The effectiveness of mindfulness and acceptance based interventions for informal caregivers of people with dementia: a meta-analysis

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Abstract

Background and Objectives: The application of mindfulness and acceptance based interventions (MABIs) for informal caregivers of people with dementia (PwD) is relatively novel and the current state of the evidence base is unclear. This meta-analysis examined the effectiveness of MABIs on reducing symptoms of depression and burden in informal caregivers of PwD. The quality of included studies was evaluated and moderator variables explored.

Research Design and Methods: A literature search of six electronic databases (PsycARTICLES, PsycINFO, MEDLINE Complete, SCOPUS, Web of Science and ProQuest) was conducted from the first available date to the 20th December 2016. Inclusion criteria involved studies that quantitatively investigated the impact of MABIs on depression and/or burden in informal caregivers of PwD.

Results: Twelve studies, providing data on 321 caregivers, were included. Most used Mindfulness Based Stress Reduction and were conducted in the USA. The average attrition among participants was 15.83%. The pre-post effect of MABIs was large for depression and moderate for burden. These effects were largely maintained at follow-up. Significant heterogeneity of effect sizes was observed, with no significant moderators identified. Study quality varied from very poor to moderately good.

Discussion and implications: The low attrition and moderate to large effects suggest that MABIs are acceptable and beneficial for informal caregivers of PwD. The lack of significant moderators could advocate services using more cost-effective forms of MABIs. Further higher quality research is needed to improve the robustness of the evidence base and enable a meta-analysis to thoroughly examine and quantify moderator variables.

Keywords: carers; burden; depression; effects.

Introduction

There are an estimated 47 million people with dementia (PwD) worldwide and 9.9 million new cases each year (World Health Organization, 2017). The majority of PwD are community dwelling and cared for by an informal caregiver; someone that provides physical, emotional and/or practical support for a person, based on social connection or kinship (Schulz & Martire, 2004). Informal caregivers improve the quality of life of PwD, delay the need for institutional care and save international governments billions of pounds every year (Brodaty & Donkin, 2009).

The effects of being an informal caregiver are diverse and complex. Research has found that five times as many caregivers of people with dementia fulfil diagnostic criteria for major depressive disorder compared to the general population (Cuijpers, 2005). They are also likely to experience greater perceived burden and depressive symptoms compared to caregivers of people without dementia (e.g., Bertrand, Fredman & Saczynski, 2006; Pinquart & Sörensen, 2003). In this review 'burden' is conceptualised as the caregiver's perception of the degree to which the care-recipient is dependent upon them and their emotional health, physical health, social or financial status has declined as a result of the caring role (Zarit, Todd & Zarit, 1986).

There may be a number of reasons as to why these differences in emotional distress and burden have been observed. Practically, caregivers of PwD engage in a greater variety of care tasks, and a higher percentage provides 40 hours or more care per week compared to caregivers of people without dementia (e.g. Connell, Janevic & Gallant, 2001). Not only can this create employment complications and financial burden (Ory, Yee, Tennstedt & Schulz, 2000), but it could also impact upon the physical health of the caregiver and limit the amount of time the caregiver has for accessing support. In addition to this, due to the progressive

nature of the disease, caregivers of PwD have to face the reality that the intellectual and emotional reciprocity they share with their loved one will increasingly deteriorate (Bertrand et al., 2006). Moreover, aggressive behaviours have been shown to increase the likelihood of the caregiver experiencing significant depressive symptoms and burden (Ornstein & Gaugler, 2012). It is important to note that there continues to be some uncertainty about whether long-term caregiving increases the risk for psychological difficulties or leads to some degree of adaptation (Tremont, 2011).

In order to ensure the affordability of care for PwD in the future, the world Alzheimer's report recommended that the coverage of caregiver interventions be increased so as to lessen burden and delay and reduce rates of transition into care homes (Alzheimer's Disease International, 2013). The research and recommendation demonstrate the need for interventions to be effective at decreasing burden and depressive symptoms.

Previous reviews have focussed on psychosocial interventions; primarily support groups, psychoeducation and counselling. These have found minimal and highly inconsistent evidence for their effectiveness on reducing burden or depressive symptoms (e.g., Cooke, McNally, Mulligan, Harrison & Newman, 2001; Dam, de Vugt, Klinkenberg, Verhey & van Buoxtel, 2016). In regards to evidence-based psychological treatments, cognitive-behavioural therapy (CBT) has been the most researched, with findings revealing small effects on burden and moderate to large effects on depression (Pinquart & Sörenson, 2006; Gallagher-Thompson & Coon, 2007; Kinnear, 2012). Indeed, the National Institute of Clinical Excellence (NICE, 2006) state that:

"Carers of people with dementia who experience psychological distress and negative psychological impact should be offered psychological therapy, including cognitive behavioural therapy, conducted by a specialist practitioner" (NICE, 2006).

However, the guideline states that further research is needed to generate a better evidence base for its update (NICE, 2006). The promising findings of moderate to large effects of CBT on depression raise the question of whether such benefits could extend to the dissemination of other evidence based therapies such as mindfulness and acceptance based therapies. These approaches are receiving increased amounts of attention as potential treatments for various psychological difficulties including depression (e.g. Zettle, 2015). Moreover, given the small effect of CBT on burden, an investigation into the impact of other psychological approaches on this outcome is warranted.

The most established and evaluated mindfulness and acceptance-based interventions (MABIs) are mindfulness based stress reduction (MBSR; Kabat-Zinn, 1990), Mindfulness Based Cognitive Therapy (MBCT; Segal, Williams & Teasdale, 2002), Acceptance and Commitment Therapy (ACT; Hayes, Strosahl & Wilson, 1999) and Dialectical Behaviour Therapy (DBT; Linehan, 1993).

MBSR has a strong focus on the formal practice of mindfulness meditations. It was designed for people with chronic pain and stress related conditions, but has been shown to be effective for depression (Fjorback, Arendt, Ørnbøl, Fink & Walach, 2011). MBCT was developed from MBSR and adapted to clients at risk of depressive relapse. It focuses on mindfulness practices and attempts to build participants' awareness of and disengagement from depressogenic cognitive processes and promotes behaviour-change strategies. It has strong empirical support for reducing depressive relapse (Fjorback et al., 2011) and emerging support for active depression (Finucane & Mercer, 2006).

ACT is based on behavioural principles and aims to promote psychological flexibility. It facilitates detachment from rigid rules or self-critical thoughts and acceptance and kindness towards oneself, non-judgemental present-focused awareness of internal experiences, and the

discovery of what is most important to oneself and the establishment of larger patterns of effective action based on such values (Hayes et al., 1999). Mindfulness exercises are incorporated to enhance awareness and acceptance of thoughts and feelings. ACT has a strong evidence base for its effectiveness on depression (Zettle, 2015).

DBT is underpinned by a dialectical philosophy relating to the struggle of holding onto multiple "truths" (Linehan 1993). A key dialectic is balancing change and acceptance. DBT combines mindfulness with acceptance-based and cognitive-behavioural strategies focusing on facilitating interpersonal effectiveness, emotion regulation and distress tolerance. DBT was designed to treat suicidal women with self-injurious behaviours, but has been adapted for individual's experiencing significant depressive symptoms (Lynch, Morse, Mendelsen & Robins, 2003).

The four MABIs differ in their level of focus on mindfulness meditation, their duration and the extent to which behaviour change strategies are taught. However, these MABIs share a coherent conceptual and practical foundation that warrants combining these approaches within a quantitative review (e.g., Baer & Huss, 2008). Firstly, they have overarching principles of the conceptualization of the mind, mental suffering and psychotherapeutic cure; all proposing that unpleasant cognitions, emotions and sensations are a part of life (Baer & Huss, 2008). Secondly, all emphasise the need to synthesise change and acceptance and the potential harm resulting from excessive experiential avoidance (Baer & Huss, 2008). Lastly, all apply Buddhist principles and techniques within a psychological framework to enable people to change the way they relate to experiences and facilitate valued action in the face of distress (Gore & Hastings, 2016).

