reduced depressive symptoms in carers by targeting carer needs (i.e., tailored support, educational resources). Carers often neglect their own needs, therefore self-care should be incorporated into future interventions.^{1,2}

This is the first meta-analysis to assess the effectiveness of psychosocial interventions on depressive symptoms in stroke survivors, carers and survivor-carer dyads. Our meta-analysis showed that these interventions reduced depressive symptoms, compared to usual care, with a small Hedge's G effect size. Meta-analysis also showed that psychosocial interventions had a small effect on the depressive symptoms of carers, though half of the six trials had less than 40 participants; larger studies will be needed to confirm findings. We found no evidence that psychosocial interventions for carers reduce depressive symptoms in stroke survivors.

Depressive and anxiety symptoms are associated,⁵³ but the anxiety remains under-recognised and under-treated amongst stroke survivors.⁵⁵ Only one trial reduced anxiety symptoms in stroke survivors.²² This trial recruited stroke survivors within a week of their stroke onset which may have affected the outcomes as clinical status rapidly improves within the first three to six months post-stroke.^{57,58}

Although, our review found that interventions delivered to survivor-carer dyads decreased depressive symptoms among carers,^{46,47,49} there was no evidence that they reduced anxiety symptoms. Interestingly, none of the included interventions delivered solely to carers included anxiety symptoms as an outcome of interest. This is of concern given that anxiety symptoms are at least as prevalent as depressive symptoms in carers.^{59,60} These findings suggest that interventions need to be more effectively targeted at anxiety as well as depressive symptoms.

Quality of life was reported in five trials: three for stroke survivors stroke three for survivors,^{24,27,30} one for carers³⁶ and one for survivor-carer dyads.⁴⁷ This concurs with previous systematic reviews concur that have also found that QoL is difficult to improve.^{1,3} Two of the five trials^{27,30} reported improved stroke survivor QoL^{27,30} through discharge planning and community rehabilitation. Thus these components appear important and should be further investigated as means to promote QoL. Indeed, the absence of effective interventions to improve QoL among stroke survivors may reflect the complexity of the problems that stroke survivors face in enhancing the physical, psychological and social aspects of their health.⁶¹

Only one trial reported improvements in carer QoL.³⁶ In reality, stroke survivors and carers have very different experiences and needs post-stroke.^{1,3} While stroke survivors QoL is often strongly impacted by physical functioning,⁶² that of carers is often affected by the need to adjust to the carer role and a sense of uncertainty.⁶³ It is likely that the disparity between the experiences of stroke survivors and carers means that each population requires tailored interventions to address their needs. This may also explain why the intervention delivered to survivor-carer dyads improved the QoL stroke survivors but not carers.⁴⁷

All six trials reporting on coping found improvements; two delivered to survivor-carer dyads^{46,47} and four delivered to carers. Theoretical frameworks were used by all trials

measuring coping^{35,37,38,50,46,47} utilized such frameworks; this may have contributed to success and therefore should be incorporated into future interventions.

Limitations

Currently, psychosocial interventions are not defined, delivered or evaluated according to a consistent definition; this makes the evaluation of these interventions complicated.⁵ There remains some debate about how to define psychosocial interventions.^{5,8-10} None-the-less, we maintain that psychosocial interventions must contain both psychological and social components⁵ and ensured that the included trials reflected this definition.

Nine non-English publications were excluded; this may limit the evidence-base and geographical representativeness. The quality of the trials in the meta-analysis measuring depressive symptoms in carers was moderate and that of the effectiveness of interventions for survivors and carers measuring depressive symptoms in stroke survivors was low. Likewise, 29 trials in the systematic review were assessed as having an unclear or high risk of bias in one or more domains of assessment.

Conclusions

Psychosocial interventions reduced depressive symptoms among stroke survivors and, to a lesser extent, their carers. There was limited evidence that such interventions improved anxiety symptoms, QoL and coping for stroke survivors and carers and no evidence that they improved self-efficacy, carer strain and carer satisfaction.

Declaration of conflicting of interests

The authors declare no potential conflicts of interest with respect to the research, the authorship, and/or publication of this article.

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Clinical trial registration

Systematic review registration: CRD42017071129

https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=71129

Online supplemental materials

Supplementary Figure. Meta-analysis funnel plots.

Supplementary Figure. A, B & C about here

Supplementary Table. Study characteristics

Supplementary Table. about here

References

1. Bakas, T, Clark, P, Kelly-Hayes, M, King, R, Lutz, B, Miller, E. Evidence for stroke family caregiver and dyad interventions: a statement for healthcare professionals from the american heart association and american stroke association. *Stroke*. 2014;45:2836-2852. doi: 10.1161/str.0000000000000033
2. Bakas, T, McCarthy, T, Miller, T. An update on the state of the evidence for stroke family caregiver and dyad interventions. *Stroke*. 2017;48:e122-e125. doi: 10.1161/STROKEAHA.117.016052
3. Cheng, HY, Chair, SY, Chau, JP-C. The effectiveness of psychosocial interventions for stroke family caregivers and stroke survivors: a systematic review and meta-analysis. *Patient Educ Couns*. 2014;95:30-44. doi: 10.1016/j.pec.2014.01.005
4. Eldred, C, Sykes, C. Psychosocial interventions for carers of survivors of stroke: a systematic review of interventions based on psychological principles and theoretical frameworks. *Br J Health Psychol*. 2008;13:563-581. No doi.
5. Thompson, DR, Ski, CF. Psychosocial interventions in cardiovascular disease: what are they? *Eur J Cardiol*. 2013;20:916-917. doi: 10.1177/2047487313494031
6. Gerrig, R, Zimbardo, P. *Psychology and life*. Boston: Allyn and Bacon. 2002.
7. Northcott, S, Moss, B, Harrison, K, Hilari, K. A systematic review of the impact of stroke on social support and social networks: associated factors and patterns of change. *Clin Rehabil*. 2015;8:811-831. doi: 0.1177/0269215515602136.
8. Ski, CF, Jelinek, M, Jackson, A, Murphy, B, Thompson, D. *Psychosocial interventions for patients with coronary heart disease and depression: a systematic review and meta-analysis*. *Eur J Cardiovasc Nurs*. 2016;15:305-316. doi: 10.1177/1474515115613204
9. Pascoe, MC, Thompson, DR, Castle, DJ, McEvedy, SM, Ski, CF. Psychosocial interventions for depressive and anxiety symptoms in individuals with chronic kidney disease: systematic review and meta-analysis. *Front Psychol*. 2017;8:992. doi: 10.3389/fpsyg.2017.00992
10. Pascoe, MC, Thompson, DR, Castle, DJ, Jenkins, ZM, Ski, CF. Psychosocial interventions and wellbeing in individuals with diabetes mellitus: a systematic review and meta-analysis. *Front Psychol*. 2017;8:2063. doi: 10.3389/fpsyg.2017.02063

