



Effects of Caregiver-Focused Programs on Psychosocial Outcomes in Caregivers of Individuals with ASD: A Meta-analysis

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Abstract

The current meta-analysis comprehensively reviewed group-design studies of interventions designed to improve ASD caregiver psychosocial outcomes and explored potential moderators of effectiveness. Forty-one unique studies targeting 1771 caregivers met inclusion criteria. Overall, the interventions had a small positive effect in improving psychosocial outcomes in caregivers of individuals with ASD (within-subjects: Hedges' $g = .44$; between-subjects: Hedges' $g = .28$). Most intervention approaches demonstrated some evidence of effectiveness. Acceptance and commitment therapy, mindfulness-based interventions, and cognitive behavioral treatments demonstrated the strongest impact in improving caregiver psychosocial outcomes in pre-post comparisons. Although the results provide preliminary support for the effectiveness of caregiver-focused interventions, more studies with larger sample sizes, rigorous research designs, and long-term follow-up assessments are needed.

Keywords Caregiver · Parents · Autism spectrum disorder · Meta-analysis · Psychosocial outcomes · Intervention

Caring for a child with autism spectrum disorder (ASD) can be challenging. Compared to caregivers of typically developing children and of children with other developmental disabilities (DD), primary caregivers of individuals with ASD report greater stress (Abbeduto et al. 2004; Hayes and Watson 2013), depression, anxiety (Pakenham et al. 2005), and caregiver strain (McGrew and Keyes 2014), and lower levels of life satisfaction, psychological and physical well-being (Benson and Kersh 2011), quality of life, and marital satisfaction (Siman-Tov and Kaniel 2011).

Most interventions for ASD focus exclusively on the needs of the child with ASD and rarely target the needs of the caregiver. “Direct” interventions work directly with the child in targeting the core social and communication deficits or problem behaviors (e.g., Early Start Denver Model;

Dawson et al. 2010). Parent-mediated (parent-implemented) interventions target the child “indirectly,” teaching parents to deliver the intervention strategies that manage problem behaviors and promote social communication skills (Green et al. 2010; Wong and Kasari 2012).

However, across both direct and indirect interventions, the experiences and psychosocial adjustment of caregivers are generally neglected (Ergüner-Tekinalp and Akkök 2004), even when parents are employed as the intervention agents. For example, when McConachie and Diggie (2007) systematically reviewed parent-implemented interventions for young children with ASD, 8 of the 12 studies reviewed did not even report parent-focused outcomes. This failure to address parent needs is concerning because of the missed potential to ameliorate parent stress and to increase parental well-being—variables that may also increase the effectiveness of interventions for the child with ASD (Wainer et al. 2017). Further, attention to parent stress may have spillover effects that positively impact the psychological well-being of other children within the family (Rossiter and Sharpe 2001).

A few intervention studies have been conducted in ASD or related non-ASD populations to address negative caregiver psychosocial outcomes (Barlow et al. 2002). For example, in an early review of group interventions for parents of children with intellectual disabilities (ID), Hastings and Beck (2004) found that cognitive behavioral group

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interventions helped reduce stress. In addition, four more recent reviews have summarized the literature on caregiver interventions for the DD and ASD population, using both qualitative (Cachia et al. 2016; Da Paz and Wallander 2017) and quantitative methods (i.e., meta-analytic; Lindo et al. 2016; Singer et al. 2007). Da Paz and Wallander (2017) reviewed 13 studies examining the effectiveness of interventions primarily targeting caregivers' mental health, 9 of which focused exclusively on ASD caregivers. Studies included in the review examined a variety of treatment strategies (e.g., cognitive behavioral therapy [CBT], expressive writing, acceptance and commitment therapy [ACT]) and caregiver outcomes (e.g., stress, anxiety, quality of life). Overall, the treatment elicited better results than the control conditions across intervention strategies and produced small to large effects in improving caregivers' general health and reducing stress, depression, and anxiety.

The second narrative review (Cachia et al. 2016) focused exclusively on parents of children with ASD and examined ten studies of interventions using either mindfulness-based training, ACT, or both. The studies using mindfulness-based training and ACT demonstrated generally positive results (e.g., reduced stress; Cachia et al. 2016).

The two meta-analyses reviewed interventions targeting ASD and related disorders more broadly. Singer et al. (2007) used meta-analysis ($n = 17$ studies) to examine parenting and stress management interventions for caregivers of individuals with DD and found that cognitive behavioral training and stress management interventions were effective. Similarly, Lindo et al. (2016) examined six studies of the impact of various caregiver-focused interventions on reducing the stress in parents of children with cognitive/developmental disabilities and found a moderate effect size.

Taken together, these reviews provide preliminary evidence for the effectiveness of interventions targeting parents of children with ASD and DD generally. However, each of the reviews had limitations. First, with the exception of Cachia et al. (2016), the reviews focused on parents of those with DD generally and often did not separately examine results for caregivers of those with ASD (e.g., Benn et al. 2012). For example, only 6 of the 22 studies in the two meta-analysis reviews were restricted to ASD, and these studies were not analyzed separately, limiting their value in understanding outcomes for parents of those with ASD. Further, although Cachia et al. (2016) did focus exclusively on ASD caregivers, their use of a qualitative approach was limited to providing descriptive information only, and could not estimate effect sizes, quantitatively compare the effectiveness of different types of interventions, or examine potential moderators of effective interventions. Second, none of the reviews were comprehensive. For example, Lindo et al. (2016) examined only six studies, Da Paz and Wallander (2017) missed six studies reviewed by Cachia et al. (2016)

and Cachia et al. (2016) missed 9 studies reviewed by Da Paz and Wallander (2017).

Current Study

The current study used meta-analytic techniques to comprehensively review interventions that directly target psychosocial outcomes in caregivers of those with ASD, also examining potential moderators of effectiveness, including child, parent, intervention, and methodological variables.

Two child moderators were examined: age and diagnosis of Asperger syndrome. Although neither moderator had been directly examined in an intervention study of caregiver adjustment, both have been related to caregiver adjustment cross-sectionally. Fitzgerald et al. (2002) reported that better maternal mental health was associated with having an older child with ASD. In addition, caregivers of children with ASD with cognitive and language delays, which are indicators of increased severity (Karst and van Hecke 2012) but are absent in children with Asperger syndrome (American Psychiatric Association 2000), report greater parenting stress. Because most studies did not measure or report symptom severity or presence of cognitive or language delay, we used the diagnosis of Asperger syndrome as a proxy of severity. Accordingly, we hypothesized that studies including a greater percentage of older offspring with ASD or of offspring with Asperger syndrome would yield higher effect sizes.

One parent moderator was examined. In a meta-analysis of parent training programs, disadvantaged caregivers (low SES) of children with disruptive behaviors were found to demonstrate less positive change (Lundahl et al. 2006). Accordingly, we expected that caregivers with lower SES would demonstrate less treatment change.

Four treatment moderators were examined: treatment type, number of components, format, and dose. With respect to treatment type, as noted earlier, both cognitive and mindfulness based interventions have been effective in improving outcomes for caregivers of those with DD and ASD (Cachia et al. 2016; Singer et al. 2007). Cognitive treatments (e.g., mindfulness) also have tended to produce greater effect sizes in psychological adjustment than non-cognitive approaches in interventions for dementia caregivers (Pinquart and Sörensen 2006). With respect to number of components, multicomponent interventions (e.g., psychoeducation and social support) have been shown to produce greater effectiveness in caregivers of those with DD (Singer et al. 2007). With respect to format, group interventions have produced smaller reductions in distress than individual interventions for elderly caregivers (Knight et al. 1993) and for parents of those with cancer (Northouse et al. 2010). With respect to treatment dose, smaller effects have been found

for interventions with shorter durations in a meta-analysis of DD caregivers (Lindo et al. 2016), and with lower treatment intensity (fewer sessions) in caregivers of older adults (Sorensen et al. 2002) and cancer patients (Northouse et al. 2010). Accordingly, we expected greater effectiveness for cognitive and mindfulness treatment approaches and for interventions using multiple components, individual formats, and of higher intensity.

Finally, we examined three methodological moderators: type of dependent measure, publication status, and study quality. Specifically, in a meta-analytic review of interventions for caregivers (e.g., children or spouse of elderly), Knight et al. (1993) found that measures of parent emotional outcome (e.g., depression and anxiety inventories) were more sensitive to change than measures of burden, as assessed by the Zarit Burden Interview (Zarit et al. 1980). Also, for intervention studies generally, effect sizes tend to be smaller for unpublished studies (Polanin et al. 2016) and for high quality studies (Cuijpers et al. 2010). Accordingly, we expected that published or low quality studies would yield larger effect sizes. The moderating effect of dependent measures was exploratory.

In summary, the current meta-analysis examined the effectiveness of caregiver-focused interventions in improving psychosocial outcomes in caregivers of individuals with ASD. The major aims were to: (1) determine the overall effectiveness of caregiver-focused interventions, (2) compare effectiveness across intervention approaches, and (3) examine possible moderators of intervention effectiveness.

Methods

Literature Search

Multiple databases were used to search for relevant studies including: ERIC, MEDLINE, PubMed, Web of Science, PsycARTICLES, PsycINFO, Dissertations and Theses (Proquest), CINAHL, and EMBASE. Backward and forward searches were conducted for additional relevant studies (Lipsey and Wilson 2001). E-alerts to receive weekly notifications of relevant studies were set up in both PsycARTICLES and PsycINFO at the time of the initial literature search (August 2017). Articles generated from these additional searches were screened for inclusion criteria until July 2018. The search included published and unpublished empirical studies, systematic reviews, and conference proceedings. A variety of search term combinations were used, including types of participants (e.g., “parent”), types of diagnoses (e.g., “autism”), types of interventions (e.g., “psychoeducation”), and types of psychosocial outcomes (e.g., “depression”, “anxiety”).

Inclusion and Exclusion Criteria

Studies were included when: (1) participants were primary caregivers of offspring of any age diagnosed with ASD. Because there was no restriction on year of publication, studies focusing on a(ny of the DSM-IV or DSM-5 diagnoses related to ASD were deemed acceptable (e.g., ASD, autism, Asperger’s syndrome, PDD-NOS); (2) group comparisons were used, either within-subjects (i.e., pre- vs. post-) or between-subjects designs (treatment vs. control); (3) the group sample size receiving treatment was larger than five (see Blodgett et al. 2014; Liu et al. 2014; Virués-Ortega 2010); (4) caregivers were the main focus of the intervention, not the child with ASD; (5) outcome data on caregiver psychosocial adjustment was provided and was the target of the intervention; (6) effect sizes or information that allowed calculation of effect sizes was provided; and (7) the study was reported in English.