There are several findings that indicate the potential benefit of MABIs for caregivers of PwD. The main coping strategies these individuals engage in are 'wishing the problem

would go away' and 'blocking and concealing emotions'; both of which heighten depressive feelings (Williamson & Schulz, 1993). Spira et al. (2007) broadens these findings in discovering a high and significant association between depressive symptoms and experiential avoidance in familial dementia caregivers. Therefore fostering mindfulness and acceptance of internal states may help caregivers of PwD to notice their struggles and relinquish unhelpful coping strategies; enabling depressive feelings to reduce. Research has also revealed that many caregivers of PwD disengage from services due to difficulties accepting the diagnosis and negative beliefs about dementia (La Fontaine et al, 2016). This could advocate the use of approaches aimed at promoting acceptance and a non-judgemental stance. Krishnan, York, Backus and Heyn (2017) suggest that increasing acceptance in caregivers of people with neurodegenerative diseases may relieve caregiver burden. Finally, most MABIs are short-term in nature which may be particularly beneficial for caregivers of PwD as the added demand to find alternative care for PwD can lead to increased burden.

A review of meditation-based interventions for informal caregivers of people with varying forms and severities of dementia found tentative evidence that they improve depressive symptoms and burden (Hurley, Patterson & Cooley, 2014). However this included studies in which the primary intervention was the practice of mantram repetitions, based upon transcendental meditation or Kundalini Yoga Kirtan Kriya (e.g. Lavretsky et al, 2013). These practices are a distinct approach to meditation and not part of Buddhist-mindfulness (Shonin, Van Gordon & Singh, 2015). A recent systematic review concluded mindfulness-based interventions for informal palliative caregivers to be effective at reducing depression and burden (Jaffray, Bridgman, Stevens & Skinner, 2016). However, this included studies with caregivers of people without dementia. Given the experiential differences between caregivers of PwD and non-dementia caregivers, the conclusions of this review may not be reliably

generalised. Moreover, both reviews were qualitative in nature and neither quantified the size of the treatment effect.

The application of MABIs for informal caregivers of PwD is a novel field. In order to clarify the current state of the evidence base, provide a direction of future research and inform dementia care guidelines, an effect-size analysis was conducted with the following objectives:

(1) to quantify the size of the treatment effects of MABIs on depressive symptoms and burden in informal caregivers of PwD using the maximum available data.
(2) to assess the methodological quality of protocols used.
(3) to explore factors that may moderate intervention effectiveness including intervention duration, contact time, study quality, intervention type and level of adaptation.

Method

The meta-analysis adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA; Moher et al., 2009).

Eligibility Criteria

In accordance with the objective to use the maximum available data, the threshold for eligibility of study design criteria was not restrictive. Articles examining the pre and post or controlled effects of mindfulness and/or acceptance based interventions for informal caregivers of PwD were considered for analysis. This included randomized controlled trials (RCT), quasi-randomized controlled trials, controlled before and after studies and before and after studies. A study was classified as an RCT if individuals were prospectively assigned to one of two groups (one being the intervention) via a concealed randomization procedure. If a

study used a quasi-method of allocation or if a concealed randomisation procedure was suspected but not stated, it was classified as a Quasi-RCT. Studies where participants were allocated to one of two groups without concealed- or quasi-randomization were identified as controlled before-and-after studies. Inactive comparators (waitlist or treatment as usual; TAU) and active comparators (alternative interventions where the mode of delivery, content and design were described) were included. In order to reduce the risk of publication bias, published and unpublished articles were considered for analysis.

Recognized MABIs (MBSR, MBCT, DBT and ACT) in any duration or format were included. Studies that combined elements, or focused on a specific element, from these approaches were included; providing that at least 50% of the intervention was devoted to mindfulness or acceptance based principles or practices. Protocols that were not mindfulness or acceptance based including those that used other forms of meditation (e.g. transcendental, concentration or Kundalini Yoga Kirtan Kriya) were excluded.

The population studied were informal unpaid caregivers of individuals with dementia. Caregivers were not required to have scored above a clinical cut-off for depression or received a depression diagnosis. No limits were set on gender, age, setting or time spent as a caregiver. Studies that delivered the intervention to both caregivers and care-recipients were included; providing that data for both were reported separately. Studies involving caregivers of people without dementia were excluded.

Articles were included if they used validated outcome measures for depression and/or burden at baseline and post intervention. Studies were excluded if insufficient data was provided or data overlapped with another included study.

Information sources

Published articles were primarily identified by searching PsycARTICLES, PsycINFO, MEDLINE Complete, SCOPUS and the citation database Web of Science. Unpublished articles including dissertations and theses were sought through ProQuest. Hand searches were performed on the reference lists of included studies and relevant systematic reviews and meta-analyses obtained via The Cochrane Online Library. All databases were searched from their inception to 20th December 2016.

Search

The search was performed by the first author. The key terms (Table 1) were searched for in the title of articles of all databases. No limits were applied to language. Foreign papers were translated into English.

Study selection

Search results were merged using EndNote software (version X8.0) and duplicate articles removed. Eligibility assessment was performed in a non-blinded manner. The initial screening of titles and abstracts was undertaken by the first author, whereby clearly irrelevant articles were excluded. One Spanish article was translated by a Research Associate, who was fluent in Spanish and English and had published dementia research. Full text articles were screened by both authors independently using a structured checklist. The kappa coefficient was 0.59 indicating moderate agreement (Cohen, 1960). Disagreements between reviewers were resolved through discussions. It was unclear whether two studies met eligibility criteria and study authors were contacted for clarification.

Data collection process

The first author developed an electronic database which was pilot tested on a randomly-selected study by both authors collaboratively and refined accordingly. In order to reduce errors and minimise bias, data extraction was conducted on three randomly-selected

studies by both authors independently and results compared, with no discrepancies identified. The first author independently continued to extract data from the remaining studies. Where data was missing or unclear, study authors were contacted. Data was transferred to the Comprehensive Meta-Analysis software (CMA version 3; Borenstein, Hedges, Higgins, & Rothstein, 2005).

Data items

Data was extracted from each study based on the (1) characteristics of the trial (publication year, country, recruitment process, design, time points measures were taken, sample size at all time points and whether intent-to-treat analysis was used, job title of facilitator, outcome measures, and follow up time in weeks); (2) characteristics of the intervention (intervention type, manual-based, adaptation level, length of session in minutes, number of sessions, day long retreat, total contact time and format); (3) characteristics of the control group, in controlled studies (sample size, mean age, type of control and type of treatment); (4) characteristics of the participants (mean age, age range, attrition, percentage female, average time spent as caregiver, relationship to patient, and the form of dementia the patient had and diagnostic procedure); (5) depression and caregiver burden outcome data (means, standard deviations, p values and correlations). The intervention type was defined according to the primary MABI used, unless the intervention appeared to be an equal combination of two or more MABIs and was classed as a 'multi-component MABI'. An intervention was deemed 'adapted' when the study authors stated that it had been tailored to suit the needs of informal caregivers of PwD (e.g., discussing concepts within the context of caregiving). If the authors did not explicitly state this then the intervention was classed as 'non-adapted'. One study provided outcomes from three subscales of a burden measure (Whitebird et al, 2012). The data from the subjective demand burden subscale was extracted as this seemed most similar to the burden measures used in the other included studies.

Information was not inputted if it was missing or unclear and not made available by study authors. There were two exceptions to this, where two studies did not clarify the day retreat length. These used a MBSR approach and it was assumed that the length of the retreat was that of the standardized program. Total contact time was calculated by multiplying session length by number of sessions and adding this to the length of the day retreat (if applicable). If a study included more than one control condition the data from the inactive condition (waitlist and TAU) was extracted. This was the most common comparison condition across the studies and it was deemed more important to evaluate the effectiveness of the intervention relative to its absence/treatment as usual (Hollon & Wampold, 2009).

Risk of bias in individual studies

A modified version of the RCT of Psychotherapy Quality Rating Scale (RCTPQRS; Kocsis et al., 2010) was used to calculate a score of and assign a qualitative description to the quality of included studies (see supplementary material). The assesses 24 areas of study quality, including a description of individuals screened, included and excluded, the intervention, and adequacy of the sample size. A value of 0, 1 and 2 is assigned for each item, with an available total score of 48. The tool has been shown to have good internal reliability, internal consistency (Gerber et al., 2011) and external validity (Kocsis et al., 2010). The modified scale was pilot tested on a randomly selected study by both authors collaboratively and refined accordingly. Three randomly-selected studies were rated by both authors independently and results compared. Very few discrepancies were noted. These were resolved by choosing the most conservative score given on an item. The remaining studies were assessed by the first author independently.

Summary measures

Meta-analyses were conducted by computing Hedge's *g* (Hedge's & Olkin, 1985) in depression and burden outcomes using CMA.