11. Godwin, KM, Swank, PR, Vaeth, P, Ostwald, SK. The longitudinal and dyadic effects of mutuality on perceived stress for stroke survivors and their spousal caregivers. *Aging Ment Health*. 2013;17:423-431. doi: 10.1080/13607863.2012.756457
12. Lyons, KS, Lee, CS. The theory of dyadic illness management. *J Fam Nurs*. 2018;24:8-28. doi: 10.1177/1074840717745669
13. Godwin, KM, Swank, PR, Vaeth, P, Ostwald, SK. The longitudinal and dyadic effects of mutuality on perceived stress for stroke survivors and their spousal caregivers. *Aging Ment Health*. 2013;17:423-431. doi: 10.1080/13607863.2012.756457
14. Lee, J, Soeken, K, Picot, SJ. A meta-analysis of interventions for informal stroke caregivers. *West J Nurs Res*. 2007;29:344-356. doi: 10.1177/0193945906296564
15. Moher, D, Liberati, A, Tetzlaff, J, Altman, DG, Goup., TP. Preferred reporting items for systematic reviews and meta- analyses : the prisma statement. *Br Med J*. 2009;6:e1000097.
16. The Cochrane Collaboration. *Cochrane handbook for systematic reviews of interventions: online version (5.1.0, march 2011)*. 2011; Available from www.cochrane-handbook.org.
17. Durlak, JA. How to select, calculate, and interpret effect sizes. *J Pediatr Psychol*. 2009;34:917-928. doi: 10.1093/jpepsy/jsp004
18. Borenstein, M, Hedges, L. V., Higgins, J. P. T., Rothstein, H. R. *Introduction to meta-analysis*. Vol. 1. Chichester: Wiley. 2009.
19. Cleophas, TJ, Zwinderman, AH, *Meta-analysis and random effect analysis*, in *Modern meta-analysis: Review and update of methodologies*. Springer International Publishing: Cham.
20. Alexopoulos, GS, Wilkins, VM, Marino, P, Kanellopoulos, D, Reding, M, Sirey, JA et al. Ecosystem focused therapy in poststroke depression: a preliminary study. *Int J Geriatr Psychiatry*. 2012;27:1053-1060. doi: 10.1002/gps.2822
21. Ertel, KA, Glymour, MM, Glass, TA, Berkman, LF. Frailty modifies effectiveness of psychosocial intervention in recovery from stroke. *Clin Rehabil*. 2007;21:511-522. doi: 10.1177/0269215507078312

22. Fang, Y, Mpofu, E, Athanasou, J. Reducing depressive or anxiety symptoms in post-stroke patients: pilot trial of a constructive integrative psychosocial intervention. *International journal of health sciences*. 2017;11:53-58.
23. Glass, T, Berkman, L, Hiltunen, E, Furie, K, Glymour, M, Fay, M et al. The families in recovery from stroke trial: Primary study results. *Psychosom Med*. 2004;66:889-897. doi: 10.1097/01.psy.0000146326.01642.ca
24. Harrington, R, Taylor, G, Hollinghurst, S, Reed, M, Kay, H, Wood, VA. A community-based exercise and education scheme for stroke survivors: randomized controlled trial and economic evaluation. *Clin Rehabil*. 2010;24:3-15. doi: 10.1177/0269215509347437
25. Hoffmann, T, Ownsworth, T, Eames, S, Shum, D. Evaluation of brief interventions for managing depression and anxiety symptoms during early discharge period after stroke: a pilot randomized controlled trial. *Top Stroke Rehabil*. 2015;22:116-126. doi: 10.1179/1074935714Z.0000000030
26. Kendall, E, Catalano, T, Kuipers, P, Posner, N, Buys, N, Charker, J. Recovery following stroke: the role of self-management education. *Soc Sci Med*. 2007;64:735-746. No doi.
27. Markle-Reid, M, Orridge, C, Weir, R, Browne, G, Gafni, A, Lewis, M et al. Interprofessional stroke rehabilitation for stroke survivors using home care. *Can J Neurol Sci*. 2011;38:317-334. No doi.
28. Mitchell, P, Veith, R, Becker, K, Buzaitis, A, Cain, K, Fruin, M et al. Brief psychosocial-behavioral intervention with antidepressant reduces poststroke depression significantly more than usual care with antidepressant. Living well with stroke: Randomized controlled trial. *Stroke*. 2009;40:3073-3078. doi: 10.1161/STROKEAHA.109.549808
29. Watkins, CL, Auton, MF, Deans, CF, Dickinson, HA, Jack, CIA, Lightbody, CE et al. Motivational interviewing early after acute stroke - a randomized, controlled trial. *Stroke*. 2007;38:1004-1009. doi: 10.1161/01.STR.0000258114.28006.d7
30. Wong, FKY, Yeung, SM. Effects of a 4-week transitional care programme for discharged stroke survivors in hong kong: a randomised controlled trial. *Health Soc Care Community*. 2015;23:619-631. doi: 10.1111/hsc.12177
31. Forster, A, Young, J, Chapman, K, Nixon, J, Patel, A, Holloway, I et al. Cluster randomized controlled trial: clinical and cost-effectiveness of a system of longer-term stroke care. *Stroke*. 2015;46:2212-2219. doi: 10.1161/STROKEAHA.115.008585