No date or publication format limits were set, which allowed access to the full body of research addressing the issue. Studies that included a mixed sample of caregivers (e.g., ASD, ADHD, ID) and did not provide separate results for the ASD caregivers were excluded. Interventions targeting the offspring’s adaptive and/or challenging behaviors directly (child-focused) or teaching caregivers child-focused intervention strategies (caregiver-mediated/implemented) were excluded from the review.

Coding

Based on recommendations from Lipsey and Wilson (2001) two codebook modules were created, one coded information applicable to the whole study (e.g., basic study information, sample descriptors, study design) and the other coded effect size information for individual study findings. The codebooks were created, tested and then revised as needed by the first author, a masters degree doctoral student in clinical psychology. To confirm reliability, 20% of eligible studies were independently coded by a second rater, a masters degree student in clinical psychology. Interrater reliability ranged from 80% to 100% across codes. Discrepancies between coders were discussed until consensus was reached. Codebooks were updated to reflect the consensus coding, as needed. Authors were contacted for additional information when necessary.

Study Quality

The Cochrane Collaboration Guideline and Quality Assessment Tool for Quantitative Studies (QATQS, The Cochrane Collaboration 2011; Thomas 2009) was used to measure study quality. The 14-item QATQS examines five components: selection bias, study design, confounding variables,

blinding of the outcome assessors and participants, data collection methods, and dropout rates in the study. Components were rated using a three point scale (i.e., strong, moderate, weak). A global quality rating was assigned to each study based on the ratings of the five components (see details in Thomas 2009).

Statistical Analyses

Descriptive Statistics

Participant (e.g., age, gender, SES), intervention (e.g., sample size, number of intervention sessions), and methodological characteristics (e.g., study design, study quality measures) were examined using descriptive statistics using SPSS Version 23.0 (IBM Corp. Released 2015).

Main Meta-analytic Analyses

To examine effectiveness, two main meta-analyses were conducted using the within- and between-subjects data, separately. First, for within-subjects data, the mean effect size (ES) was calculated with pre- and post-test data representing the standardized mean gain in outcomes from both within-subjects design studies and the experimental groups from the between-subjects design studies. Pre- and post-test data were used because they were the most commonly available measurement time points across studies conforming to the pretest and follow-up scores (discussed in more details in Results). To control for statistical dependence between pre- and post-test scores, pre-post correlations were used to calculate the standardized mean (Lipsey and Wilson 2001). When available, the pre-post correlations were extracted directly from the studies. However, because most studies do not report data on the correlations between the pre- and post-treatment measures (Lipsey and Wilson 2001), when unavailable, previous published studies were used to estimate the pre-post correlation (i.e., test-retest reliability; Lipsey and Wilson 2001; Rosenthal 1991). When correlation information was not available from the published literature, a conservative estimate ($r = .70$) was used according to recommendations by Rosenthal (1991), Hofmann et al. (2010), and Houry et al. (2013).

For between-subjects data, the post-intervention data from the treatment and control groups were used to calculate a between-subjects ES, representing the standardized mean difference in outcomes between the experimental and control groups (Hedges and Olkin 1985; Singer et al. 2007; Sorensen et al. 2002). If groups had substantially different average scores on the dependent measures at pretest, change scores were used with the appropriately adjusted standard deviation (Singer et al. 2007; Sorensen et al. 2002).

The second major goal of this meta-analysis was to examine whether effectiveness differed across intervention approaches. First, moderator analyses were conducted to examine if the mean ES depended on type of interventions. If significant, separate individual meta-analyses were conducted, using both the within- and between-subjects data, to examine mean ES restricted to a specific intervention approach.

Data analyses were conducted using the Comprehensive Meta-analysis 3 program (CMA 3; Borenstein et al. 2014). ESs were calculated using a random-effects model, which increases the ability to generalize results by accounting for within- and between-subjects variability of the individual study data (Borenstein et al. 2009; Lipsey and Wilson 2001). Each study was constrained to contribute one ES per construct per study to ensure statistical independence of the ESs (Lipsey and Wilson 2001), i.e., multiple outcome measures of a single construct of interest were averaged (Card 2015).

Hedges' g was used for the calculation of mean ESs instead of Cohen's d because Cohen's d tends to overestimate ESs in studies with small samples, which was true for the majority of the studies in this meta-analysis. ESs were weighted by the inverse of its variance to account for study differences in sample size (Lipsey and Wilson 2001; Borenstein et al. 2009). Ninety-five percent confidence intervals (CI) were calculated to indicate the degree of precision of the estimate and the significance of the mean ESs. The interpretation of Hedges' g is equivalent to Cohen's d (i.e., ESs of .20, .50, and .80 are considered small, medium, and large, respectively; Cohen 1992; Lipsey and Wilson 2001). Because it is inadvisable to combine ESs from within-subjects and between-subjects design studies (Borenstein et al. 2009; Lipsey and Wilson 2001), within- and between-subjects data were analyzed separately.

Outliers

Both within-subject and between-subject study effect sizes were examined for potential outliers. This is a common procedure in meta-analysis to detect potentially unrepresentative studies whose inclusion may bias mean effect size estimates. Study effect sizes were examined initially using visual inspection through forest plots using the CMA 3 program. Sensitivity analyses also were conducted to determine whether removal of studies with highly discrepant effect sizes (i.e., outliers) significantly altered the results (Card 2015). Outliers were retained if their removal did not significantly alter the results.

Publication Bias

Publication bias is concerned with whether the sample of studies included in a meta-analysis is representative of the

population of studies theoretically available for inclusion. The key concern is that published studies are both easier to access and more likely to report significant positive results. Tests for publication bias examine the distribution of effect sizes across the sample of studies included in the meta-analysis. We employed two tests of publication bias. First, bias was examined visually using a funnel-plot of study ESs. An asymmetric plot indicates probable missing studies due to publication bias (Lipsey and Wilson 2001). Second, Egger's tests were used, by regressing the standardized ES onto an estimate of ES precision (the inversion of the standard error; Card 2015). A significant Egger's test would indicate publication bias (Card 2015). Egger's test required at least 17 studies to have sufficient power to detect publication bias (Card 2015).

Heterogeneity

Hedges' Q statistic and the I^2 index were used to examine homogeneity of the ES distribution. A statistically significant Q indicates a heterogeneous distribution. However, the sensitivity of the Q statistic is strongly impacted by the number of studies. That is, it has low power when the number of studies is small and may detect unimportant heterogeneity when the number of studies is large (Fu et al. 2011). Accordingly, the I^2 index, which quantifies the extent of the heterogeneity, was also computed and used as a heterogeneity indicator. Specifically, I^2 indices larger than 25% are usually interpreted to indicate heterogeneity (Huedo-Medina et al. 2006). For the current study, when the Q statistic was significant ($p < .10$; Fu et al. 2011; Higgins and Thompson 2002) or the I^2 index was greater than 25%, the ES distributions were viewed as heterogeneous, and moderator analyses were conducted to examine sources of the heterogeneity (Lipsey and Wilson 2001).

Moderator Analyses

The third goal of this meta-analysis was to examine potential moderators that contributed to any detected heterogeneity in the data. Moderator analyses were conducted using subgroup analyses for categorical moderators and meta-regressions for continuous moderators. For subgroup analyses, Hedges' g and Q statistics were computed across subgroups (Borenstein et al. 2009). For meta-regressions (Huedo-Medina et al. 2006), a random-effects model was used, which is generally preferred in meta-regressions (Higgins and Green 2011) because it allows true effects to vary between studies (Borenstein et al. 2009). A minimum of four studies per subgroup was required for categorical moderator analyses and 10 for meta-regression analyses (Fu et al. 2011; Higgins and Green 2011).

Results

Characteristics of Included Studies

The literature search identified 5995 articles, producing 41 unique studies that were included in the meta-analyses (see Fig. 1). Studies were conducted from 1998 to 2018, and over half were published (63.4%). The review included a diverse group of participants from the United States (51.2%) and other countries (e.g., Australia, China, Turkey, Iran). The number of participants per study ranged from 5 to 212 ($M = 43.20$, $SD = 40.93$).

Of the 41 studies, 18 studies used a within-subjects design and 23 studies used a between-subjects design, of which 10 were randomized controlled trials (RCT). The majority of the comparison groups were treatment as usual or waitlist controls (91.3%). About a third of the studies reported follow-up outcome data (31.7%) after the first posttest.

A total of 1771 participants were included in the meta-analysis ($N_{\text{treatment}} = 1156$, $N_{\text{control}} = 708$). The average caregiver age was 39.92 ($SD = 4.40$; range 33–52). Over half of the participants had a bachelor's degree or above (60.9%), and the majority were females (85.8%). One study focused exclusively on fathers of children with ASD (Elfert and Mirenda 2015), and 16 studies included only mothers.

The mean age of the individuals with ASD across studies ranged from 4.5 months to 16.13 years old, with the majority being male (82.58%). Fewer than 20% of the studies reported sample information about the level of problem behaviors ($k = 7$), ASD symptom severity ($k = 4$), or comorbid ID of children with ASD ($k = 3$).

Number of intervention sessions ranged from 1 to 60 ($M = 7.88$, $SD = 9.12$) with a mode of 8 ($k = 11$). The duration of interventions ranged from one day to three months ($M = 56.56$ days, $SD = 40.26$). Intervention approaches included social support ($k = 5$), psychoeducational programs ($k = 10$), ACT ($k = 6$), mindfulness-based therapy ($k = 3$), CBT ($k = 7$), positive psychotherapy ($k = 1$), written emotional disclosure ($k = 4$), and multicomponent interventions ($k = 6$). A variety of psychosocial outcomes were reported, including parenting stress, caregiver burden, depression, anxiety, general well-being, quality of life, and family and marital adjustment. Based on the study quality assessment, over half of the studies (63.4%) were categorized as weak, with 29% rated as moderate quality ($k = 12$) and 7.3% rated as strong ($k = 3$; see Tables 1 and 2).