Synthesis of results

Effect sizes (Hedge's *g*), their 95% confidence intervals (CI) and associated *z* and *p* values were computed using means and standard deviations when available. The effect sizes for one study were calculated using the p value. For pre-post intervention effect sizes, when the correlations between pre- and post-measures were not available, a conservative estimate (r=0.7) recommended by Rosenthal (1993) was used. To calculate the mean effect size (Hedge's *g*) for a group of studies, individual effect sizes were pooled using a random-effects model as the studies within each meta-analysis were not identical (e.g. did not have identical interventions). The mean Hedge's *g* and its 95% confidence interval (95% CI) were computed. To assess for heterogeneity among studies in each group, the chi squared statistic (Q; Higgins & Thompson, 2002) and I squared statistic (I^2; Higgins, Thompson, Deeks & Altman, 2003) were computed. I^2 provides a percentage of the total observed variability in effect estimates that is due to heterogeneity rather than to chance and is not affected by low statistical power. An I^2 of 25% is considered low, 50% moderate and 75% high (Higgins et al., 2003).

Risk of bias across studies

To assess publication bias, funnel plots were constructed and the trim and fill method (Duval & Tweedie, 2000a) used to estimate how many studies could be missing from each meta-analysis, correct the funnel plot symmetry, and calculate adjusted effect size estimates. Rosenthal's Fail Safe N (Rosenthal, 1979) was calculated to determine how many studies averaging a null result would be needed to reduce overall treatment effects to non-significance. If only a few studies are required to nullify the observed effect (e.g. five or ten), it may not be robust (Borenstein, Hedges, Higgins & Rothstein, 2009).

Additional analyses

Random-effects meta-regression was conducted to investigate the relationship between intervention duration (no. of sessions), contact time (minutes), study quality and the pooled effect sizes, and mixed-effects sub-group analysis to determine whether effect sizes differed according to level of adaptation and intervention type. These analyses were performed on pre-post effect sizes when data from at least eight studies were available (Higgins & Thompson, 2004). A sensitivity analysis was conducted to determine the robustness of findings and whether conclusions would have differed substantially if a study that included caregivers of people without dementia (Epstein-Lubow et al., 2011) was omitted.

Results

Study selection

The database searches resulted in 8041 articles (Fig. 1). After the removal of 3643 duplicates, the first author examined 4398 titles and abstracts and excluded 4370 articles. The full texts of the remaining 28 studies were screened, with 16 not fulfilling criteria and 12 studies included in the meta-analysis (Table 2). One study that recruited frail elderly caregivers (Epstein-Lubow, McBee, Darling, Armey & Miller, 2011) included two caregivers of people without dementia; however, as the majority of participants (77.8%) were caregivers of PwD, the authors decided to include this study. The hand searching of included studies and relevant reviews from The Cochrane Library did not yield any new articles.

Study characteristics

Table 2 presents the summary data for the 12 identified studies. The total number of participants was 321 (treatment = 207; control = 114). Ten studies reported the sample

genders; one was predominantly male (38% female) and nine predominantly or all female (80 to 100%). Ten studies reported the mean age; ranging from 56.20 (SD = 7.70) to 71.60 (SD = 6.10). The average attrition among participants was 15.83%. Only four studies reported the diagnosis of the cared person and only three the procedure used to diagnose the condition. Of the four that reported the diagnosis, the majority had an Alzheimer's disease diagnosis - ranging from 53% to 100% of the sample. Three studies reported the average amount of months spent caregiving (see Table 2).

There were five pre-post design studies and seven active/waitlist/TAU controlled studies. Interventions were predominantly MBSR (n = 6), followed by studies using one primary MABI (MBSR or MBCT) and incorporating elements from others (n = 2). The four remaining studies were MBCT, ACT, DBT and a 'multi-component MABI' (mindfulness practices combined with ACT metaphors). The ACT intervention was delivered in an individual format, and all others used a group format. Study durations ranged from 4-10 sessions and overall contact time from 240 to 1740 minutes. Eight studies were classed as using adapted interventions; a description of the adaptations used is described in Table 2. Various measures were used for depression and burden and are detailed in Table 2.

Risk of bias within studies

The total RCTQRS scores ranged from 8 (very poor) to 30 (moderately good), with a mean of 16.5 (SD = 8.70) and median of 13.50 (Table 2). Only one study demonstrated a check that the treatment studied was the treatment being delivered; through supervision and a measure of treatment receipt. The follow-up periods ranged from 1 to 12 months. Three studies provided a full description of drop outs or withdrawals. Of the seven controlled studies, two employed intent-to-treat (ITT) analysis and three provided full reports of appropriate randomization procedures.

Results of individual studies

Fig. 2 and Fig. 3 show forest plots of pre-post effect sizes (Hedge's *g*) for burden and depression, including 95% confidence intervals (CI) and associated *z* and *p* values. Pre-follow-up depression and burden effect sizes and post-intervention between-group depression effects can be seen in Table 3. Post-intervention between-group effects for burden were not analysed due to the limited number of controlled studies using this measure.

Synthesis of results

Effects on depression

11 studies included pre-post measures of depression. These effect sizes varied from small (*g* = 0.22) to large (*g* = 1.18; fig 2). Overall, MABIs had a large effect on depressive symptoms pre- to post-intervention (*g* = 0.98; 95% CI 0.68 to 1.27, p <.001). However, the heterogeneity of these effect sizes was high (I^2 = 78.79%, Q = 47.15). Eight studies included depressive outcomes at follow-up; effect sizes ranged from a small negative effect (g = -0.04) to a very large positive effect (*g* = 2.51) with a medium mean effect size (*g* = 0.71, 95% CI 0.41 to 1.01, p <.001). However, heterogeneity of effect sizes was high (I^2 = 74.51, Q= 27.47). Seven controlled studies included depression measures; effect sizes compared to controlled conditions ranged from small (*g* = 0.29) to large (*g* = 1.80) with an overall large effect (*g* = 0.92, CI 0.64 to 1.20, p <.001).

Effects on Burden

Eight studies included pre-post burden measures. These effect sizes ranged from small (*g* = 0.30) to large (*g* = 1.18; fig 3), with a medium mean effect size (*g* = 0.66, CI 0.42 to 0.90, p <.001). However, heterogeneity of effect sizes was moderate (I^2 = 64.04, Q = 19.47). Seven studies included pre-follow-up burden outcomes. Effect sizes varied from small (*g* = 0.42) to medium (*g* = 0.76). The pre-follow-up mean effect of MABIs on burden was medium (g = 0.53, CI 0.39 to 067, p <.001), with no significant heterogeneity of effect sizes (I^2 <.001, Q = 1.50).

Risk of bias across studies

Studies on depression

The mean pre-post effect size corresponded to a z value of 13.85 (p<.001) indicating that 539 studies with a null effect size would be needed before the combined two-tailed p-value would exceed 0.05, suggesting that the observed effect sizes may be robust. The trim and fill method indicated one potentially missing study that would need to fall on the left side of the mean effect size to make the plot symmetrical (Fig 4). Assuming a random-effects model, the new mean effect size reduced to Hedge's *g* = 0.91 (95% CI 0.61 to 1.21). The pre-follow-up effect size corresponded to a z value of 9.19 (p<.001) indicating that 168 studies with a null effect size would be needed to nullify the results. The trim and full method indicated two potentially missing studies that, if imputed under a random-effects model, would decrease the mean Hedge's g to 0.53 (95% CI 0.20 to 0.86). The post between-groups intervention effect size corresponded to a z value of 7.23 (p<.001) indicating 89 studies with a null effect size would be needed to nullify these results. The trim and fill method suggested one potentially missing study that, if imputed using a random-effects model, would decrease the mean effect size to Hedge's g = 0.85 (95% CI 0.54 to 1.17).

Studies on burden

The mean pre-post effect size corresponded to a z value of 8.75 (p<.001) indicating that 152 studies with a null effect size would be needed before the combined two-tailed p-value would exceed 0.05, suggesting that the observed effect sizes may be robust. The trim and fill method suggested no missing studies (Fig 5). The pre-follow-up effect size corresponded to a z value of 7.06 (p<.001) indicating that 84 studies with a null effect size would be needed to nullify the results. The trim and full method indicated one potentially missing studies that, if imputed using a random-effects model, would decrease the mean Hedge's g to 0.51 (95% CI 0.37 to 0.65).