32. Draper, B, Bowring, G, Thompson, C, Heyst, J, Conroy, P, Thompson, J. Stress in caregivers of aphasic stroke patients: a randomized controlled trial. *Clin Rehabil.* 2007;21:122-130. doi: 10.1177/0269215506071251
33. Grant, JS, Elliott, TR, Weaver, M, Bartolucci, AA, Giger, JN. Telephone intervention with family caregivers of stroke survivors after rehabilitation. *Stroke.* 2002;33:2060-2065. doi: 10.1161/01.str.0000020711.38824.e3
34. Hartke, RJ, King, RB. Telephone group intervention for older stroke caregivers. *Top Stroke Rehabil.* 2003;9:65-81.
35. İnci, FH, Temel, AB. The effect of the support program on the resilience of female family caregivers of stroke patients: randomized controlled trial. *Appl Nurs Res.* 2016;32:233 - 240. doi: 10.1016/j.apnr.2016.08.002
36. Larson, J, Franzén-Dahlin, A, Billing, E, Arbin, M, Murray, V, Wredling, R. The impact of a nurse-led support and education programme for spouses of stroke patients: a randomized controlled trial. *J Clin Nurs.* 2005;14:995-1003. doi: 10.1111/j.1365-2702.2005.01206.x
37. van den Heuvel, ET, de Witte, LP, Nooyen-Haazen, I, Sanderman, R, Meyboom-de Jong, B. Short-term effects of a group support program and an individual support program for caregivers of stroke patients. *Patient Educ Couns.* 2000;40:109-120. No doi.
38. van den Heuvel, ET, Witte, LP, Stewart, RE, Schure, LM, Sanderman, R, Meyboom-de Jong, B. Long-term effects of a group support program and an individual support program for informal caregivers of stroke patients: Which caregivers benefit the most? *Patient Educ Couns.* 2002;47:291-299. No doi.
39. Johnston, M, Bonetti, D, Joice, S, Pollard, B, Morrison, V, Francis, JJ et al. Recovery from disability after stroke as a target for a behavioural intervention: results of a randomized controlled trial. *Disabil Rehabil.* 2007;29:1117-1127. No doi.
40. Bakas, T, Austin, J, Habermann, B, Jessup, N, McLennon, S, Mitchell, P et al. Telephone assessment and skill-building kit for stroke caregivers: a randomized controlled clinical trial. *Stroke.* 2015;46:3478–3487. Doi 10.1161/STROKEAHA.115.011099
41. Bakas, T, Farran, C, Austin, J, Given, B, Johnson, E, Williams, L. Stroke caregiver outcomes from the telephone assessment and skill-building kit (TASK). *Top Stroke Rehabil.* 2009;16:105-121. doi: 10.1310/tsr1602-105

42. Rodgers, H, Atkinson, C, Bond, S, Suddes, M, Dobson, R, Curless, R. Randomized controlled trial of a comprehensive stroke education program for patients and caregivers. *Stroke*. 1999;30:2585-2591.
43. Bishop, D, Miller, I, Weiner, D, Guilmette, T, Mukand, J, Feldmann, E et al. Family intervention: Telephone tracking (FITT): a pilot stroke outcome study. *Top Stroke Rehabil*. 2014;21 Suppl 1:S63-74. doi: 10.1310/tsr21S1-S63
44. Clark, MS, Rubenach, S, Winsor, A. A randomized controlled trial of an education and counselling intervention for families after stroke. *Clin Rehabil*. 2003;17:703-712. No doi.
45. Goldberg, G, Segal, ME, Berk, SN, Schall, RR, Gershkoff, AM. Stroke transition after inpatient rehabilitation. *Top Stroke Rehabil*. 1997;4:64-79. No doi.
46. Ostwald, SK, Godwin, KM, Cron, SG, Kelley, CP, Hersch, G, Davis, S. Home-based psychoeducational and mailed information programs for stroke-caregiving dyads post-discharge: a randomized trial. *Disabil Rehabil*. 2014;36:55-62. Doi: 10.3109/09638288.2013.777806
47. Robinson-Smith, G, Harmer, C, Sheeran, R, Bellino Vallo, E. Couples' coping after stroke: a pilot intervention study. *Rehabil Nurs*. 2016;41:218-229. doi: 10.1002/rnj.213
48. Shyu, YI, Kuo, LM, Chen, MC, Chen, ST. A clinical trial of an individualised intervention programme for family caregivers of older stroke victims in taiwan. *J Clin Nurs*. 2010;19:1675-1685. doi: 10.1111/j.1365-2702.2009.03124.x
49. Smith, GC, Egbert, N, Dellman-Jenkins, M, Nanna, K, Palmieri, PA. Reducing depression in stroke survivors and their informal caregivers: a randomized clinical trial of a web-based intervention. *Rehabil Psychol*. 2012;57:196-206. doi: 10.1037/a0029587
50. Cheng, HY, Chair, SY, Chau, JPC. Effectiveness of a strength-oriented psychoeducation on caregiving competence, problem-solving abilities, psychosocial outcomes and physical health among family caregiver of stroke survivors: a randomised controlled trial. *Int J Nurs Stud*. 2018;87:84-93. doi: 10.1016/j.ijnurstu.2018.07.005
51. Johnson, W, Onuma, O, Owolabi, M, Sachdev, S. Stroke: a global response is needed. *Bull World Health Organ*. 2016;94:634.

52. Australian Institute of Health and Welfare. *Stroke and its management in Australia: An update*. AIHW: Canberra. 2013.
53. Robinson, RG, Ricardo, J. Post-stroke depression: a review. *Am J Psychiatry*. 2016;173:221-231. doi:10.1176/appi.ajp.2015.15030363
54. Towfighi, LA, Ovbiagele, EB, El Hussein, MN, Hackett, HM, Jorge, ER, Kissela, AB et al. Poststroke depression: a scientific statement for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2017;48:e30-e43. doi: 10.1161/STR.000000000000113
55. Winstein, JC, Stein, RJ, Arena, CR, Bates, JB, Cherney, LL, Cramer, ES et al. Guidelines for adult stroke rehabilitation and recovery: a guideline for healthcare professionals from the American Heart Association/American Stroke Association. *Stroke*. 2016;47:e98-e169. doi: 10.1161/STR.000000000000098
56. Klinedinst, JN, Dunbar, BS, Clark, CP. Stroke survivor and informal caregiver perceptions of poststroke depressive symptoms. *J Neurosci Nurs*. 2012;44:72-81. doi: 10.1097/JNN.0b013e3182477944
57. Dharmoon, SM, Moon, PY, Paik, CM, Sacco, LR, Elkind, SVM. Trajectory of functional decline before and after ischemic stroke: the northern manhattan study. *Stroke*. 2012;43:2180-2184. doi: 10.1161/STROKEAHA.112.658922
58. Lee, BK, Lim, HS, Kim, HK, Kim, JK, Kim, RY, Chang, NW et al. Six-month functional recovery of stroke patients: a multi-time-point study. *Int J Rehabil Res*. 2015;38:173-180. doi: 10.1097/MRR.000000000000108
59. Greenwood, N, Mackenzie, A. An exploratory study of anxiety in carers of stroke survivors. *J Clin Nurs*. 2010;19:2032-2038. doi: 10.1111/j.1365-2702.2009.03163.x
60. Hu, P, Yang, Q, Kong, L, Hu, L, Zeng, L. Relationship between the anxiety/depression and care burden of the major caregiver of stroke patients. *Medicine*. 2018;97:e12638. doi: 10.1097/MD.00000000000012638
61. Kruihof, WJ, van Mierlo, ML, Visser-Meily, JMA, van Heugten, CM, Post, MWM. Associations between social support and stroke survivors' health-related quality of life-a systematic review. *Patient Educ Couns*. 2013;93:169-176. doi: 10.1016/j.pec.2013.06.003
62. Aidar, FJ, de Oliveira, RJ, Silva, AJ, de Matos, DG, Carneiro, AL, Garrido, N et al. The influence of the level of physical activity and human development in the quality of

life in survivors of stroke. *Health Qual Life Outcomes*. 2011;9:89-89. doi: 10.1186/1477-7525-9-89