Outliers and Publication Bias

One-study removal sensitivity analysis showed that the findings were robust to outliers. Both funnel plots and

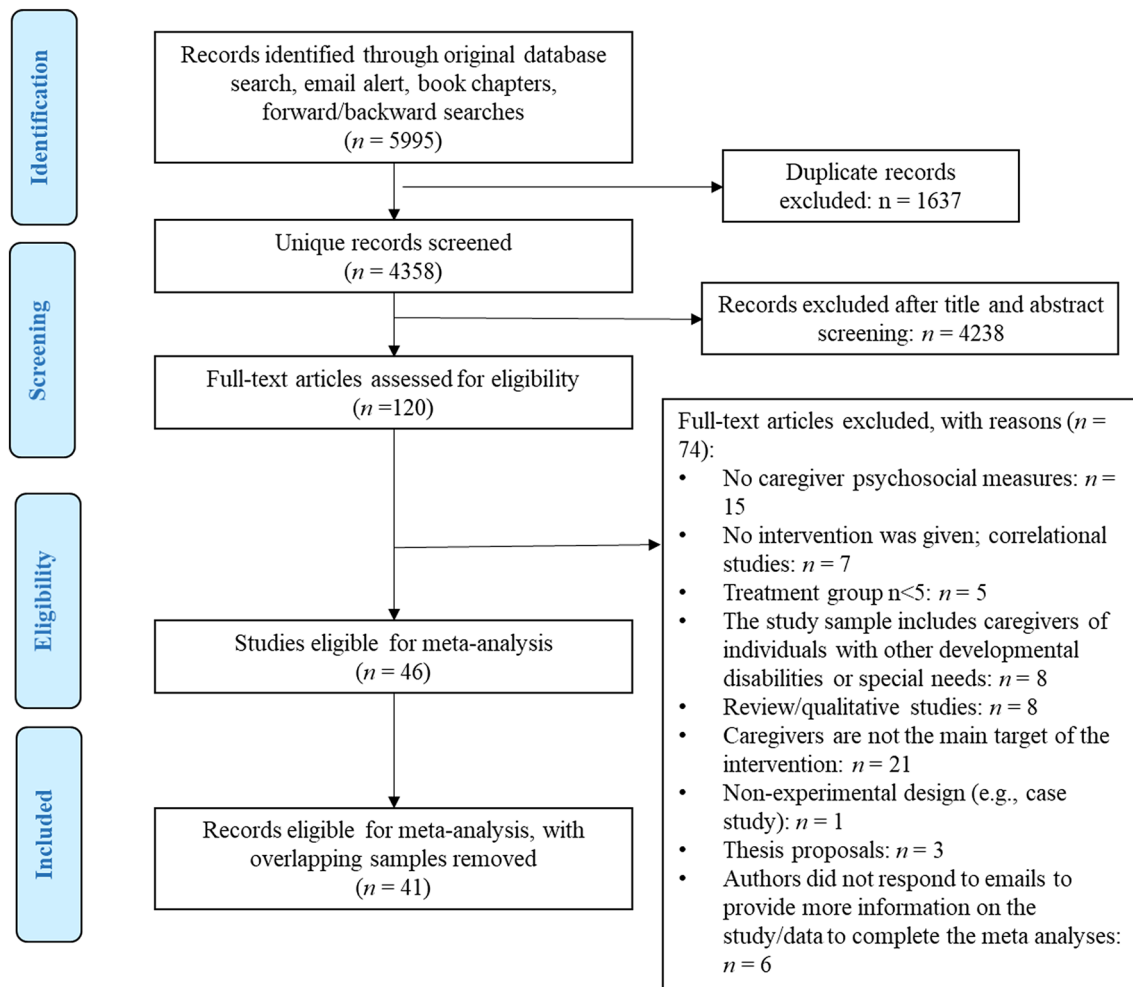


Fig. 1 Search results and screening process

Egger's test did not support publication bias for either the within- or between-subjects ESs (Within-subjects: Intercept = -3.04 , $SE = 1.76$, $p = .09$, 95% CI -6.60 , $.53$; Between-subjects: Intercept = $-.53$, $SE = .99$, $p = .59$, 95% CI -2.59 , $.54$).

The Effectiveness of Caregiver-Focused Interventions

Using a composite psychosocial outcome, which adjusted for total score direction and outcome valence of the measure, the mean within-subject ES was $.44$ ($k = 40$, $SE = .10$, 95% CI $.24$, $.64$), see Fig. 2. There was significant heterogeneity across studies ($Q = 844.38$, $p < .001$, $I^2 = 95.38$) supporting further moderator analyses. The pretest to follow-up ES was nonsignificant (Hedges' $g = .26$, $SE = .15$, 95% CI $-.03$, $.55$), indicating no significant change between pretest and follow-up; however, only one-third of the studies reported

follow-up data. The remaining within-subjects analyses were conducted using only pre- and post-test data.

The mean between-subjects ES was small ($k = 22$, Hedges' $g = .28$, $SE = .10$, 95% CI $.10$, $.45$), indicating that caregivers in the intervention groups had slightly better overall psychosocial outcomes, see Fig. 3. There was significant heterogeneity across studies, suggesting the need for moderator analyses ($Q = 40.80$, $p = .006$, $I^2 = 48.53$), see Table 3.

Comparison of Intervention Approaches

Interventions were categorized into six approaches: ACT/Mindfulness-based, CBT, positive psychotherapy (e.g., defined as "cultivating strengths, developing optimism, and expressing gratitude as a means of improving well-being"; LaPlante 2013, p. 46)/written emotional disclosure, psychoeducation, social support, and multicomponent interventions.

The six ACT and three mindfulness-based intervention studies were combined into one category because of the

Table 1 Overview of key study features

Study	Country	N	Research design	Intervention approach	Study quality	Delivery format	Outcome measures	ES _{within-subj} (CI)	ES _{between-subj} (CI)
Al-Khalaf et al. (2014)	Non-US	10	W/I	Psychoeducation	Moderate	Group	PSI	1.96 (1.64, 2.29)	
Blackledge and Hayes (2006)**	US	20	W/I	ACT ^b	Weak	Group	BDI, BSI, GHQ	.38 (.11, .64)	
Campbell (2003)*	US	30	B/T ^c	Positive Psychotherapy/Written Disclosure	Weak	Individual	FES, IES, Negative and Positive Mood		.09 (–.69, .86)
Canon-Garzon (2012)*	US	17	W/I	ACT ^a	Weak	Group	BAI, BDI	.43 (–.07, .93)	
Chiang (2014)	US	9	W/I	Multicomponent	Weak	Group	PSI, WHOQOL	.78 (.37, 1.20)	
Clifford and Minnes (2013)**	Non-US	45	B/T	Social Support	Weak	Group	FSCI, STAI, STDS	.02 (–.30, .33)	–.06 (–.64, .51)
Corti et al. (2018)	Non-US	42	B/T	Multicomponent ^a	Moderate	Group	PSI		.25 (–.34, .85)
Da Paz (2016)*	US	71	B/T ^c	Positive Psychotherapy/Written Disclosure	Moderate	Individual	CGSQ, PSI, PSS, SF-36	.22 (.04, .40)	.03 (–.48, .53)
Elfert and Miranda (2015)	Non-US	12	W/I	Social Support	Weak	Group	BDI, DAS, PSI	.17 (–.36, .70)	
Erguner-Tekinalp and Akkok (2004)	Non-US	20	B/T	CBT	Weak	Group	QRS		–.51 (–1.36, .35)
Farmer and Reupert (2013)	Non-US	102	W/I	Multicomponent ^a	Weak	Group	Anxiety_ (author-created)	.36 (.15, .56)	
Feinberg et al. (2014)	US	122	B/T ^c	CBT ^{ab}	Moderate	Individual	PSI, QIDS	.44 (.30, .59)	.45 (.08, .83)
Ferraioli and Harris (2013)**	US	21	B/T ^c	Mindfulness-based ^{ab}	Moderate	Group	GHQ, PSI	1.22 (.25, 2.19)	1.48 (.37, 2.59)
Fung (2011)*	US	5	W/I	Social Support ^{ab}	Weak	Individual	PSI	.21 (–.01, .44)	
Gika et al. (2012)	Non-US	11	W/I	CBT	Weak	Group	PSI, PSS	1.48 (1.07, 1.89)	
Hahs (2013)*	US	18	B/T	ACT ^{ab}	Moderate	Group	BDI	.65 (–.27, 1.56)	.48 (–.41, 1.37)
Hajiabolhasani-Nargani et al. (2016)	Non-US	64	B/T ^c	Psychoeducation	Weak	Individual	STAI	.45 (.18, .73)	.49 (.00, .98)
Izadi-Mazidi et al. (2015)	Non-US	20	W/I	CBT	Weak	Group	PSI	.01 (–.32, .33)	
Ji et al. (2014)	Non-US	50	B/T	Psychoeducation	Strong	Group	CBI, FAD, SF-36	.41 (–.02, .83)	.34 (–.26, .94)
Jurkowitz (2013)*	US	17	W/I	CBT ^a	Weak	Group	PSI, PSS	.67 (.39, .94)	
Kowalkowski (2013)*	US	25	B/T	ACT ^a	Weak	Group	BSI, PSI	.31 (–.02, .64)	
Kroodsma (2008)*	US	40	W/I	Psychoeducation	Weak	Group	PSI, Stress	.32 (–.06, .71)	
LaPlante (2013)*	US	212	B/T ^c	Positive Psychotherapy/Written Disclosure	Moderate	Individual	CES_D, PANAS, SWLS	.21 (.05, .37)	.15 (–.21, .52)
Lovell et al. (2016)	Non-US	37	B/T	Positive Psychotherapy/Written Disclosure	Strong	Individual	HADS_Anxiety, HADS_Depression, PSS	–.02 (–.28, .25)	.46 (–.21, 1.14)

Table 1 (continued)

Study	Country	N	Research design	Intervention approach	Study quality	Delivery format	Outcome measures	ES _{within-subj} (CI)	ES _{between-subj} (CI)
Magaña et al. (2017)	US	22	W/I	Psychoeducation ^a	Weak	Individual	Caregiver burden, CES_D	-.08 (-.51, .36)	
McCreadie (2013)*	Non-US	71	W/I	Psychoeducation ^a	Weak	Group	PSI	2.04 (1.91, 2.16)	
Montgomery (2016)*	US	60	B/T	ACT	Moderate	Group	BDI, PSI, QOLI	.40 (.15, .65)	.15 (-.48, .78)
Nguyen et al. (2016)	US	24	W/I	CBT ^a	Moderate	Individual	BDI, IES, POMS	.62 (.19, 1.04)	
Niinomi et al. (2016)	Non-US	24	W/I	Social Support	Weak	Group	PS-SF, WHOQOL	.29 (.04, .53)	
Peck (1998)	US	19	W/I	Psychoeducation	Weak	Group	PSI	.19 (-.41, .78)	
Rayan and Ahmad (2016a, b)	Non-US	117	B/T	Mindfulness-based ^{ab}	Moderate	Mixed	DASS_Anxiety, DASS_Depression, DASS_Stress, WHOQOL	.65 (.36, .95)	.67 (.28, 1.06)
Ruiz-Robledillo and Moya-Albiol (2015)	Non-US	17	W/I	CBT	Weak	Group	BDI, POMS, ZBI	.64 (.14, 1.14)	
Ruiz-Robledillo et al. (2015)	Non-US	13	B/T	Mindfulness-based	Weak	Group	BDI, GHQ, STAI	.84 (.44, 1.25)	-.19 (-1.21, .83)
Samadi et al. (2013)	Non-US	37	B/T	Multicomponent	Weak	Group	GHQ, PSI	.93 (.76, 1.11)	1.59 (.86, 2.32)
Shu and Lung (2005)	Non-US	27	B/T	Social Support	Weak	Group	GHQ, WHOQOL	-.74 (-1.31, -.17)	-1.02 (-1.94, -.11)
Suzuki et al. 2014	Non-US	72	B/T ^c	Psychoeducation ^a	Strong	Group	GHQ, SF-36, ZBI	.15 (-.04, .35)	.27 (-.18, .73)
Timmons (2015)*	US	67	B/T ^c	Positive Psychotherapy/Written Disclosure	Weak	Individual	CSI, PANAS	.22 (-.02, .45) .23(-.01, .48)	-.13 (-.64, .38)
Tonge et al. (2006)	Non-US	105	B/T ^c	Psychoeducation/Multicomponent ^d	Moderate	Mixed	FAD, GHQ, Stress Thermometer	.26 (.05, .48) .47 (.25, .69)	.33 (-.08, .74)
White (2011)*	US	48	B/T	Psychoeducation	Weak	Group	CEQOL	-.56 (-.88, .23)	.45 (-.21, 1.11)
Zimmerman (2013)*	US	8	W/I	Multicomponent ^a	Weak	Group	SIPA	.19 (-.18, .55)	
Zody (2017)*	US	20	B/T ^c	ACT	Moderate	Group	DASS_Anxiety, DASS_Depression, DASS_Stress	.36 (-.27, .99)	.05 (-.79, .90)