Additional analysis

Meta-regression results

Regression coefficients were computed to investigate the differential effects of potential moderators on depression and burden pre-post effect sizes. The association between intervention duration and depression effect sizes approached significance (0.33, 95% CI -0.03 to 0.69, p = .075). There was a lack of relationship between contact time and depression effect sizes (0.0004, 95% CI -0.0005 to 0.001, p = .374), and study quality and depression effect sizes (0.01, 95% CI -0.03 to 0.05, p = .601). No significant associations were found between burden effect sizes and intervention duration (0.02, CI -0.17 to 0.17, p = 0.983), contact time (0.002, CI -0.008 to 0.005, p = .618), or study quality (0.004, CI -0.04 to 0.03, p = .827).

Sub group analysis

Adapted interventions did not significantly differ in effectiveness on depression (p = 0.216) or burden (p = 0.776) to non-adapted interventions. After removing data for the ACT, DBT and multi-component MBAI (as each had 1 study), a sub-group analysis was performed comparing MBSR to MBCT finding no evidence that the impact on depression differed between these interventions (p = 0.685). Due to the limited number of studies and lack of sub-groups, analysis was not possible for burden outcomes.

Sensitivity analysis

All mean pre-post and pre-follow-up depression and burden effect sizes marginally increased, but remained within their qualitative descriptor (small, medium or large), bar the mean pre-follow-up depression effect size which increased from a medium to large effect (*g* = 0.71 to *g* = 0.81). The analysis found no deviations from the main analysis in terms of heterogeneity or significance of effect sizes.

Discussion

This appeared to be the first meta-analysis to explore and quantify the effects of MABIs on levels of depression and burden in informal caregivers of PwD. Twelve studies of varying research designs, providing data on 321 caregivers of diverse ages, were included in the analysis. The most promising finding of the review was that MABIs were largely effective at reducing levels of depression in informal caregivers of PwD from pre-to-post intervention. This effect decreased at follow up, moving into the medium effect size range; indicating that the gains lessened, but on the whole maintained over time. These results were very robust in the context of publication bias. Although there were fewer studies included in the analyses of post-intervention between group effects of controlled and MABI interventions, a significant difference in depressive symptoms with large effect was found. This suggests that MABIs have a large effect on depressive symptoms compared to control conditions; although this finding may not be robust in terms of publication bias. Although the large effect is a similar finding to that of CBT on depressive symptoms in Pinquart and Sörenson (2006), when compared with the result of Kinnear (2012), it indicates that MABIs may be more beneficial for reducing depressive symptoms. However, this is interpreted with caution due to the variance in methodologies across reviews.

The meta-analyses discovered that MABIs have a moderate effect on reducing burden in caregivers of PwD pre-to-post intervention; a finding that was very robust in the context of publication bias. Although the effect at follow-up may not be as reliable given the outcome of Rosenthal's fail safe *N*, it did suggest that gains were maintained over time. Unfortunately a comparison of the between group effect of burden for controlled studies was not conducted due to the limited number of studies that employed this measure. However, given that CBT has been found to have small effects on burden (e.g. Kinnear, 2012), the moderate effect found in the current analysis could indicate MABIs to be viable alternatives to CBT.

In addition to the findings demonstrating the effectiveness of MABIs on reducing depressive symptoms and burden, the average attrition among participants was relatively low (15.83%); lower than the expected rate for adults engaging in a psychological intervention (Swift & Greenberg, 2012). This demonstrates that MABIs are acceptable for this population. It is possible that the low attrition is linked to the underlying mechanisms of change within MABIs. As previously discussed, a strong association has been found between experiential avoidance and depressive symptoms in caregivers of PwD and the engagement of caregivers in services has been linked to a struggle with acceptance of the diagnosis and negative beliefs about dementia (La Fontaine et al., 2016). Therefore caregivers of PwD may be more likely to continue a therapy that reduces experiential avoidance, increases acceptance of internal and external experiences, and develops a non-judgemental stance.

Limitations

The meta-analysis found that for all effect sizes, apart from the pre-follow up burden effect, there was significant moderate to high heterogeneity. This suggests that the effects are not similar across studies and any conclusions drawn are limited by this fact. Sub group analysis of intervention type was extremely limited due to the small number of included studies and lack of sub groups. Most studies used an MBSR intervention, followed by MBCT. A comparison of MBSR to MBCT for effectiveness on depressive symptoms revealed no significant difference. The heterogeneity was also not explained by the intervention duration, contact time, study quality or level of adaptation. However, it is possible that the moderator analyses lacked power to detect significant differences. The factors contributing towards the heterogeneity among pre-post effect sizes for depressive symptoms therefore remains unknown. It is important to note however that heterogeneity was low and non-significant among the post depressive symptoms between-group effects, suggesting that the variation in these effects is not greater than what would be expected by chance. Given that the studies

varied in contact time, intervention duration and level of adaptation, the lack of heterogeneity among these effect sizes may tentatively indicate the appropriateness of healthcare providers delivering cost effective forms of MABIs; lower-dose and derived from a standardised manual.

Another limitation of the meta-analysis was the quality of included studies. Although study quality was not a significant moderator for the effectiveness of MABIs, overall study quality was relatively poor. The majority of the sample sizes within the included studies were small. There was a lack of RCTs, thus the current meta-analysis did not focus solely on RCTs, and only two of these employed ITT analysis. Many studies also failed to provide a full description of the diagnoses of the care-recipient and diagnostic procedure. Therefore the review cannot reliably state that all of the caregivers were caring for someone with dementia, given that some may not have received a formal diagnosis. However what was most apparent was a consistent lack of treatment adherence measurement.

The meta-analysis also only examined depression and burden outcomes. It therefore cannot provide evidence for the effectiveness of MABIs on other outcomes such anxiety, which has been found to be highly prevalent in caregivers of PwD (Cooper, Balamurali & Livingston, 2007). The decision to focus on depressive symptoms and burden was based upon the prevalence of these difficulties in dementia caregivers, the recommendations of the World Alzhiemer's report (Alzheimer's disease International, 2013) and the limited number of MABIs that measured outcomes such as anxiety.

Conclusion and future directions

The meta-analysis discovered that the average attrition of participants was relatively low, indicating that MABIs are acceptable for this population. The findings revealed that MABIs are largely effective at improving symptoms of depression, and moderately effective at reducing burden in informal caregivers of PwD. Moderate to significant heterogeneity was

observed in almost all effect sizes. Unfortunately, the study did not find significant moderator variables to account for these observations. This may suggest that variables not assessed were contributing towards heterogeneity, and/or that the analyses were underpowered. The results warrant further research, using more rigorous methodology into the effectiveness of MABIs for informal caregivers of PwD. In particular, to improve the reliability of findings, future studies should strive to include the diagnoses of the individuals with dementia and the procedure/s used to ascertain these. The use of more robust methodologies could enable a future meta-analysis to thoroughly explore and quantify moderator variables in order to establish optimization of MABIs for informal caregivers of PwD. Finally, the majority of included studies involved a female dominated sample; although this is representative of the current demographic (Alzheimer's Research UK, 2015) and in fact of caregivers of individual's with other neurological conditions (e.g. Krishnan et al., 2017), it may be helpful for future research to explore the impact of MABIs for male caregivers of PwD specifically.

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Table 1. Search strategy and key terms

Concepts	Search terms
Type of intervention[1]	'Mindfulness' OR 'mindfulness-based' OR 'meditation' OR 'mindfulness based' OR 'MBSR' OR 'MBCT' OR 'acceptance' OR 'acceptance-based' OR 'acceptance based' OR 'acceptance and commitment therapy' OR 'ACT' OR 'DBT' OR 'dialectical behaviour therapy'
Type of participants[2]	'Dementia' OR 'Alzheimer's' OR 'Frail Elderly' OR 'cognitively impaired' OR 'caregiver' OR 'carer' OR 'care' OR 'caring' OR 'caregiving' OR 'family caregiver' OR 'family carer' OR 'informal caregivers' OR 'informal carer'
Combined	1 AND 2

Note: PsychARTICLES, PsychINFO, MEDLINE Complete were limited to journals, academic journals and dissertations, and SCOPUS search to articles and reviews.