63. Lou, S, Carstensen, K, Jørgensen, CR, Nielsen, CP. Stroke patients' and informal carers' experiences with life after stroke: an overview of qualitative systematic reviews. *Disabil Rehabil*. 2017;39:301-313. doi: 10.3109/09638288.2016.1140836

Tables

Table 1. Psychosocial components of interventions

Author/s	Personnel delivering the intervention	Psychological component	Social component	Topics addressed/components	Individual/group/dyad	Delivery mode	Intervention duration
Alexopoulos et al., 2012 ²⁰	Therapist	Problem solving; cognitive/behavioral support	Family/social support	Problem solving; community support	Individual	In person	12wk
Bakas et al., 2009 ⁴¹	Nurse	Problem solving; stress/behavioral management	Communication; service links	Behavioral support; service links	Individual	Telephone	8wk
Bakas et al., 2015 ⁴⁰	Nurse	Problem solving	Service links	Emotional/behavioral support; skill building	Individual	Telephone	9wk
Bishop et al., 2014 ⁴³	Family therapist;	Psycho-education	Family resources	Problem solving; family functioning	Dyad	Telephone	6m

	nurse						
Cheng et al. 2018 ⁵⁰	Nurse	Psycho-education; coping skills training; strengths-based	Dyad support; social support	Problem solving; coping; social support; carer competence	Dyad	Telephone, in person	26w
Clark et al., 2003 ⁴⁴	Social worker	Counseling	Family functioning	Counseling	Dyad	In person	3.5m
Draper et al., 2007 ³²	Social worker; psychologist	Psycho-education	Communication	Service links; stress management	Group	In person	4wk
Ertel et al., 2007 ²¹	Social worker; psychologist	Cognitive behavioural therapy	Social support; services links	Self-efficacy; stress management; problem solving	Individual carer/ health professional	In person	12wk
Fang et al., 2017 ²²	Not stated	Problem solving; Psycho-education	Services links	Psycho-education; stress management; coping; problem	Individual	In person	Not stated

				solving; service links			
Forster et al., 2015 ³¹	Stroke coordinators	Problem solving	Healthcare/service links	Goal setting; service links	Individual	In person	Not stated
Glass et al., 2004 ²³	Mental health worker; social worker; psychologist	Self-efficacy	Family systems	Social/emotional/beh avioral support	Individual/ carer/family	In person	6m
Goldberg et al., 1997 ⁴⁵	Psychiatrist; psychologist; recreational therapist; social worker	Stress management	Community resources	Stress management; problem solving; community links	Individual/dy ad	In person	Not stated
Grant et al., 2002 ³³	Nurse	Social problem solving	Social problem solving	Problem solving; family support	Dyad	Telephone, in person	12wk
Harrington et	Rehabilitation	Goal setting	Social participation;	Peer support; goals	Group	In person	8wk

al., 2010 ²⁴	clinicians; psychologist		peer activities				
Hartke et al., 2003 ³⁴	Psychologist; social worker; nurse	Psycho-education	Communication	Dyad/emotional/beha viorial support; community links	Group	Telephone	8wk
Hoffmann et al., 2015 ²⁵	Psychologist; occupational therapist	Cognitive behavioural therapy; psycho- education; motivational interviewing; coping	Family support	Intervention 1- Coping: cognitive/behavioral support; coping; psycho-education Intervention 2 - Self- management: problem solving; services links	Individual	In person	8wk
Inci et al.,	Clinician	Problem solving;	Family support	Family support	Individual/gr	In person	10wk

2016 ³⁵		psycho-education			oup		
Johnston et al., 2007 ³⁹	Clinician	Cognitive behavioural therapy; goal setting	Dyad support	Coping; self- management; Cognitive behavioural therapy; goal setting	Individual	Telephone/in person	5wk
Kendall et al., 2007 ²⁶	Clinician	Problem solving; goal setting	Peer support; communication	Emotional support; service links	Group	In person	6wk
Larson et al., 2005 ³⁶	Nurse	Psycho-education	Carer support	Peer support	Group	In person	6m
Markle-Reid et al., 2011 ²⁷	Nurse; rehabilitation clinicians; social worker	Behavioral change; counseling	Collaborative care; community/carer support	Self-management	Individual	In person	<12m
Mitchell et al., 2009 ³⁸	Nurse; prescriber	Problem solving; motivational	Caregiver/social support	Antidepressants; CBT; social support	Individual/ca regiver	In person	8wk

		interviewing					
Ostwald et al., 2014 ⁴⁶	Nurse; occupational therapist; physical therapist	Counseling	Community links	Coping; community links; stress management	Dyad	Telephone/in person	Psychosocial: 6m. Information: 12m
Robinson- Smith et al., 2016 ⁴⁷	Nurse	Problem solving; coping skills; self- efficacy; counseling	Family/dyad functioning	Counseling; goal setting; communication; social/dyad support	Dyad	In person	6 sessions
Rodgers et al., 1999 ⁴²	Rehabilitation clinicians; nurse; psychologist; social worker;	Psycho-education; behavioral support	Communication	Communication	Group/indivi dual	Telephon/in person	6 sessions

carer group							
Shyu et al. 2010 ⁴⁸	Nurses	Behavioral support; counseling	Dyad support	Planning; emotional support	Dyad/carer	Telephone /in person	Hospital: 4-5 sessions Telephone: 1 session Home-based: 1 week/month
Smith et al., 2012 ⁴⁹	Nurse	Emotional support; psycho-education	Dyad support; peer/online forum	Emotional/stress support	Group	In person	Not stated
van den Heuvel et al., 2000 ³⁷	Nurses	Problem solving	Dyad support	Problem solving; dyad support; services links	Group/indivi dual	In person	Groups: 8wk Home-based: 8-10wk
van den Heuvel et al., 2002 ³⁸	Nurses	Problem solving	Dyad support	Problem solving; dyad support; services links	Group/indivi dual	In person	Groups: 8wk Home-based:

							8-10wk
Watkins et al., 2007 ²⁹	Nurse; psychologist	Motivational interviewing	Social support	Counseling; social support; goal setting; self-efficacy	Individual	In person	4wk
Wong et al., 2015 ³⁰	Nurse	Behavior support	Family support	Behavioral/emotional /family/social support	Individual	In person	5wk

Supplementary Table. Study characteristics

Reference	Country	Setting	Participants	Intervention group	Control group	Time of assessment	Relevant outcome measures
Alexopoulos et al., 2012 ²⁰	USA	Hospital rehabilitation and home-based	SS depressed (randomized n=24)	SS Education and psychosocial counseling (n=12; mean age 72; female=6 [50%])	SS Education only (n=12; mean age 69; female=5 [42%])	Pre-post	HAM-D, SIS
Bakas et al., 2009 ⁴¹	USA	Via telephone	CG (randomized n=40)	SS Education and psychosocial counseling (n=12; mean age 72; female=6)	CG Counseling and active listening (n=19; mean age 58; female=16)	Pre-post	SSQOL-Pr, PHQ-9