N=number of participants who enrolled in the study. W/I=within-subjects design studies. B/T=between-subjects design studies

PSI Parenting Stress Index, BDI Beck Depression Inventory, BSI Brief Symptom Inventory, GHQ General Health Questionnaire, FES Family Environment Scale, IES Impact of Event Scale, BAI Beck Anxiety Inventory, WHOQOL World Health Organization Quality of Life, FSCI Family Stress and Coping Interview, STAI State-Trait Anxiety Inventory, STDS State-Trait Depression Scales, CGSQ Caregiver Strain Questionnaire, PSS Perceived Stress Score, SF-36 Short Form Health Survey, DAS Dyadic Adjustment Scale, QRS Questionnaire on Resources and Stress, QIDS Quick Inventory of Depressive Symptomatology, CBI Caregiver Burden Index, FAD Family Assessment Device, CES_D Center for Epidemiologic Studies Depression Scale, CSI Couple Satisfaction Index, PANAS Positive and Negative Affect Schedule, SWLS Satisfaction with Life Scale, HADS_Anxiety Hospital Anxiety and Depression Scale_Anxiety, HADS_Depression Hospital Anxiety and Depression Scale_Depression, QOLI Quality of Life Inventory, POMS Profile of Mood States, PS-SF Parenting Stress-Short Form, DASS Depression Anxiety Stress Scales, ZBI Zarit Burden Index, CEQOL Caregiver Evaluation of Quality of Life, SIPA Stress Index for Parents of Adolescents, ES effect size, CI confidence interval

^aStudy reported using a manual

^bStudy reported fidelity

^cRandomized controlled trial

*Dissertation

**Both published and unpublished as dissertation

Table 2 Overview of study features across studies

Variables	<i>k</i>	Mean (<i>SD</i>)	Range
Publication status			
Published	26		
Unpublished	15		
Program location			
United States	21		
Europe	7		
Australia	2		
Canada	2		
Asian/Pacific	4		
Middle East	5		
Research design			
Within-subjects design	18		
Between-subjects design	23		
Comparison group			
Treatment as usual/Waitlist	22		
Active Control Group	1		
Delivery format			
Individual	10		
Group	29		
Mixed	2		
Intervention approach			
Social support	5		
Psychoeducation	10		
Acceptance and commitment therapy	6		
Mindfulness-based	3		
Positive psychotherapy	1		
Written emotional disclosure	4		
Cognitive behavioral therapy	7		
Multicomponent	6		
Fidelity measure			
Yes	6		
No/did not report	35		
Manualized treatment			
Yes	16		
No/did not report	25		
Follow-up measure			
# of reporting	13		
1–3 Month follow-up	9		
3–6 months follow-up	3		
12 months follow-up	1		
No/did not report	27		
Duration of treatment (days)	56.56 (40.26)	1–180	
# of treatment sessions	7.88 (9.12)	1–60	
% participant attrition in treatment group	17.76 (15.38)	0–52.63	
Number reporting	30		
% Participant attrition in control group	20.35 (17.46)	0–52	
Number reporting	14		

k = number of studies reported. Means and standard deviations are weighted by study sample size

small number of studies and the overlap in the two intervention approaches (e.g., ACT includes a combination of acceptance and mindfulness methods; Hayes et al. 1999); also, several studies using ACT included mindfulness-based strategies (Blackledge and Hayes 2006; Hahs 2013; Kowalkowski 2013; Montgomery 2016). Multicomponent interventions included psychoeducation and either social support (Chiang 2014; Farmer and Reupert 2013; Samadi et al. 2013; Zimmerman 2013) or behavior management (e.g., Tonge et al. 2006). The mean overall psychosocial ES was examined within each intervention category separately for both within- and between-subjects data.

Intervention type was a significant moderator of within-subjects ES differences across studies ($Q_{between}=23.97$, $df=5$, $p<.001$). When examined separately, four intervention approaches had significant small to medium within-subjects ESs in improving caregiver psychosocial outcomes. CBT had the highest mean ES ($k=6$, Hedges' $g=.62$, $SE=.17$, 95% CI .30, .95, $p<.001$), followed by multicomponent interventions ($k=5$, Hedges' $g=.55$, $SE=.15$, 95% CI .26, .84, $p<.001$), ACT/Mindfulness-based interventions ($k=9$, Hedges' $g=.49$, $SE=.07$, 95% CI .36, .62, $p<.001$), and positive psychotherapy/written emotional disclosure ($k=5$, Hedges' $g=.19$, $SE=.05$, 95% CI .10, .28, $p<.001$). Psychoeducational programs ($k=10$, Hedges' $g=.52$, $SE=.34$, 95% CI $-.14$, 1.18, $p=.12$) and social support when provided alone ($k=5$, Hedges' $g=.06$, $SE=.13$, 95% CI $-.19$, .32, $p=.63$) did not significantly improve caregiver psychosocial outcomes. Although cross-study heterogeneity was found for two intervention approaches (CBT: $Q=33.02$, $p<.001$, $I^2=84.86$; multicomponent interventions: $Q=26.65$, $p<.001$, $I^2=84.99$), the small number of studies available within intervention type precluded conducting additional moderator analyses, see Table 4.

Intervention type was not a significant moderator of the between-subjects ES ($Q_{between}=7.14$, $df=6$, $p=.31$). Therefore, no separate individual meta-analyses were conducted for intervention type using the between-subjects data.

Moderators of Effectiveness across Interventions

Categorical Moderators

As reported above, the significant cross-study heterogeneity in effectiveness for both the within- and between-subjects ESs supported the need for further moderator analyses. The following categorical moderators were examined: intervention delivery format, publication status, number of treatment components, and study quality. Although three intervention delivery formats were reported (Individual, Group, mixed), only group and individual delivery formats were utilized often enough to be analyzed as moderators ($k > 4$; Fu et al.

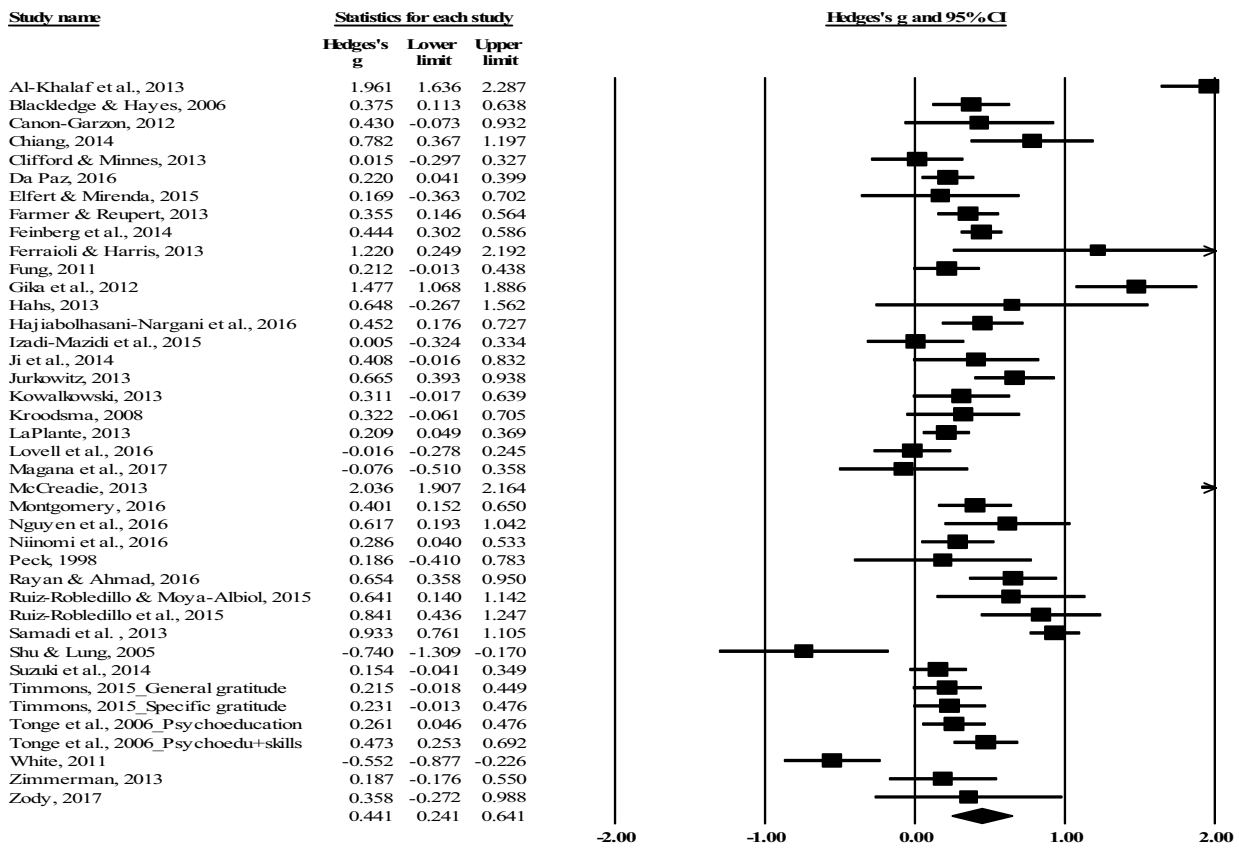


Fig. 2 Forest plot of studies included in within-subjects overall psychosocial outcome meta-analysis