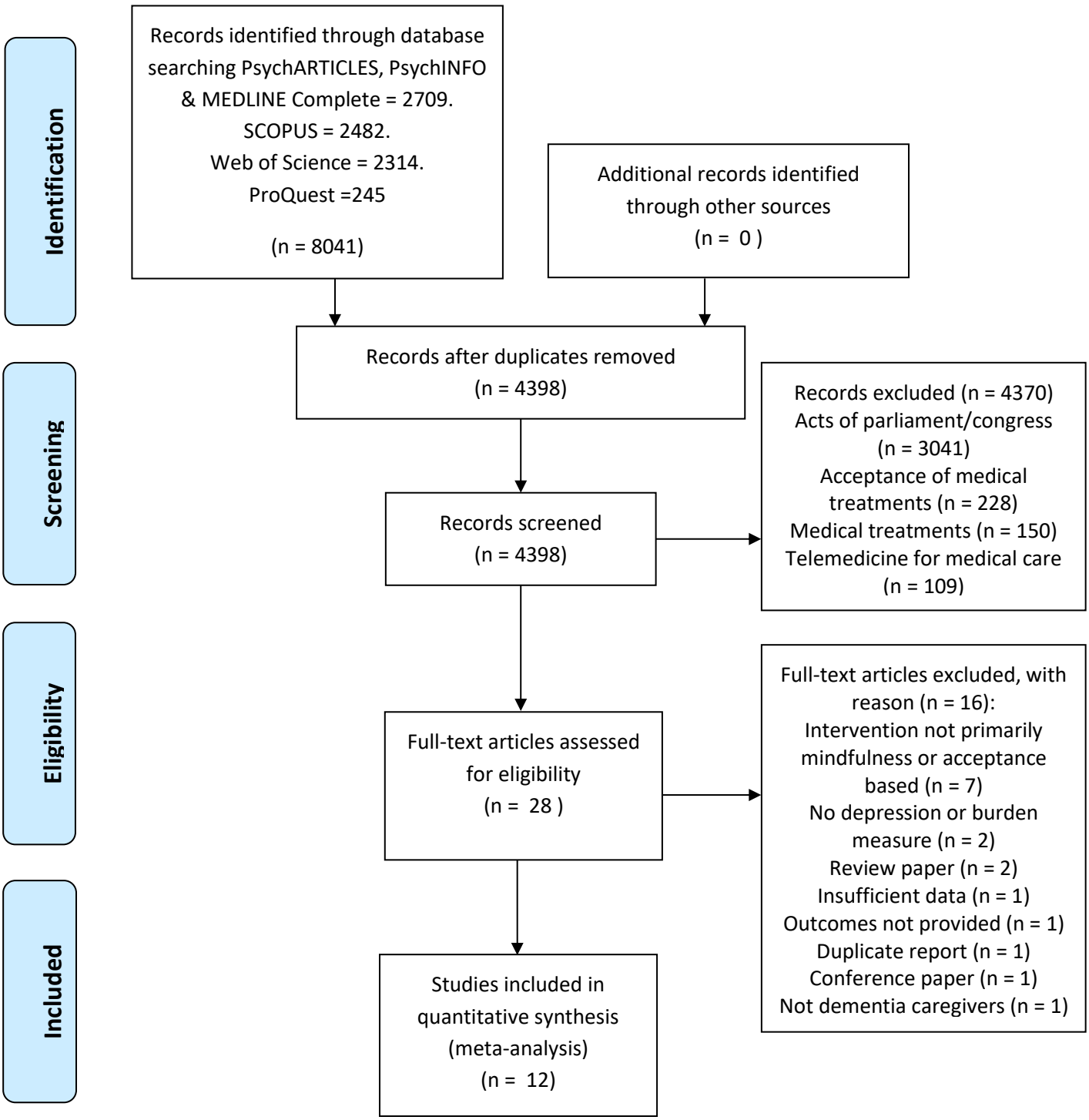

Fig.1. PRISMA flowchart of information from identification to inclusion of studies

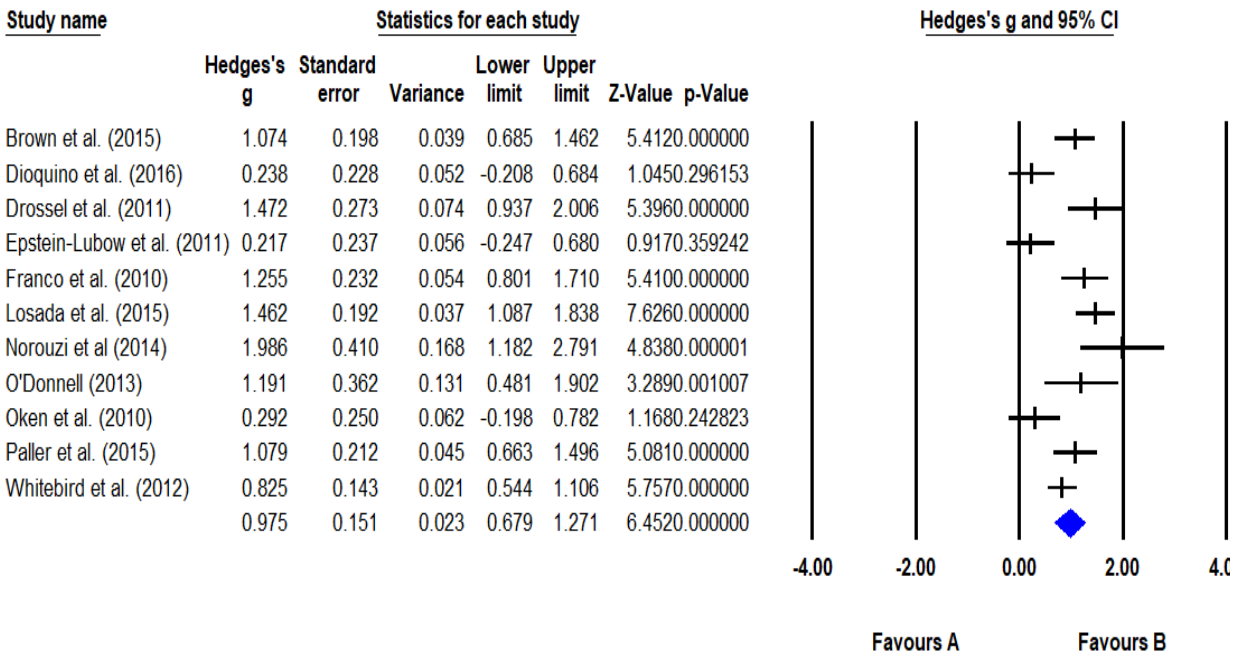

Fig 2. Pre-post effect sizes (Hedge's *g*) derived from studies examining the efficacy of mindfulness and acceptance based interventions for dementia caregivers – depression.

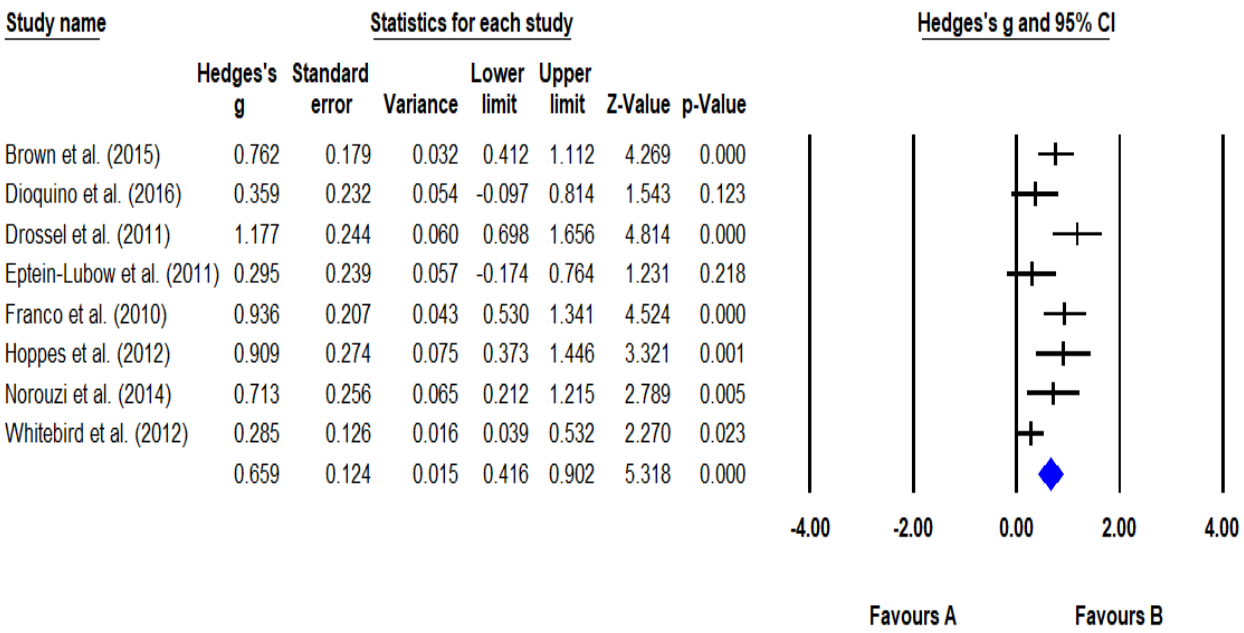

Fig 3. Pre-post effect sizes (Hedge's *g*) derived from studies examining the efficacy of mindfulness and acceptance based interventions for informal caregivers of PwD – burden.