				[50%])	[84%])		
Bakas et al., 2015 ⁴⁰	USA	Home-based	CG (randomized n=254)	CG Enhanced psychosocial support (n=123; mean age 54; female 96 [78%])	CG UC plus information and active listening (n=131; mean age 54; female 103 [78%])	Pre-post	SSQOL-Pr, PHQ- 9
Bishop et al., 2014 ⁴³	USA	Home-based	Dyad (randomized n=49)	Dyad Psychosocial telecounseling plus UC (n=23)	Dyad UC (n =26)	Pre-post	GDS
Cheng et al., 2018 ⁵⁰	Hong Kong	Hospital and home-based	Dyad (randomized n=128)	Dyad Enhanced psychosocial support (n=64)	Dyad UC (n=64)	Pre-post	CES-D, PSI
Clark et al.,	Australia	Hospital	Dyad	Dyad Post-	Dyad UC (n=30;	Pre-post	GDS, HADS

2003 ⁴⁴		rehabilitation service	(randomized n=62)	discharge education and counseling. SS (n=32; mean age 73; female n=13 [41%]) and CG (mean age 71)	mean age 71; female n=11 [37%]) and CG (mean age 69)		
Draper et al., 2007 ³²	Australia	Hospital rehabilitation service	CG of aphasic SS (randomized n=39)	CG Enhanced psychosocial support (n=19; mean age 64)	CG Wait list control (n=20; mean age 60)	Pre-post	GHQ, QLQ
Ertel et al., 2007 ²¹	USA	Hospital and rehabilitation services	SS (randomized n=291)	SS Enhanced psychosocial support (n=146; mean age 69; female=71)	SS UC and stroke education (n=145; mean age 70; female=71)	Pre-post	CES-D

				[49%])	[49%])		
Fang et al., 2017 ²²	Singapore	Hospital	SS (randomized n=42)	SS Enhanced psychosocial support (n=23)	SS UC (n=19)	Pre-post	HADS
Forster et al., 2015 ³¹	UK	Home-based	Dyads and single SS (randomized SS n=800 and CG n=208)	Dyad and single SS Longer term stroke care. SS (n=401; mean age 71; female=186 [46%]) and CG (n=108; mean age 61; female=73 [68%])	Dyad and single SS UC SS (n=399; mean age 72; female n=181 [45%]) and CG (n=100; mean age 61; female 68 [68%])	Pre-post	EQ-5D

Glass et al., 2004 ²³	USA	Home-based	SS (randomized n=291)	SS Enhanced psychosocial support (n=143; mean age 69; female n= 70 [48%])	SS UC and standard stroke information (n=141; mean age 70; female n=70 [50%])	Pre-post	CES-D, REFFI, QoL 5-item scale
Goldberg et al., 1997 ⁴⁵	USA	Home-based	Dyad (randomized n=41)	Dyad Case management post-discharge (n=21; median age 72; female n=11 [52%])	Dyad UC (n=20; median age 72; female n=9 [45%])	Pre-post	CES-D, QoL scale not specified
Grant et al., 2002 ³³	USA	Home-based	CG (randomized n=74)	CG Enhanced psychosocial support	CG Sham intervention OR UC	Pre-post	CSQ, CES-D

Harrington et al., 2010 ²⁴	UK	Leisure and community centers	SS (randomized n=243)	SS Exercise and education program (n=119; mean age 71; female n=54 [45%])	SS UC (n=124; mean age70; female n=57 [46%])	Pre-post	WHOQoL-Bref, HADS
Hartke et al., 2003 ³⁴	USA	Home-based	CG (randomized n=88)	CG Enhanced psychosocial support (n=43; mean age 70; female n=32 [74%])	CG UC (n=45; mean age 70; female n=35 [78%])	Pre-post	CES-D, BI
Hoffmann et al., 2015 ²⁵	Australia	Hospital and home-based	SS (randomized n=33)	SS Coping skills (n=11; mean age 64; female n=4 [36%]) OR SS	SS UC (n=10; mean age 57; female n=4 [40%])	Pre-post	MADRS, HADS, SAQOL-g, SSEQ

				self- management (n=12; mean age 61; female n=3 [25%])			
Inci et al., 2016 ³⁵	Turkey	Home-based and community	CG (randomized n=70)	CG enhanced psychosocial- based program (n=34; female n=34 [100%])	CG UC (n=36; female n=36 [100%])	Pre-post	FCCI
Johnston et al., 2007 ³⁹	UK	Home-based and via telephone	Dyad and single CG (randomized SS n=203 and CG n=not stated)	Dyad and single CG Workbook- based psychosocial support (n=103; mean age 69;	Dyad and single CG SS UC (n=100; mean age 69; female n=39 [39%]) and CG (mean age 61)	Pre-post	HADS, Satisfaction with Services Scale

				female n=40 [39%]) and CG (mean age 63)			
Kendall et al., 2007 ²⁶	Australia	Community	SS (randomized n=100)	SS Enhanced psychosocial support (n=58; mean age 66; female n=17 [29%])	SS UC (n=42; mean age 66; female n=16 [38%])	Post	SSQOL, SE Scale
Larson et al., 2005 ³⁶	Sweden	Hospital	CG spousal (randomized n=100)	CG Enhanced psychosocial support with education and telephone support (n=50)	CG UC (n=50)	Pre-post	Visual analogue scale

Markle-Reid et al., 2011 ²⁷	Canada	Home-based and community	SS (randomized n=101)	SS Specialist interdisciplinary support (n=43; mean age 76; female n=22 [51%])	SS Community-based stroke rehabilitation with usual homecare services (n=39; mean age 71; female n=15 [38%])	Pre-post	SIS, CES-D, K-10, SF-36
Mitchell et al., 2009 ³⁸	USA	Community	SS depressed (randomized n=101)	SS Brief psychosocial behavioral intervention plus antidepressant (n=48; mean age 57; female n=19)	SS UC plus antidepressant (n=53; mean age 57; female n=21 [40%])	Pre-post	HRSD, GDS