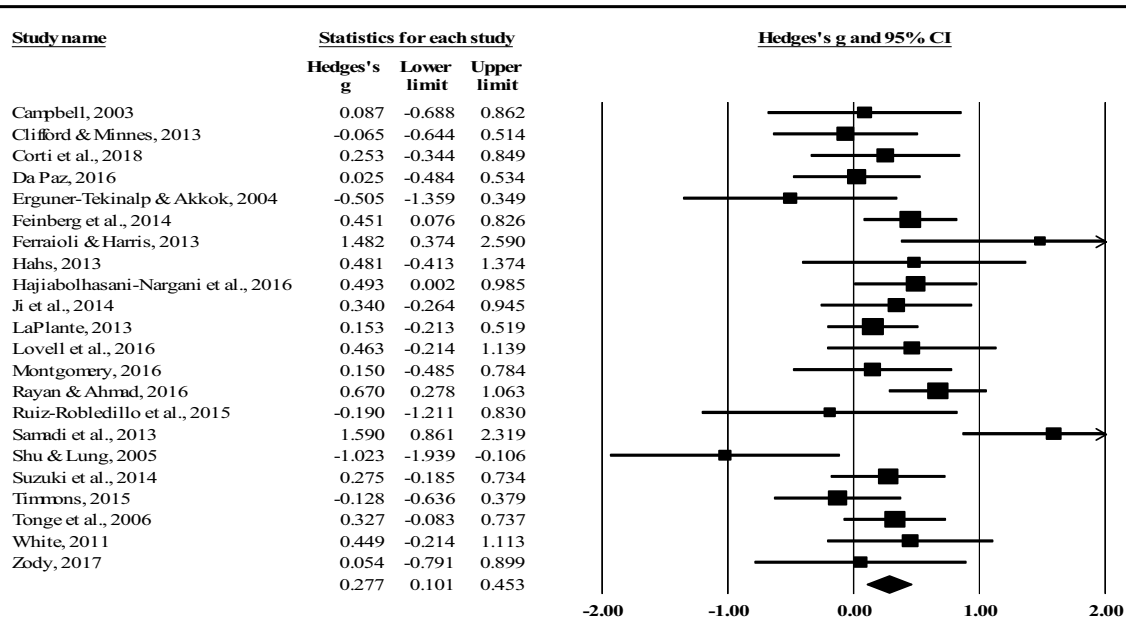


Fig. 3 Forest plot of studies included in between-subjects overall psychosocial outcome meta-analysis

Table 3 Summary of mean effect sizes

Scale	<i>k</i>	ES	<i>SE</i>	95% CI	<i>z</i>	<i>p</i>	<i>Q</i>	<i>p</i>	<i>I</i> ²
Within-subjects									
Composite	40	0.44	0.10	.24, .64	4.32	0.000	844.38	0.000	95.38
Between-subjects									
Composite	22	0.28	0.10	.10, .45	3.08	0.002	40.80	0.006	48.53

k=number of studies used in the calculation of the mean effect size. ES=Hedges' *g* effect size statistic. *SE*=standard error. 95% CI 95% confidence interval. *z*=test for statistical significance of the mean effect size. *p*=2-tailed *p*-value associated with the test of statistical significance. *Q*=test for homogeneity. A significant *Q* indicates greater between-study variability than would be expected by chance. *I*²=indicates the percentage of between-study variability. Values larger than 25 suggest the presence of moderators. Composite=overall psychosocial outcomes based on average of psychosocial measures

Table 4 Summary of mean effect sizes across intervention types, within-subjects

Interventions	<i>k</i>	ES	<i>SE</i>	95% CI	<i>z</i>	<i>p</i>	<i>Q</i>	<i>p</i>	<i>I</i> ²
Composite	40	0.44	0.10	.24, .64	4.32	0.000	844.38	0.000	95.38
CBT	6	0.62	0.17	.30, .95	3.78	0.000	33.02	0.000	84.86
Multicomponent	5	0.55	0.15	.26, .84	3.74	0.000	26.65	0.000	84.99
ACT/mindfulness	9	0.49	0.07	.36, .62	7.17	0.000	8.93	0.348	10.39
Psychoeducation	10	0.52	0.34	-.14, 1.18	1.54	0.123	553.19	0.000	98.37
Positive psychotherapy/ written emotional dis- closure	5	0.19	0.05	.10, .28	4.05	0.000	2.70	0.609	0.00
Social support	5	0.06	0.13	-.19, .32	0.48	0.634	11.54	0.021	65.33

k=number of studies used in the calculation of the mean effect size, *ES* Hedges' *g* effect size statistic, *SE* standard error, 95% CI 95% confidence interval, *z*=test for statistical significance of the mean effect size, *p*=2-tailed *p*-value associated with the test of statistical significance, *Q*=test for homogeneity, A significant *Q* indicates greater between-study variability than would be expected by chance, *I*²=indicates the percentage of between-study variability, Values larger than 25 suggest the presence of moderators, Composite=overall psychosocial outcomes based on average of psychosocial measures

2011). Number of treatment components (multicomponent approach vs. single-component) was examined as a potential moderator limited to the within-subjects data because only three between-subjects studies used a multicomponent intervention approach (*k* < 4; Fu et al. 2011). Several exploratory variables also were examined as potential moderators: country of data collection, the use of telehealth, and the use of multiple vs. single psychosocial outcome measures. As mentioned earlier, in calculating the mean intervention ES, a composite score was used in studies that assessed more than one psychosocial outcome. A moderator analysis was conducted to test whether using one ES from a combination of multiple psychosocial outcomes vs. a single outcome impacted the mean ES.

Both within- and between-subjects results indicated that intervention delivery format, publication status, study quality, and number of intervention components (*p* > .05) were not significant moderators. Moreover, none of the exploratory variables were significant moderators, including country of data collection, use of telehealth techniques, and using a composite vs. a single outcome indicator (*p* > .05). However, the moderating effect of telehealth in the within-subjects

analysis was at a trending level (*p* = .09). Studies that did not use telehealth were more effective (Hedges' *g* = .51, *SE* = .14, 95% CI .24, .78) than studies that used some form of telehealth (Hedges' *g* = .25, *SE* = .05, 95% CI .15, .36).

Continuous Moderators

Meta-regressions using simple regression and a random-effects model were used to examine the relationship between the continuous variables and the study ESs. Variables examined included age of the offspring, a diagnosis of Asperger syndrome, education level, intervention duration, and number of sessions. Given the small number of studies, only single covariate analyses were conducted because there was insufficient power to conduct analyses with multiple covariates (Borenstein et al. 2009).

None of the aforementioned variables were significant continuous moderators in either the within- or between-subjects analyses. That is, the average age of the child with ASD, the percentage of the sample with Asperger syndrome, caregiver education level, intervention duration, and number of sessions failed to explain heterogeneity in the mean

ES. Although dose as measured by treatment length was not significant, another possible indicator of intervention intensity suggested in previous studies is total intervention hours (Northouse et al. 2010). Accordingly, we also examined the potential moderation effect of total intervention hours on outcomes and found that increased intervention hours were related to larger mean ES ($B = .0003$, $SE = .00$, 95% CI .0001, .001) in the within-subjects meta-analysis.

Type of Dependent Measures

Due to statistical dependence, neither meta-regression nor categorical analysis was suitable to examine the statistical significance of dependent measure type as a moderator. As an alternative, ESs using different types of psychosocial outcomes were calculated separately and compared.

For the within-subjects data, the largest ESs were found for decreased perceived stress/distress ($k = 13$, Hedges' $g = .56$, $SE = .09$, 95% CI .39, .74) and parenting stress ($k = 18$, Hedges' $g = .55$, $SE = .17$, 95% CI .22, .87) and improved general well-being ($k = 8$, Hedges' $g = .54$, $SE = .11$, 95% CI .32, .76). Smaller ESs were found for decreasing caregiver depressive symptoms ($k = 14$, Hedges' $g = .34$, $SE = .08$, 95% CI .19, .49), improving positive and negative affect (Hedges' $g = .29$, $SE = .07$, 95% CI .15, .42), and decreasing anxiety ($k = 7$, Hedges' $g = .25$, $SE = .10$, 95% CI .05, .45). Effect sizes for quality of life and life satisfaction were not significant ($k = 10$, Hedges' $g = .22$, $SE = .14$, 95% CI $-.04$, .49). Additionally, few studies measured caregiver burden ($k = 5$), family adaptation ($k = 3$), and marital adjustment ($k = 3$), and all elicited small nonsignificant ESs.

For the between-subjects data, the largest ESs were for improved general well-being ($k = 6$, Hedges' $g = .65$, $SE = .26$, 95% CI .14, 1.15) and decreased parenting stress ($k = 6$, Hedges' $g = .49$, $SE = .22$, 95% CI .05, .93), anxiety level ($k = 5$, Hedges' $g = .42$, $SE = .12$, 95% CI .18, .66), and depressive symptoms ($k = 9$, Hedges' $g = .32$, $SE = .12$, 95% CI .09, .55). The ESs for general subjective stress/distress ($k = 7$, Hedges' $g = .24$, $SE = .17$, 95% CI $-.08$, .57) and quality of life were not significant ($k = 7$, Hedges' $g = .01$, $SE = .24$, 95% CI $-.46$, .47). Few studies measured caregiver burden ($k = 3$), positive and negative affect ($k = 3$), and family ($k = 2$) and marital adjustment ($k = 1$), and none of the results reached significance.

Discussion

This study was the first meta-analysis examining the effectiveness of interventions exclusively focused on caregivers of individuals with ASD. A total of 41 studies using both within- and between-subjects group designs, and including 1771 participants were identified. The comprehensiveness

of our sampling is supported by the fact that the number of studies included is more than double the number reported in any prior meta-analysis or narrative review. Below we discuss our findings with respect to the three main research questions: (1) were interventions effective in improving overall psychosocial outcomes in caregivers of those with ASD?; (2) did effectiveness differ across intervention approaches?; (3) what were the potential moderators of effectiveness?

The Overall Caregiver-Focused Interventions Effectiveness

Overall, interventions were effective in improving caregivers' psychosocial outcomes with a small, significant ES. This finding is similar to results from three prior meta-analyses in non-ASD caregiver samples. Singer et al. (2007) conducted a meta-analysis on group interventions for parents of children with DD and found a small ES, Maughan et al. (2005) examined the impact of parenting programs on parental psychosocial outcomes in the general population and found improvement in a variety of psychosocial outcomes (e.g., anxiety, depression, stress) with small ESs, and Brodaty, Green, and Koschera (2003) examined intervention effectiveness for dementia caregivers and found significant benefits for caregivers (e.g., mood, burden, psychological morbidity), with a small ES.