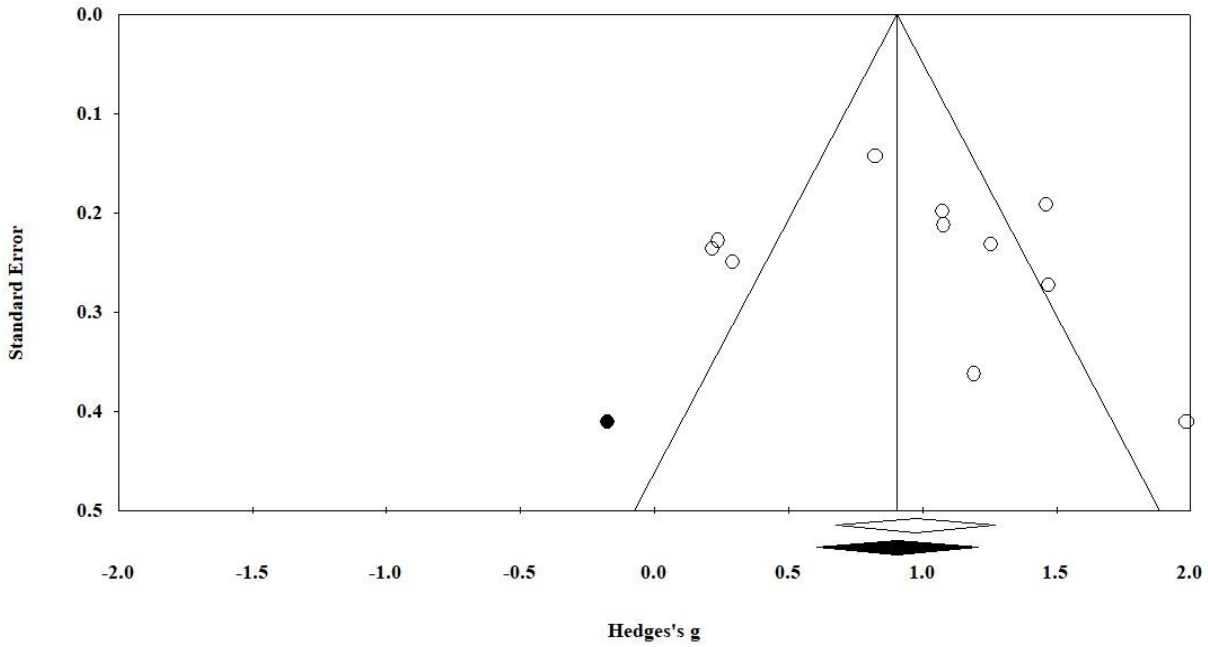

Fig 4. Funnel plot of Hedge's g pre-post depression effect sizes by standard error

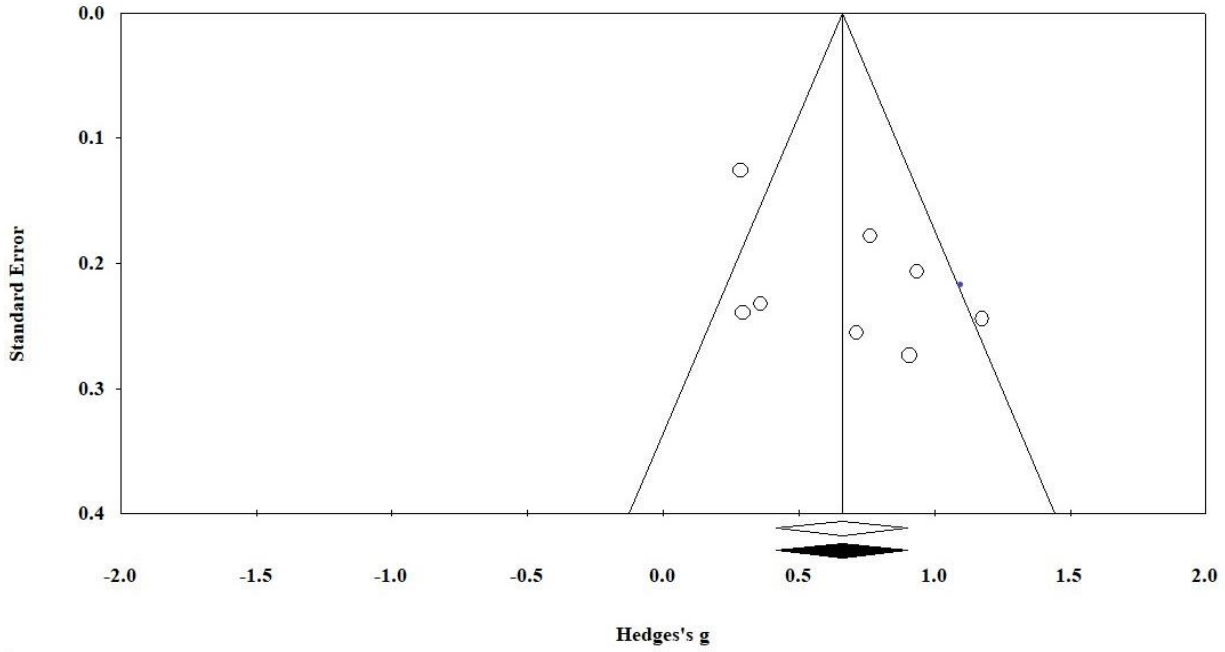

Fig 5. Funnel plot of Hedge's g pre-post burden effect sizes by standard error

Table 2: Key characteristics of included studies

Authors	Country	Study design	Recruitment Process	Relationship to care-recipient	Type and severity of dementia	Tool for dementia diagnosis	Intervention
Brown, Coogle and Wegelen (2015)	USA	RCT	Media, radio ads, posters and flyers disseminated at local Alzheimer's Association support groups and public community locations.	Spouse 52.17% Child 47.83%	Early stage Alzheimer's disease or other dementia	Stage 5 or lower on the FAST (Reisberg, 1988)	MBSR
Dioquino, Manteau-Rao and Madison (2016)	USA	BA	Recruited from among companions of dementia patients at a brain health centre by word-of-mouth and an advertising flyer.	Spouse 70% Child 30%	N/A	N/A	MBSR
Drossel, Fisher and Mercer (2011)	USA	BA	Referrals from dementia caregiver's individual therapists at a community clinic servicing PwD and their family.	Spouse 26.67% Child 73.33%	Unknown (moderate to severe cognitive impairment)	Physical and neurological assessments by neurologists.	DBT

Epstein-Lubow, McBee, Darling, Armey and Miller (2011)	USA	BA	A diverse nursing home and home care clinical setting.	Spouse 22.22% Child 77.78%	N/A	N/A	MBSR
Franco, Sola and Justo (2010)	Spain	Quasi-RCT	Recruited through the University of Almería	N/A	Alzheimer's Disease	N/A	Mindfulness meditation and ACT metaphors
Hoppes, Bryce, Hellman and Finlay (2012)	USA	BA	E-mail, presentations to support groups for caregivers, and invitations to caregivers at an adult day-services centre.	Spouse: 63.64% Child: 36.36%	N/A. Some had "advanced dementia"	N/A	MBSR

Losada et al. (2015)	Spain	RCT	Social and Health Care Centers as well as through Internet advertisement	Spouse 48.89% Child: 42.22% Relative 8.89%	Alzheimer's Disease 75.6%	N/A	ACT
Norouzi, Golzariand Sohrabi (2014)	Iran	Quasi-RCT	Referrals from the local Alzheimer's Association.	N/A	N/A	N/A	MBCT
O'Donnell (2013)	USA	Quasi-RCT	Magazine/newspaper advertisements, newsletters, presentations to caregiver support groups, retirement communities, and local chapters of Alzheimer's/Parkinson's disease societies	Majority spouses	32.14% Alzheimer's Disease 17.86% Mixed Dementia 25% Mild cognitive impairment 21.43% undiagnosed dementia 4.55% Lewy Body Dementia	N/A	MBSR
Oken et al. (2010)	USA	RCT	N/A	Spouse 70.00% Child 30.00%	N/A	N/A	MBCT with MBSR components