				[40%])			
Ostwald et al., 2014 ⁴⁶	USA	Home-based	Dyad (randomized n=159 dyads)	Dyad Brief psychosocial behavioral and information SS (n=80; mean age 67; female n=25 [31%]) and CG (n=80; mean age 64; female n=55 [69%])	Dyad Information plus UC SS (n=79; mean age 66; female n=15 [19%]) and CG (n=79; mean age 61; Female n=64 [81%])	Pre-post	F-COPES, GDS
Robinson-Smith et al., 2016 ⁴⁷	USA	Home-based	Dyads (randomized n=10 dyads)	Dyad Enhanced psychosocial program. SS (n=5; mean age 65; female n=2 [40%]) and CG (n=5; mean age	Dyad UC SS (n=5; mean age 77; female n=2 [40%]) and CG (n=5; mean age	Pre-post	DCI, QLI-stroke, SUPPH, CES-D

				[40%]) and CG	76; female n=2		
				(n=5; mean age	[40%])		
				65; female n=2			
				[40%])			
Rodgers et al., 1999 ⁴²	UK	Hospital	Dyad (randomized SS n=204 and CG n=176)	Dyad Education and enhanced psychosocial support SS (n=121; median age 74; female n=62 [51%]) and CG (n=107; median age 58; female n=75 [70%])	Dyad UC Information and hotline phone number SS (n=83; median age 76; female n=45 [54%]) and CG (n=69; median age 60; female n=46 [67%])	Pre-post	HADS, Satisfaction Questionnaire
Shyu et al.,	Taiwan	Hospital and	Dyads	CG discharge	Dyads UC SS	Post	SF-36

2010 ⁴⁸		home-based	(randomized n=158)	preparation program SS (n=72; mean age 74; female n=44 [61%])	(n=86; mean age 74; female n=41 [48%])		
Smith et al., 2012 ⁴⁹	USA	Internet-based	Dyad, male SS (randomized SS n=38 and female CG n=38)	Dyad online information SS (n=15; mean age 60; female n=0 [0%]) and CG (n=15; M age 55; female n=15 [100%])	Dyad Limited online resources SS (n=17; mean age 59; female n=0 [0%]) CG (n=17; M age 55; female n=17 [100%])	Pre-post	CES-D, PHQ-9
van den Heuvel et al., 2000 ³⁷	The Netherlands	Home-based and community	CG (randomized n=212)	CG group education (n=110; mean	CG UC (n=42; mean age 61; female n=30	Pre-post	Utrecht Coping list, CSI, custom efficacy

				age 66; female [71%])			questionnaire
				n=82 [75%]) OR			
				CG home-based			
				stroke education			
				(n=60; mean age			
				63; female n=43			
				[73%])			
van den Heuvel et al., 2002 ³⁸	The Netherlands	Home-based and community	CG (randomized n=212)	CG group education (n=110; mean age 66; female n= 82 [75%]) or CG home-based stroke education (n=60; mean age 63; female n=42	CG UC (n=42; mean age 61; female n=30 [71%])	Pre-post	Utrecht Coping List

				[71%])			
Watkins et al., 2007 ²⁹	UK	Hospital and home-based	SS (randomized n=411)	SS Motivational interviewing (n=204; median age 70; female n=86 [40%])	SS UC n=207; median age 70; female n=85 [41%])	Pre-post	Yale Depression Screen
Wong et al., 2015 ³⁰	Hong Kong	Hospital and home-based	SS (randomized n=108)	SS Transitional care program (n=54; mean age 66; female n=34 [63%])	SS UC (n=54; mean age 72; female n=34 [63%])	Pre-post	CES-D-HK, WHO- QOL- SRPB