The ESs varied with study design. Consistent with previous studies of meta-analyses (Lipsey and Wilson 2001), the within-subjects ESs (Hedges' $g = .44$) were larger than the between-subjects ESs (Hedges' $g = .28$). Lipsey and Wilson (2001) examined 45 meta-analyses and noted that on average within-subjects designs yielded ESs 61% larger than those using between-subjects designs and suggested that within-subjects design studies could potentially inflate mean ESs. Because within-subject studies lack a control group, they are subject to more internal validity threats (e.g., maturation effects, history effects) so that factors unrelated to the intervention could inflate the apparent effectiveness (Higgins and Green 2011) potentially biasing the results.

Effectiveness Across Intervention Approaches

A variety of intervention approaches were identified and used across the studies: CBT, ACT, mindfulness-based intervention, psychoeducational intervention, social support, positive psychotherapy, written emotional disclosure, and multicomponent interventions. Psychosocial outcome ES depended on intervention approaches in the within-subjects analyses. Although there were no differences across intervention type in the between-subjects analyses, this may have been due to the limited number of studies available. Moreover, because the within-subjects analyses included all of the

identified studies, it represents a more comprehensive and externally valid sample.

ACT/mindfulness-based interventions were effective and exhibited a medium positive impact on caregiver overall psychosocial outcome in the within-subjects meta-analysis. This finding validates the results reported earlier by Cachia et al. (2016) that mindfulness was effective for caregivers of those with ASD and also is consistent with the findings of Pinquart and Sörensen (2006) that cognitive treatments, including mindfulness, have tended to produce greater effects sizes in psychological adjustment than non-cognitive approaches in interventions for dementia caregivers. The results also are consistent with findings from the general psychotherapy literature that mindfulness-based interventions are moderately effective in improving anxiety and mood for people diagnosed with psychological or physical disorders (e.g., cancer, anxiety, depression; Hofmann et al. 2010).

CBT was moderately effective in improving caregiver overall psychosocial outcome in the within-subjects meta-analysis. In fact, compared to the other intervention approaches, CBT produced the largest effect size. This is consistent with prior studies showing that CBT is effective in improving psychosocial outcomes in parents of children with DD (Hastings and Beck 2004; Singer et al. 2007). The findings also are consistent with the general psychotherapy literature that CBT is effective in reducing depression, anxiety, and stress in the general population (e.g., Richardson and Rothstein 2008).

Multicomponent interventions also were moderately effective in improving caregiver psychosocial outcomes in the within-subjects meta-analysis. This result is consistent with the findings of Hastings and Beck (2004) that multicomponent interventions are effective in improving psychological well-being in parents of children with ID and in reducing stress in parents of children with DD (Singer et al. 2007).

Finally, positive psychotherapy/written emotional disclosure also had a small effect in improving caregiver outcomes in the within-subject analyses. However, the ES was the smallest of the significant interventions. The results indicate that focusing on positive aspects in life or sharing thoughts and feelings about a stressful event in a safe environment may have a small positive impact on psychological well-being although the limited number of studies and inconsistency in the results temper our confidence in these findings.

The results for psychoeducation and social support were nonsignificant for the within-subjects analyses. However, the number of studies was limited and should be interpreted with caution. Previous meta-analyses have reported small effects for psychoeducation in reducing stress, depression, and anxiety in the general population (Donker et al. 2009; Van Daele et al. 2012) and in caregivers of people with dementia (Pinquart and Sörensen 2006).

In summary, four of the six intervention approaches demonstrated some evidence of effectiveness. ACT, mindfulness-based interventions, and CBT were moderately effective in improving caregiver psychosocial outcomes in pre-post comparisons. Although multicomponent, psychosocial and positive psychotherapy/written emotional disclosure interventions had modest support, these findings are tempered by small samples and small effects in the within-subjects results. Social support and psychoeducational interventions, however, were not effective in improving caregiver psychosocial outcomes. However, as already mentioned, due to the small number of studies in some of the intervention categories, these results should be taken with caution. Moreover, it should again be emphasized that these results refer to the within-subjects analyses. These modest effect sizes are likely to be even smaller when examined using a between-subjects design.

Moderators of Intervention Effectiveness

Group level sample characteristics related to child and caregiver had little impact on the outcomes of interventions. The lack of moderation effects for study sample composition is in part explicable because studies exhibited a range restriction in mean values on many of these variables. Also, because only about a third of the studies reported the detailed ASD diagnostic categories based on DSM-IV criteria (American Psychiatric Association 2000), and even fewer studies reported the presence of comorbid ID and problem behaviors in the offspring, there was limited ability to examine the potential moderating effects of these child characteristics on effectiveness.

Apart from the moderating impact of intervention type noted earlier, other intervention characteristics (i.e., group vs. individual delivery format, multi- vs. single-component, intervention duration, number of sessions) had little impact on the outcomes. Specifically, although group interventions were more effective than individual interventions in the within-subjects meta-analysis, the difference was not significant. Prior findings concerning delivery format have been inconsistent. For example, group interventions were less effective in improving burden and well-being than individual interventions in caregivers of older adults and dementia caregivers (Sorensen et al. 2002), whereas interventions delivered in group format were more effective in cancer caregivers (Northouse et al. 2010). Moreover, the moderation analysis was complicated by the fact that format was confounded with type of interventions (i.e., all the ACT/mindfulness-based studies and the majority of the CBT and multicomponent studies were conducted in groups, whereas all the positive psychotherapy/written emotional disclosure studies were in individual format).

In contrast to predictions that higher intervention intensity should have a positive impact on caregiver outcomes (Sorensen et al. 2002), neither total intervention duration nor the number of intervention sessions moderated the effectiveness of interventions. However, in a supplemental analysis, effectiveness was found to be related to total number of intervention hours. That is, similar to findings from Northouse et al. (2010), total intervention hours (i.e., in person, online, through phone) predicted higher mean ES in the within-subjects meta-analysis. However, the moderating effect was small and explained only 7% of the variance in the model. Because total hours combines the impact of intervention duration and frequency, it may be a more sensitive measure of intervention intensity. Other factors like attendance, homework practice, and compliance could also impact intervention outcomes (Khoury et al. 2013).

ESs differed based on the outcome measure used, suggesting that some measures were more sensitive to the effect of caregiver-focused interventions. Specifically, interventions were most effective in reducing parenting stress, depression, and anxiety and improving general well-being in both within- and between-subjects meta-analyses. In contrast, both caregiver burden and quality of life produced nonsignificant small ESs, suggesting that caregiver burden and quality of life are less sensitive to the effect of interventions, which is similar to the findings in Knight et al. (1993). However, these conclusions should be tempered with caution because of the small number of studies utilizing some of the outcome measures. Ideally, future studies should compare the sensitivities of the outcome measures within the same studies.

Limitations of the Reviewed Studies

The reviewed studies suffered from several limitations. First, the majority of the studies included small sample sizes. Although small samples have less impact on the results of meta-analyses, small sample sizes threaten internal and external validity of the findings in individual studies. Second, very few studies used randomized controlled trials, with over half of the between-subjects design studies using quasi-experimental designs, which limited the quality and reliability of the results. However, when explicitly examined, the use of an RCT design was not a significant moderator of effectiveness. Third, the majority of the studies used convenience sampling allowing participants to self-refer to the study, which may introduce selection bias to the results. It is possible that caregivers who volunteer differ from the general population of caregivers in important ways that could limit generalizability, e.g., experiencing either greater or fewer negative psychosocial outcomes, have children with either more or less severe problem behaviors. For example, the proportion of participants with a college degree was

roughly twice the proportion in the general population (Ryan and Bauman 2016), marking the sample as particularly well educated. Moreover, because many studies provided insufficient information on offspring's characteristics (e.g., comorbidities, problem behaviors), there was limited ability to evaluate external validity of the individuals with ASD. Fourth, as mentioned earlier, over half of the studies were categorized as of weak quality. Many studies did not provide important information needed to evaluate study quality, such as allocation concealment and dropout rates, contributing to the high percentage of studies rated as having weak quality. Lastly, few studies reported long term follow-up, reducing the ability to examine the long term or maintenance effect of the interventions.

Limitations of the Current Meta-analysis

Although this is the first study to systematically review interventions that specifically target psychosocial outcomes of caregivers of individuals with ASD using meta-analytic methods, there were several limitations. First, there are inherent problems when using meta-analysis to compare intervention effectiveness, as proposed by the second research question, because caregivers in each study may nonrandomly select to participate in a particular type of intervention (Dura and Kiecolt-Glaser 1990; Robinson et al. 2005), confounding preference with intervention type.

Second, because some of the moderators (e.g., outcome variables) were used in very few studies (e.g., caregiver burden, family adjustment), it was not possible to reliably examine intervention impact on these outcomes. In addition, the power to detect significance in any of the moderator analyses was likely to be low (Borenstein et al. 2009) due to the small number of studies, which may have contributed to some of the nonsignificant findings (e.g., treatment intensity, delivery format).

A couple of strengths of the current meta-analysis are worth noting. The first strength is its generalizability across countries. The review included a diverse group of participants from the US and other countries around the world, which supports the effectiveness of caregiver-focused interventions regardless of country of origin. Second, efforts to include unpublished studies to minimize the "file drawer" problems were largely successful. There was no evidence of publication bias and 37% of the studies reviewed were dissertations.

Implications and Future Research Directions

This is a developing research area compared to caregiver interventions in other populations (e.g., dementia, cancer). More studies examining interventions that target psychosocial outcomes in ASD caregivers are needed, especially

studies with a rigorous study design (i.e., RCT), larger sample sizes, and long-term follow-ups. Moreover, the effectiveness of these studies was quite modest, suggesting that critical features impacting caregiver outcomes are not being addressed. For example, it is possible that interventions that focus on improving outcomes both for the child and the caregiver may have greater impact for the caregiver than interventions that focus solely on the caregiver (such as those investigated here) or focus solely on the child (assuming they also impact caregiver outcomes).

Future research should be more comprehensive in reporting details about sample characteristics (both the caregivers' and the offspring's) and intervention descriptions. For example, offspring characteristics, such as comorbid intellectual disability or problem behaviors, could affect severity of caregiver stress or ability to participate in the intervention and thus would be interesting and meaningful to explore.

Also, there was a restricted range of offspring's age in the current meta-analysis, thus the effectiveness of interventions in different age groups is not clear. Studies of interventions that target ASD caregivers across the lifespan are needed. Caregiver stress tends to wax and wane, and parental psychosocial outcomes may change coinciding with the offspring's key transition periods, e.g., receiving an ASD diagnosis, transitioning into adulthood (Stuart and McGrew 2009; Yu et al. 2018). Research is needed to examine whether caregiver-focused interventions are effective in improving psychosocial outcomes during or after the key transition periods, and whether incorporating strategies specific to the transition periods will have positive impacts on caregivers.