Paller et al. (2015)	USA	BA	University Alzheimer's Disease Center, local advertisements, and word of mouth.	Spouse 65.00% Child 25.00% Relative 10.00%	Alzheimer's neuropathology 52.94%, mild cognitive impairment related to Alzheimer's Disease 11.76%, multiple strokes 11.76%, memory complaints without a diagnosis 17.65 %, frontotemporal dementia 5.88%	National institute on aging-Alzheimer's association workgroups on diagnostic guidelines for Alzheimer's disease (Albert et al., 2011).	MBSR (with DBT and ACT components)
Whitebird et al. (2012)	USA	RCT	A health plan and its clinics, community outreach, paid advertising (i.e., print and radio ads), press coverage, and word of mouth	Spouse, sibling and friend 32.60% Child 68.40%	N/A	N/A	MBSR

Table 2 continued Key characteristics of included studies

Study Name	Level of adaptation to intervention	Comparator	Duration (no. sessions)	Contact time (minutes)	Follow-up (months)	Outcome measures		Quality (Descriptor)
						Depression	Burden	
Brown, Coogle and Wegelen (2015)	Adapted: discussions of caregiving; adjustments to mindfulness exercises to accommodate physical limitations.	Alzheimer's support group	8 (+ 1 day retreat)	1200	3	POMS-depression	ZBI	26 (average)
Dioquino, Manteau-Rao and Madison (2016	Adapted: each session included a lecture on dementia or applying mindfulness with PwD e.g. "Aikido of dementia communication"	N/A	7 (+ 1 day retreat)	1200	6	PHQ-9	ZBI short form	8 (very poor)
Drossel, Fisher and Mercer (2011)	Adapted: discussions of caregiving; adaptation of Interpersonal Skills Training to guide effective communication in dementia.	N/A	8	1200	N/A	CES-D	CBI	17 (moderately poor)

Epstein-Lubow, McBee, Darling, Armey and Miller (2011)	Adapted: Discussions of caregiving; applying training to stressful caregiving experiences; reduced session length and amount of home-practice. No extended 6-hr class; addition of lovingkindness meditation.	N/A	8	600	1	CES-D	ZBI	8 (very poor)
Franco, Sola and Justo (2010)	Non-adapted	Waitlist	10	1050	4	SCL-90-R	ZBI Spanish version	9 (very poor)
Hoppes, Bryce, Hellman and Finlay (2012)	Adapted: recognizing caregivers may have limited time for stress management, MBSR delivered at a 'lower-dose'	N/A	4	240	1	N/A	ZBI short form	10 (very poor)
Losada et al . (2015)	Adapted: a focus on unchangeable dementia-related behaviours/situations; values involved in caregiving; metaphors and mindfulness tailored for caregivers of PwD.	Support group/ workshop	8	720	6	CES-D	N/A	30 (moderately good)

Norouzi, Golzariand Sohrabi (2014)	Non-adapted	Waitlist	8	1200	2	HRSD	CBI	8 (very poor)
O'Donnell (2013)	Non-adapted	PMR group	8 (+ 1 day retreat)	1740	2	GDS	N/A	24 (average)
Oken et al. (2010)	Dementia caregiving adapted	Respite-only	7	630	N/A	CES-D	N/A	23 (average)
Paller et al. (2015)	Adapted: recognizing the potential burden of being separated from PwD, session length reduced from 2 hr to 1.5 hr. First session was purely dementia psychoeducation.	N/A	8	720	N/A	GDS	N/A	9 (very poor)

Whitebird et al. (2012)	Non-adapted	Education and support group	8 (+1 day retreat)	1500	6	CES-D	MBCBS	26 (average)

Note. N/A = not available. Design: BA = Before-and-After study; Quasi-RCT = Quasi-Randomized Controlled Trial; RCT = Randomized Controlled Trial. Intervention: ACT = Acceptance and Commitment Therapy; DBT = Dialectical Behaviour Therapy; FAST = Functional Assessment Staging of Alzheimer's Disease; MBCT = Mindfulness Based Cognitive Therapy; MBSR = Mindfulness Based Stress Reduction. Measures: CBI = Caregiver Burden Inventory (Novak & Guest, 1989); CES-D = Centre for Epidemiological Studies Depression Scale (Radloff, 1977): GDS = Geriatric Depression Scale (Yesavage et al., 1983); HRSD = Hamilton Rating Scale for Depression (Hamilton, 1980); MBDBC = Montgomery Borgatta Caregiver Burden Scale (Montgomery, 2002); PHQ-9 = Patient Health Questionnaire-9 (Kroenke, Spitzer & Williams, 2001); POMS-depression = Profile of Mood States-Depression (McNair, Lorr, & Droppleman, 1971); SCL-90-R = Symptom Checklist-90-Revised (Derogatis, 1994); ZBI = Zarit Burden Inventory 22-item (Zarit, Reever, & Bach-Peterson, 1980), 12-item (Bedard et al., 2001), Spanish version (Martín et al., 1996).

Table 3. Pre to follow up depression and burden effect size data and post between group effect size data for depression.

Study	Pre to follow up depression					Pre to follow up burden					Post between-groups depression				
	Hedge's *g*	Lower limit	Upper limit	Z value	P value	Hedge's *g*	Lower limit	Upper limit	Z value	P value	Hedge's *g*	Lower limit	Upper limit	Z value	P value
Brown et al. (2015)	0.48	0.15	0.80	2.89	.004	0.42	0.10	0.74	2.55	.011	0.77	0.11	1.43	2.29	.022
Dioquino et al. (2016)	0.75	0.16	1.33	2.51	.012	0.60	0.05	1.16	2.12	.034	-	-	-	-	-
Epstein-Lubow et al. (2011)	-0.04	-0.50	042	-1.78	.859	0.56	0.06	1.06	2.20	.028					
Franco et al. (2010)	0.56	0.20	0.93	3.06	.002	0.51	0.15	0.86	2.78	.005	1.22	0.52	1.92	3.41	.001
Hoppes et al. (2012)	-	-	-	-	-	0.45	-0.01	0.92	1.91	.056	-	-	-	-	-
Losada et al. (2015)	0.70	0.37	1.03	4.16	<.001	-	-	-	-	-	1.10	0.58	1.63	4.16	<.001

O' Donnell (2013	0.77	0.14	1.40	2.38	.017	-	-	-	-	-	0.97	0.16	1.77	2.36	.018
Norouzi et al. (2014)	2.51	1.56	3.47	5.13	<.001	0.76	0.25	1.26	2.91	.004	1.80	0.79	2.81	3.50	<.001
Oken et al. (2010)	-	-	-	-	-	-	-	-	-	-	0.29	-0.62	1.20	0.62	.533
Whitebird et al. (2012)	0.83	0.60	1.17	6.05	<.001	0.56	0.30	0.82	4.22	<.001	0.65	0.20	1.10	2.81	.005

Note. – denotes that the study did not include this data

Supplementary Material

Adapted-RCT of Psychotherapy Quality Rating Scale (RCT-PQRS)

Description of subjects

Item 1. *Diagnostic method and criteria for inclusion and exclusion*

0	poor description and inappropriate method/criteria
1	full description or appropriate method/criteria
2	full description and appropriate method/criteria

A rating of 2 requires;

- Full details of the diagnosis of the care recipient and diagnostic procedure AND
- Description of participants – including that they were **ALL** informal caregivers AND details the caregiver-care-recipient relationship AND
- Detailed description of inclusion and exclusion criteria for participants

Item 2. *Documentation or demonstration of reliability of diagnostic methodology*

0	poor or no reliability documentation
1	brief reliability documentation (documentation in the literature is sufficient, even if it is not explicitly cited)
2	full reliability documentation (documentation of within-study reliability necessary)

A rating of 2 requires;

- The outcome measure/s used for screening is/are stated to be reliable and valid with a reference cited AND
- Inter-rater reliability is tested within the study.

Item 3. *Description of relevant comorbidities*

0	poor or no description of relevant comorbidities
1	brief description of relevant comorbidities
2	full description of relevant comorbidities

A rating of 2 requires;

- Full description of caregiver's comorbid mental health difficulties e.g. depression, or explicitly states that all participants with comorbid mental health difficulties (with details of types of difficulties) were excluded.