Figures

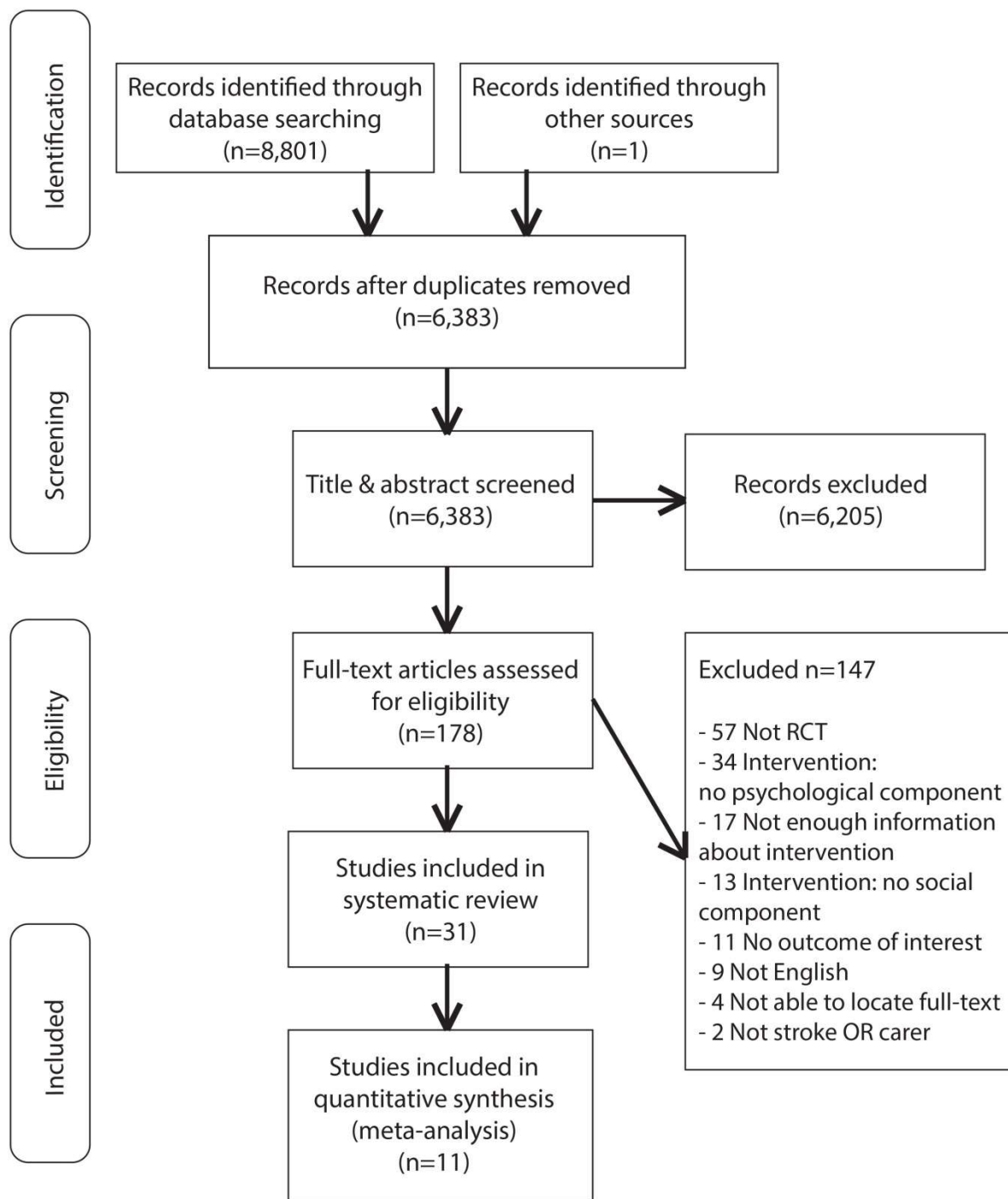


Figure 1. PRISMA flow diagram of included studies

	Random sequence generation	Allocation concealment	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Other bias
Alexopoulos et al., 2012	+	?	?	+	?	-
Bakas et al., 2009	+	+	+	-	?	+
Bakas et al., 2015	+	+	+	+	?	+
Bishop et al., 2014	+	?	+	+	?	+
Cheng et al., 2018	+	+	+	+	?	+
Clark et al., 2003	+	+	+	+	?	+
Draper et al., 2007	+	+	+	+	+	+
Ertel et al., 2007	+	+	+	+	?	+
Fang et al., 2017	?	?	?	-	-	?
Forster et al., 2015	-	?	+	+	+	?
Glass et al., 2004	+	-	+	+	?	+
Goldberg et al., 1997	+	?	?	?	?	?
Grant et al., 2002	?	?	+	+	?	?
Harrington et al., 2010	+	?	+	+	?	-
Hartke et al., 2003	?	?	?	-	?	?
Hoffmann et al., 2015	+	+	+	+	?	+
Inci et al., 2016	+	+	-	+	?	+
Johnston et al., 2007	?	?	+	+	+	?
Kendall et al., 2007	+	?	?	+	+	+
Larson et al., 2005	+	?	?	+	?	?
Markle-Reid et al., 2011	+	+	+	+	+	+
Mitchell et al., 2009	+	+	+	+	-	+
Ostwald et al., 2014	+	?	+	+	?	-
Robinson-Smith et al., 2016	?	?	?	?	?	-
Rodgers et al., 1999	-	?	?	+	-	-
Shyu et al., 2010	-	-	?	?	?	-
Smith et al., 2012	+	?	+	+	?	?
Van den Heuvel et al., 2000	-	?	?	?	?	-
Van den Heuvel et al., 2002	-	-	?	-	-	-
Watkins et al., 2007	+	+	?	+	+	+
Wong et al., 2015	+	+	+	+	?	+




 Low risk of bias
  High risk of bias
  Unclear risk of bias

Figure 2. Risk of bias

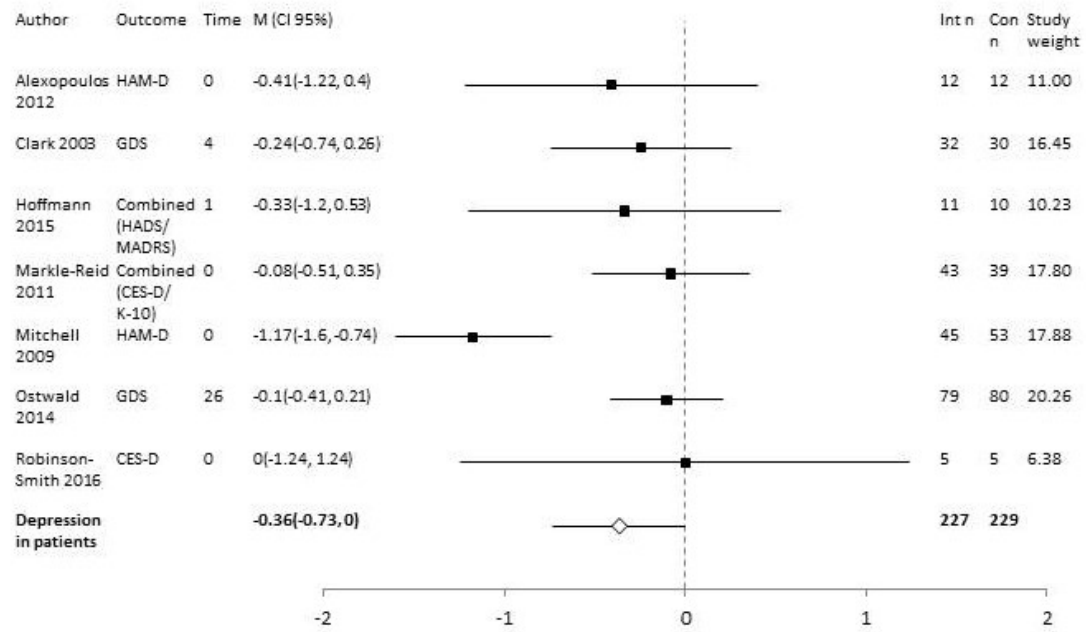


Figure 3. Forest plot - Interventions delivered to stroke survivors or dyads and depressive symptoms measured in stroke survivors

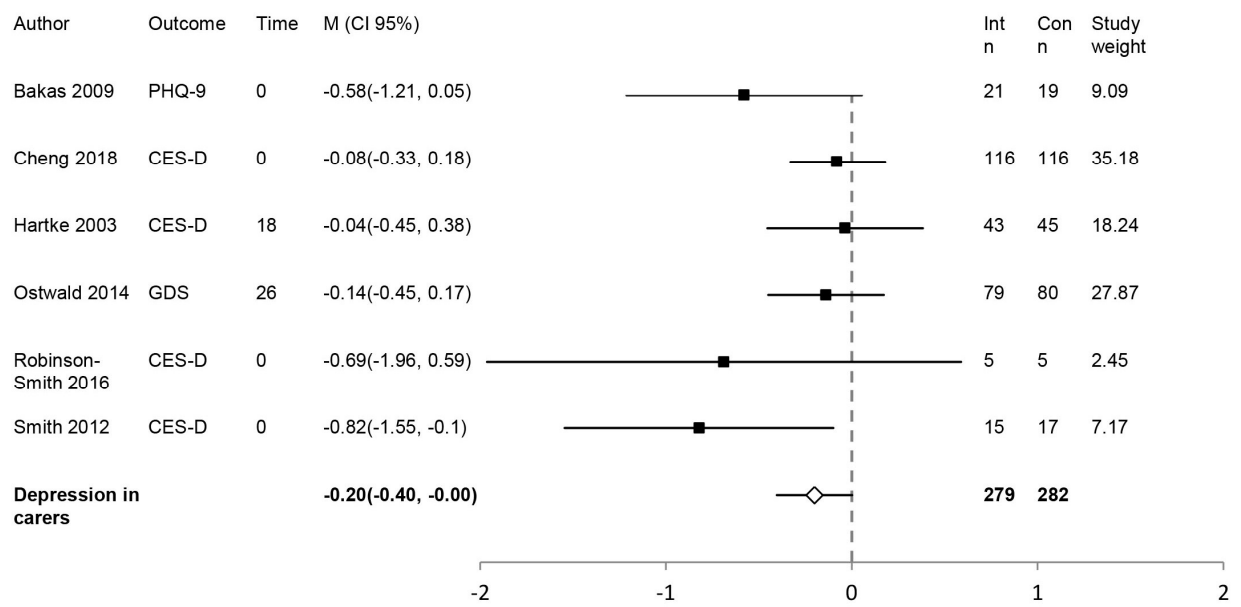


Figure 4. Forest plot - Interventions delivered to carers or dyads and depressive symptoms measured in carers