A key future challenge for researchers is to identify the moderators of intervention effectiveness. In addition, although not the focus of this meta-analysis, caregiver characteristics such as coping strategies, appraisal styles, and parental self-efficacy may act as moderators. For example, avoidance coping and negative appraisal styles have been identified as being particularly problematic in increasing caregiver stress and burden (Stuart and McGrew 2009; McGrew and Keyes 2014; Yu et al. 2018). Interventions that focus more closely on modifying these known risk factors may lead to greater improvement in caregivers' psychosocial outcomes.

Methodological quality was low across a variety of quality measures. Future studies should include fidelity assessment even when the intervention is well developed, manualized, and implemented by experienced facilitators. Ensuring model adherence in intervention studies is important because it will allow better communication among researchers (Bond et al. 2000), and monitoring intervention delivery for factors like consistency, content, and quality can limit validity threats.

Conclusion

This meta-analysis provides evidence for the effectiveness of interventions specifically targeting psychosocial outcomes in caregivers of individuals with ASD. The caregiver-focused interventions on average exhibited small but positive effects in improving overall psychosocial outcomes in caregivers. Specifically, they were successful in alleviating parenting stress, depression, and anxiety and increasing general well-being. CBT and Mindfulness/ACT approaches appear to be more effective than others. As a developing field, more research is needed to examine interventions to improve caregiver outcomes in this population and potential variables that contribute to the effectiveness.

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Author Contributions YY and JM conceived this research. YY performed the review, designed and performed the analyses, and interpreted data. YY and JM wrote and edited the manuscript. JB performed interrater reliability and participated in manuscript revision.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors.

References

* Included in the meta-analyses

- Abbeduto, L., Seltzer, M. M., Shattuck, P., Krauss, M. W., Orsmond, G., & Murphy, M. M. (2004). Psychological well-being and coping in mothers of youths with autism, Down syndrome, or fragile X syndrome. *American Journal of Mental Retardation: AJMR*, 109(3), 237–254. <https://doi.org/10.1352/0895-8017>.
- * Al-Khalaf, A., Dempsey, I., & Dally, K. (2014). The effect of an education program for mothers of children with autism spectrum disorder in Jordan. *International Journal for the Advancement of Counselling*, 36(2), 175–187. <https://doi.org/10.1007/s10447-013-9199-3>.
- American Psychiatric Association. (2000). *DSM-IV. Diagnostic and statistical manual of mental disorders* (4th ed.). Philadelphia: American Psychiatric Association.
- Barlow, J., Coren, E., & Stewart-Brown, S. (2002). Meta-analysis of the effectiveness of parenting programmes in improving maternal psychosocial health. *British Journal of General Practice*, 52(476), 223–233. <https://doi.org/10.1002/14651858>.
- Benn, R., Akiva, T., Arel, S., & Roeser, R. W. (2012). Mindfulness training effects for parents and educators of children with special needs. *Developmental Psychology*, 48(5), 1476–1487. <https://doi.org/10.1037/a0027537>.

- * Blackledge, J., & Hayes, S. (2006). Using acceptance and commitment training in the support of parents of children diagnosed with autism. *Child & Family Behavior Therapy*, 28(1), 1. https://doi.org/10.1300/J019v28n01_01.
- Benson, P. R., & Kersh, J. (2011). Marital quality and psychological adjustment among mothers of children with ASD: Cross-sectional and longitudinal relationships. *Journal of Autism and Developmental Disorders*, 41(12), 1675–1685.
- Blodgett, J. C., Del Re, A. C., Maisel, N. C., & Finney, J. W. (2014). A meta-analysis of topiramate's effects for individuals with alcohol use disorders. *Alcoholism: Clinical and Experimental Research*, 38(6), 1481–1488. <https://doi.org/10.1111/acer.12411>.
- Bond, G. R., Evans, L., Salyers, M. P., Williams, J., & Kim, H.-W. W. (2000). Measurement of fidelity in psychiatric rehabilitation. *Mental Health Services Research*, 2(2), 75–87. <https://doi.org/10.1023/A:1010153020697>.
- Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). Introduction to meta-analysis. *Psychotherapy Research Journal of the Society for Psychotherapy Research*, 19(4–5), 421. <https://doi.org/10.1002/9780470743386>.
- Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2014). Comprehensive meta analysis (Version 3.3).
- Brodsky, H., Green, A., & Koschera, A. (2003). Meta-analysis of psychosocial interventions for caregivers of people with dementia. *Journal of the American Geriatrics Society*, 51(5), 657–664.
- Cachia, R. L., Anderson, A., & Moore, D. W. (2016). Mindfulness, stress and well-being in parents of children with autism spectrum disorder: A systematic review. *Journal of Child and Family Studies*, 25(1), 1–14. <https://doi.org/10.1007/s10826-015-0193-8>.
- * Campbell, N. B. (2003). Emotional disclosure through writing: An intervention to facilitate adjustment to having a child with autism. Dissertation Abstracts International: Section B: The Sciences and Engineering. ProQuest Information & Learning, US. Retrieved August 30, 2017 from <http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2003-95022-128&site=ehost-live>.
- * Canon Garzon, L. F. (2012). Acceptance and Commitment Therapy (ACT) as an Alternative for Reducing Psychological Distress Experienced by Latino Parents of Children with Autism: A Pilot Study. ProQuest Dissertations and Theses. The Chicago School of Professional Psychology, Ann Arbor. Retrieved August 30, 2017 from <http://ulib.iupui.edu/cgi-bin/proxy.pl?url=http://search.proquest.com/docview/1313771621?accountid=7398>.
- Card, N. A. (2015). *Applied meta-analysis for social science research*. New York: Guilford.
- * Chiang, H.-M. (2014). A parent education program for parents of Chinese American children with autism spectrum disorders (ASDS): A pilot study. *Focus on Autism and Other Developmental Disabilities*, 29(2), 88–94. <https://doi.org/10.1177/1088357613504990>.
- * Clifford, T., & Minnes, P. (2013). Logging on: Evaluating an online support group for parents of children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 43(7), 1662–1675. <https://doi.org/10.1007/s10803-012-1714-6>.
- Cohen, J. (1992). A power primer. *Psychological Bulletin*, 112(1), 155–159. <https://doi.org/10.1037/0033-2909.112.1.155>.
- * Corti, C., Pergolizzi, F., Vanzin, L., Cargasacchi, G., Villa, L., Pozzi, M., et al. (2018). Acceptance and commitment therapy-oriented parent-training for parents of children with autism. *Journal of Child and Family Studies*. <https://doi.org/10.1007/s10826-018-1123-3>.
- Cuijpers, P., van Straten, A., Bohlmeijer, E., Hollon, S. D., & Andersson, G. (2010). The effects of psychotherapy for adult depression are overestimated: A meta-analysis of study quality and effect size. *Psychological Medicine*, 40(2), 211. <https://doi.org/10.1017/S0033291709006114>.
- Da Paz, N. S. (2016). Randomized controlled trial to evaluate written disclosure as treatment for parents of children with autism spectrum disorders. ProQuest Dissertations and Theses. University of California, Merced, Ann Arbor. Retrieved August 30, 2017 from <http://ulib.iupui.edu/cgi-bin/proxy.pl?url=http://search.proquest.com/docview/1799647627?accountid=7398>.
- * Da Paz, N. S., & Wallander, J. L. (2017). Interventions that target improvements in mental health for parents of children with autism spectrum disorders: A narrative review. *Clinical Psychology Review*, 51, 1–14.
- Dawson, G., Rogers, S., Munson, J., Smith, M., Winter, J., Greenson, J., ... Varley, J. (2010). Randomized, controlled trial of an intervention for toddlers with autism: The early start denver model. *Pediatrics*, 125(1), e17–e23.
- Donker, T., Griffiths, K. M., Cuijpers, P., & Christensen, H. (2009). Psychoeducation for depression, anxiety and psychological distress: A meta-analysis. *BMC Medicine*, 7(1), 79. <https://doi.org/10.1186/1741-7015-7-79>.
- Dura, J. R., & Kiecolt-Glaser, J. K. (1990). Sample bias in caregiving research. *Journal of Gerontology: Psychological Sciences*, 45(5), P200–P204. Retrieved August 30, 2017 from [http://pni.osumc.edu/KGPublications\(pdf\)/048.pdf](http://pni.osumc.edu/KGPublications(pdf)/048.pdf)
- * Elfert, M., & Mirenda, P. (2015). Evaluation of a support group for fathers of children with autism spectrum disorder. *Canadian Journal of Counselling and Psychotherapy*, 49(2), 115–138. Retrieved August 30, 2017 from <http://ezp-prod1.hul.harvard.edu/login?url=http://search.ebscohost.com>.
- * Ergüner-Tekinalp, B., & Akkök, F. (2004). The effects of a coping skills training program on the coping skills, hopelessness, and stress levels of mothers of children with autism. *International Journal for the Advancement of Counselling*, 26(3), 257–269. <https://doi.org/10.1023/B:ADCO.0000035529.92256.0d>.
- * Farmer, J., & Reupert, A. (2013). Understanding Autism and understanding my child with autism: An evaluation of a group parent education program in rural Australia. *Australian Journal of Rural Health*, 21(1), 20–27. <https://doi.org/10.1111/ajr.12004>.
- * Feinberg, E., Augustyn, M., Fitzgerald, E., Sandler, J., Ferreira-Cesar Suarez, Z., Chen, N., ... Silverstein, M. (2014). Improving maternal mental health after a child's diagnosis of autism spectrum disorder: Results from a randomized clinical trial. *JAMA Pediatrics*, 168(1), 40–46. <https://doi.org/10.1001/jamapediatrics.2013.3445>.
- * Ferraioli, S. J., & Harris, S. L. (2013). Comparative effects of mindfulness and skills-based parent training programs for parents of children with autism: Feasibility and preliminary outcome data. *Mindfulness*, 4(2), 89–101. <https://doi.org/10.1007/s12671-012-0099-0>.
- Fitzgerald, M., Birkbeck, G., & Matthews, P. (2002). Maternal burden in families with children with autistic spectrum disorder. *The Irish Journal of Psychology*, 23(1–2), 2–17.
- Fu, R., Gartlehner, G., Grant, M., Shamliyan, T., Sedrakyan, A., Wilt, T. J., ... Trikalinos, T. A. (2011). Conducting quantitative synthesis when comparing medical interventions: AHRQ and the Effective Health Care Program. *Journal of Clinical Epidemiology*. <https://doi.org/10.1016/j.jclinepi.2010.08.010>.
- * Fung, J. L. (2011). An evaluation of a social support intervention for caregivers of newly-diagnosed children with autism. ProQuest Dissertations and Theses. University of Washington, Ann Arbor. Retrieved August 30, 2017 from <http://ulib.iupui.edu/cgi-bin/proxy.pl?url=http://search.proquest.com/docview/931268641?accountid=7398>
- * Gika, D. M., Artemiadis, A. K., Alexopoulos, E. C., Darviri, C., Papanikolaou, K., & Chrousos, G. P. (2012). Use of a relaxation technique by mothers of children with autism: A case-series study. *Psychological Reports*, 111(3), 797–804. <https://doi.org/10.2466/20.15.21.PR0.111.6.797-804>.