Item 4. *Description of numbers of subjects screened, included, and excluded*

0	poor or no description of numbers screened, included, and excluded
1	brief description of numbers screened, included, and excluded
2	full description of numbers screened, included, and excluded

A rating of 2 requires;

- Presentation of detailed description of numbers of participants screened using a flow chart AND

- Detailed description of screening procedure (e.g., a therapist conducted screening assessments)

Definition and delivery of treatment

Item 5. *Treatment(s) (including control/comparison groups) are sufficiently described or referenced to allow for replication*

0	poor or no treatment description or references
1	brief treatment description or references (also if full description of one group and poor description of another)
2	full treatment description or references (manual not required)

A rating of 2 requires;

- Full treatment description is provided to allow for replication (i.e., detailed description for each session) for all conditions (including control/comparison)

OR

- There is reference to a well-established manualised treatment (e.g. mindfulness-based stress reduction by Kabat Zinn, 1979). Note: if the intervention has been adapted in anyway then this must be explicitly stated and explained or a reference to the new treatment provided.

Item 6. *Method to demonstrate that treatment being studied is treatment being delivered (only satisfied by supervision if transcripts or tapes are explicitly reviewed)*

0	poor or no adherence reporting
1	brief adherence reporting with standardized measure or full adherence reporting with non-standardized measure (eg, non-independent rater)
2	full adherence reporting with standardized measure (must be quantitative and completed by an independent rater)

A rating of 2 requires;

- There is evidence that the facilitator/s delivering the intervention/s were supervised, either within a group or one to one, to monitor adherence to the intervention methods AND
- Either a measure by supervisors was used to monitor therapist's adherence to treatment model OR participants completed outcome measures that demonstrate a good knowledge of the key principles and skills learnt relating to the intervention provided.

Item 7. *Therapist training and level of experience in the treatment(s) under investigation*

0	poor description and underqualified therapists
1	full description or well-qualified therapists
2	full description and well-qualified therapists

A rating of 2 requires;

- Description of the facilitator/s job role AND
- Description of the facilitator/s level of training (i.e. at university, MSc, BSc,) AND

- Evidence that therapists had extensive experience in the intervention being delivered OR it is stated that they have received specific training in the intervention being delivered.

Item 8. *Therapist supervision while treatment is being provided*

0	poor description and inadequate therapist supervision
1	full description or adequate therapist supervision
2	full description and adequate therapist supervision

A rating of 2 requires;

- Supervision is provided throughout the treatment from highly qualified therapists (Clinical Psychologists or over-seas equivalents) or by experienced professionals that have been highly trained in the type of intervention being delivered. Detailed description of supervision being offered (e.g. receiving weekly supervision) needs to be provided.

Item 9. *Description of concurrent treatments (eg, medication) allowed and administered during course of study*

0	poor or no description of concurrent treatments
1	brief description of concurrent treatments
2	full description of concurrent treatments

If patients on medication are included, a rating of 2 requires full reporting of what medications were used; if patients on medications are excluded, this alone is sufficient for a rating of 2.

Outcome measures

Item 10. *Validated outcome measure(s) (either established or newly standardized)*

0	poor or no validation of outcome measure(s)
1	brief validation of outcome measure(s) (shown or cited)
2	full validation of outcome measure(s) (shown or cited)

Item 11. *Primary outcome measure(s) specified in advance*

0	poor or no specification of primary outcome measure(s) in advance
1	brief specification of primary outcome measure(s) in advance
2	full specification of primary outcome measure(s) in advance

Item 12. *Outcome assessment by raters blinded to treatment group and with established reliability*

This item applies only when clinician-rated outcome measures (e.g., Hamilton Depression Rating Scale) are used in the study. Established reliability requires the interrater agreement for the assessment.

0	poor or no blinding of raters to treatment group (eg, rating by therapist, non-blind independent rater, or patient self-report) and reliability not reported
1	blinding of independent raters to treatment group or established reliability
2	blinding of independent raters to treatment group and established reliability (eg, nterrater agreement for the assessment reported)

Item 13. *Discussion of safety and adverse events during study treatment(s)?*

0	poor or no discussion of safety and adverse events
1	brief discussion of safety and adverse events
2	full discussion of safety and adverse events (for example if a caregiver's relative died)

Item 14. *Assessment of long-term posttermination outcome (should not be penalized for failure to follow comparison group if this is a waitlist or nontreatment group that is subsequently referred for active treatment)*

0	poor or no posttermination assessment of outcome
1	medium-term assessment of posttermination outcome (2-12 months posttermination)
2	long-term assessment of posttermination outcome (≥12 months posttermination)

Data analysis

Item 15. *Intent-to-treat method for data analysis involving primary outcome measure*

0	no description or no intent-to-treat analysis with primary outcome measure
1	partial intent-to-treat analysis with primary outcome measure
2	full intent-to-treat analysis with primary outcome measure

Item 16. *Description of dropouts and withdrawals*

0	poor or no description of dropouts and withdrawals
1	brief description of dropouts and withdrawals
2	full description of dropouts and withdrawals (must be explicitly stated and include reasons for dropouts and withdrawals)

Item 17. *Appropriate statistical tests (eg, use of Bonferroni correction, longitudinal data analysis, adjustment only for a priori identified confounders)*

0	inappropriate statistics, extensive data dredging, or no information about appropriateness of statistics
1	moderately appropriate, though unsophisticated, statistics and/or moderate data dredging
2	fully appropriate statistics and minimal data dredging in primary findings

Item 18. *Adequate sample size*

0	inadequate justification and inadequate sample size
1	adequate justification or adequate sample size (e.g. more than 30 participants in each condition)
2	adequate justification and adequate sample size (e.g. more than 50 participants for each condition OR a priori calculation of sample size and this sample size or more recruited)

Item 19. *Appropriate consideration of therapist and site effects*

0	therapist and site effects not discussed or considered
1	therapist and site effects discussed or considered statistically
2	therapist and site effects discussed and considered statistically

Treatment assignment

Item 20. *A priori relevant hypotheses that justify comparison group(s)*

0	poor or no justification of comparison group(s)
1	brief or incomplete justification of comparison group(s)
2	full justification of comparison group(s)

Item 21. Comparison group(s) from same population and time frame as experimental group

0	comparison group(s) from significantly different population and/or time frame
1	comparison group(s) from moderately different population and/or time frame or it appears they are from the same population and time frame but no statistical analysis has been performed to confirm this.
2	comparison group(s) from same population and time frame

A rating of 2 requires;

- Participants recruited and received intervention at the same time AND
- Description of the demographics of each group including ethnicity and mean ages – clearly compared e.g. with percentages and/or in a table AND
- Statistical analysis performed on quantitative data that demonstrates no significant differences between the groups at baseline.

Item 22. Randomized assignment to treatment groups

0	poor (eg, pseudo-randomization, sequential assignment) or no randomization
1	adequate but poorly defined randomization procedure
2	full and appropriate method of randomization performed after screening and baseline assessment

A rating of 2 requires;

- Full description of the type of randomization procedure used (e.g. using specific software to randomly allocate)

Overall quality of study

Item 23. *Balance of allegiance to types of treatment by practitioners*

0	no information or poor balance of allegiance to treatments by study therapists (eg, therapy in experimental and control groups both administered by therapists with strong allegiance to therapy being tested in the experimental group)
1	some balance of allegiance to treatments by study therapists
2	full balance of allegiance to treatments (eg, therapies administered by therapists with allegiance to respective techniques)

A rating of 2 requires;

Evidence that therapist/s within all interventions (apart from waiting list) had extensive experience in the intervention/s they delivered OR it is stated that they had received specific training in the intervention being delivered (i.e. mindfulness practitioner). AND

- Therapists were not solely qualified in another intervention that was not being provided (i.e. a CBT therapist facilitating a mindfulness intervention)

Item 24. *Conclusions of study justified by sample, measures, and data analysis, as presented (note: useful to look at conclusions as stated in study abstract)*

0	poor or no justification of conclusions from results as presented or insufficient information to evaluate (eg, sample or treatment insufficiently documented, data analysis does not support conclusions, or numbers of withdrawals or dropouts makes findings unsupportable)
1	some conclusions of study justified or partial information presented to evaluate
2	all conclusions of study justified and complete information presented to evaluate

Item 25. *Omnibus rating: please provide an overall rating of the quality of the study:*

24 items in total/score range 0-48

1 = exceptionally poor (0-7)
2 = very poor (8-14)
3 = moderately poor (15-21)
4 = average (22-29)
5 = moderately good (30-35)
6 = very good (36-42)
7 = exceptionally good (43-48)