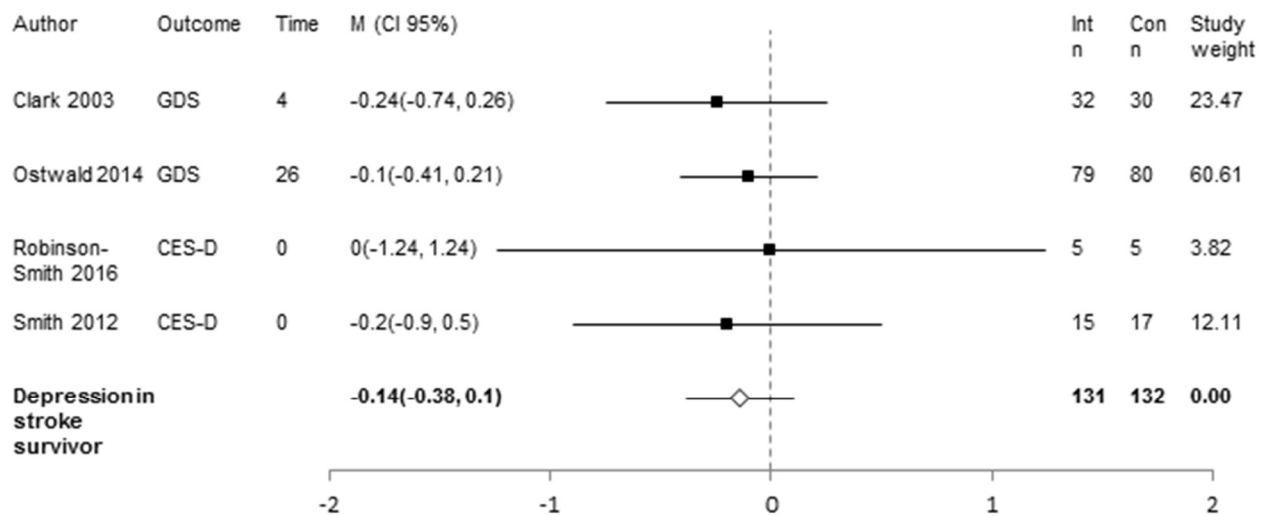
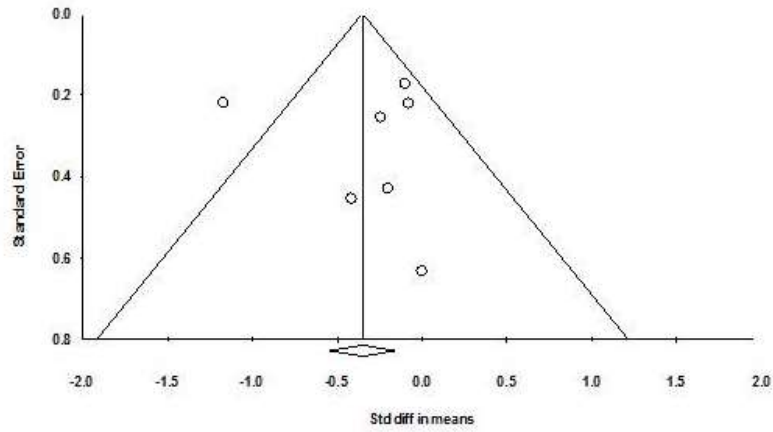
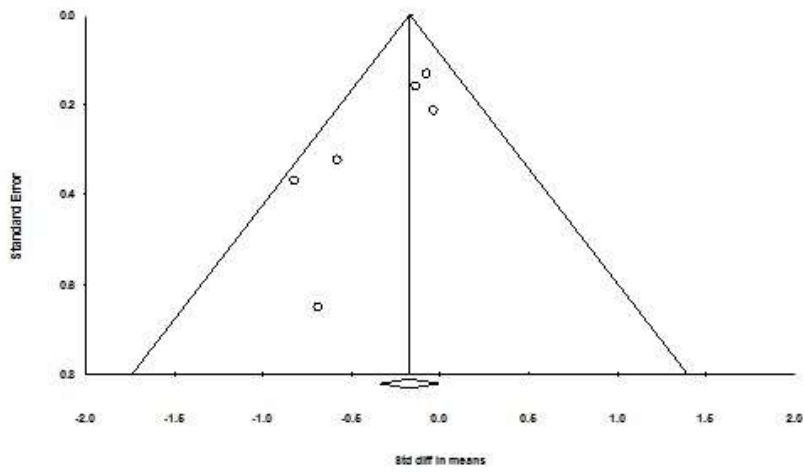


Figure 5. Forest plot - Interventions delivered to carers or dyads and depressive symptoms measured in stroke survivors

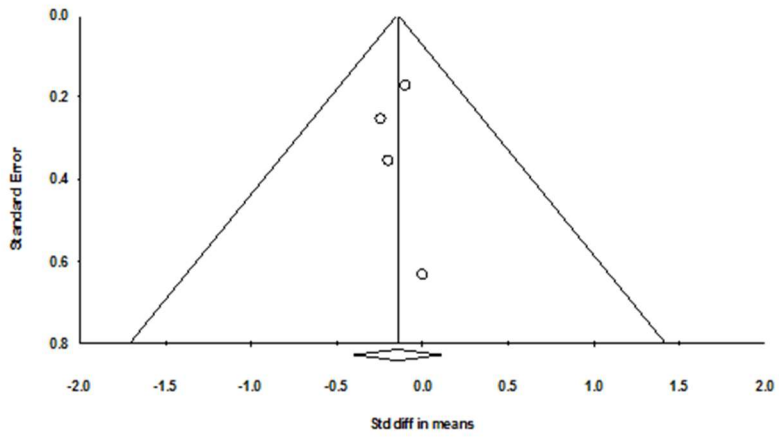
Supplementary Figure. Meta-analysis funnel plots



Supplementary Figure A. Funnel plot - Interventions delivered to stroke survivors or dyads and depressive symptoms measured in stroke survivors



Supplementary Figure B. Funnel plot - Interventions delivered to carers or dyads and depressive symptoms measured in carers



Supplementary Figure C. Forest plot - Interventions delivered to carers or dyads and depressive symptoms measured in stroke survivors