- Green, J., Charman, T., McConachie, H., Aldred, C., Slonims, V., Howlin, P., ... Pickles, A. (2010). Parent-mediated communication-focused treatment in children with autism (PACT): A randomized controlled trial. *The Lancet*, 375(9732), 2152–2160. [https://doi.org/10.1016/s0140-6736\(10\)60587-9](https://doi.org/10.1016/s0140-6736(10)60587-9).
- * Hahs, A. D. (2013). A comparative analysis of acceptance and commitment therapy and a mindfulness-based therapy with parents of individuals diagnosed with autism spectrum disorder. ProQuest Dissertations and Theses.
- * Hajiabolhasani-Nargani, Z., Najai, M., & Mehrabi, T. (2016). Effect of mobile parenting skills education on anxiety of the mothers with autistic children. *Iranian Journal of Nursing & Midwifery Research*, 21(6), 572–576. <https://doi.org/10.4103/1735-9066.197668>.
- Hastings, R. P., & Beck, A. (2004). Practitioner review: Stress intervention for parents of children with intellectual disabilities. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 45(8), 1338–1349. <https://doi.org/10.1111/j.1469-7610.2004.00357.x>.
- Hayes, S. A., & Watson, S. L. (2013). The impact of parenting stress: A meta-analysis of studies comparing the experience of parenting stress in parents of children with and without autism spectrum disorder. *Journal of Autism and Developmental Disorders*, 43(3), 629–642. <https://doi.org/10.1007/s10803-012-1604-y>.
- Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). Acceptance and commitment therapy: An experiential approach to behavior change. New York: Guilford.
- Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis*. Orlando: Academic Press.
- Higgins, J. P., & Green, S. (2011). Cochrane handbook for systematic reviews of interventions version 5.1.0 [updated March 2011]. In: *The Cochrane collaboration*.
- Higgins, J. P. T., & Thompson, S. G. (2002). Quantifying heterogeneity in a meta-analysis. *Statistics in Medicine*, 21(11), 1539–1558. <https://doi.org/10.1002/sim.1186>.
- Hofmann, S. G., Sawyer, A. T., Witt, A. A., & Oh, D. (2010). The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review. *Journal of Consulting and Clinical Psychology*, 78(2), 169–183. <https://doi.org/10.1037/a0018555>.
- Huedo-Medina, T. B., Sánchez-Meca, J., Marín-Martínez, F., & Botella, J. (2006). Assessing heterogeneity in meta-analysis: Q statistic or I² index? *Psychological Methods*, 11(2), 193–206. <https://doi.org/10.1037/1082-989X.11.2.193>.
- IBM Corp. Released. (2015). IBM SPSS Statistics for Windows, Version 23.0. 2015.
- * Izadi-Mazidi, M., Riahi, F., & Khajeddin, N. (2015). Effect of cognitive behavior group therapy on parenting stress in mothers of children with autism. *Iranian Journal of Psychiatry and Behavioral Sciences*. <https://doi.org/10.17795/ijpbs-1900>.
- * Ji, B., Sun, M., Yi, R., & Tang, S. (2014). Multidisciplinary parent education for caregivers of children with autism spectrum disorders. *Archives of Psychiatric Nursing*, 28(5), 319–326. <https://doi.org/10.1016/j.apnu.2014.06.003>.
- * Jurkowitz, I. T. N. (2013). Reducing stress in parents of children with autism spectrum disorder: Testing the effectiveness of parents matter. ProQuest Dissertations and Theses. Retrieved August 30, 2017 from <http://ulib.iupui.edu/cgi-bin/proxy.pl?url=http://search.proquest.com>.
- Karst, J. S., & van Hecke, A. V. (2012). Parent and family impact of autism spectrum disorders: A review and proposed model for intervention evaluation. *Clinical Child and Family Psychology Review*, 15(3), 247–277. <https://doi.org/10.1007/s10567-012-0119-6>.
- Khoury, B., Lecomte, T., Fortin, G., Masse, M., Therien, P., Bouchard, V., ... Hofmann, S. G. (2013). Mindfulness-based therapy: A comprehensive meta-analysis, 33, 763–771. <https://doi.org/10.1016/j.cpr.2013.05.005>.
- Knight, B. G., Lutzky, S. M., & Macofsky-Urban, F. (1993). A meta-analytic review of interventions for caregiver distress: Recommendations for future research. *The Gerontologist*, 33(2), 240–248. <https://doi.org/10.1093/geront/33.2.240>.
- * Kowalkowski, J. D. (2013). The impact of a group-based acceptance and commitment therapy intervention on parents of children diagnosed with an autism spectrum disorder. Dissertation Abstracts International: Section B: The Sciences and Engineering. ProQuest Information & Learning, US. Retrieved August 30, 2017 from <http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2013-99140-434&site=ehost-live>.
- * Kroodsmas, L. (2008). An educational workshop for parents of children with Asperger Syndrome. Dissertation Abstracts International: Section B: The Sciences and Engineering. ProQuest Information & Learning, US. Retrieved August 30, 2017 from <http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2008-99120-149&site=ehost-live>.
- * LaPlante, A. M. (2013). The effectiveness of a positive psychology intervention with parents of children with Autism Spectrum Disorders. ProQuest Dissertations and Theses. University of La Verne, Ann Arbor. Retrieved August 30, 2017 from <http://ulib.iupui.edu/cgi-bin/proxy.pl?url=http://search.proquest.com/docview/1429610290?accountid=7398>.
- Lindo, E. J., Kliemann, K. R., Combes, B. H., & Frank, J. (2016). Managing stress levels of parents of children with developmental disabilities: A meta-analytic review of interventions. *Family Relations*, 65(1), 207–224. <https://doi.org/10.1111/fare.12185>.
- Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Applied Social Research Methods Series (Vol. 49). Thousand Oaks: Sage.
- Liu, B., Zhang, Y., Zhang, L., & Li, L. (2014). Repetitive transcranial magnetic stimulation as an augmentative strategy for treatment-resistant depression, a meta-analysis of randomized, double-blind and sham-controlled study. *BMC Psychiatry*, 14(1), 342. <https://doi.org/10.1186/s12888-014-0342-4>.
- * Lovell, B., Moss, M., & Wetherell, M. A. (2016). Assessing the feasibility and efficacy of written benefit-finding for caregivers of children with autism: A pilot study. *Journal of Family Studies*, 22(1), 32–42. <https://doi.org/10.1080/13229400.2015.1020987>.
- Lundahl, B., Risser, H. J., & Lovejoy, M. C. (2006). A meta-analysis of parent training: Moderators and follow-up effects. *Clinical Psychology Review*, 26(1), 86–104. <https://doi.org/10.1016/j.cpr.2005.07.004>.
- * Magaña, S., Lopez, K., & Machalicek, W. (2017). Parents taking action: A psycho-educational intervention for latino parents of children with autism spectrum disorder. *Family Process*, 56(1), 59–74. <https://doi.org/10.1111/famp.12169>.
- Maughan, D. R., Christianseri, E., Jensori, W. R., Olympia, D., & Clark, E. (2005). Behavioral parent training as a treatment for externalizing behaviors and disruptive behavior disorders: A meta-analysis. *School Psychology Review*, 34(3), 267–286.
- McConachie, H., & Diggle, T. (2007). Parent implemented early intervention for young children with autism spectrum disorder: A systematic review. *Journal of Evaluation in Clinical Practice*, 13(1), 120–129. <https://doi.org/10.1111/j.1365-2753.2006.00674.x>.
- * McCreadie, M. (2013). The parent programme: A psycho-educational intervention for parents of children with autism. Retrieved August 30, 2017 from <http://theses.qmu.ac.uk/1632/1/1632.pdf>
- McGrew, J. H., & Keyes, M. L. (2014). Caregiver stress during the first year after diagnosis of an autism spectrum disorder. *Research in Autism Spectrum Disorders*, 8(10), 1373–1385. <https://doi.org/10.1016/j.rasd.2014.07.011>.

- * Montgomery, D. (2016). Effects of acceptance and commitment therapy for parents of children with autism. ProQuest Dissertations and Theses. ProQuest Information & Learning, US. Retrieved August 30, 2017 from <http://search.ebscohost.com/login>.
- * Nguyen, C. T., Fairclough, D. L., & Noll, R. B. (2016). Problem-solving skills training for mothers of children recently diagnosed with autism spectrum disorder: A pilot feasibility study. *Autism*, 20(1), 55–64. <https://doi.org/10.1177/1362361314567134>.
- * Niinomi, K., Asano, M., Kadoma, A., Yoshida, K., Ohashi, Y., Furuzawa, A., ... Mori, A. (2016). Developing the “Skippu-Mama” program for mothers of children with autism spectrum disorder. *Nursing & Health Sciences*, 18(3), 283–291. <https://doi.org/10.1111/nhs.12264>.
- Northouse, L. L., Katapodi, M. C., Song, L., Zhang, L., & Mood, D. W. (2010). Interventions with family caregivers of cancer patients: Meta-analysis of randomized trials. *CA: A Cancer Journal for Clinicians*, 60(5), 317–339. <https://doi.org/10.3322/caac.20081>.
- Pakenham, K. I., Samios, C., & Sofronoff, K. (2005). Adjustment in mothers of children with Asperger syndrome: An application of the double ABCX model of family adjustment. *Autism: The International Journal of Research and Practice*, 9(2), 191–212. <https://doi.org/10.1177/1362361305049033>.
- * Peck, C. Z. (1998). Program evaluation of a family systems model of service delivery for parents of children with autism: Promoting adaptation to family stress. *Special Services in the Schools*, 14(1–2), 127–145. Retrieved August 30, 2017 from <http://search.ebscohost.com/login.aspx?direct=true&db=eric&AN=EJ585383&site=ehost-live>.
- Pinquart, M., & Sörensen, S. (2006). Helping caregivers of persons with dementia: Which interventions work and how large are their effects? *International Psychogeriatrics*, 18(4), 577. <https://doi.org/10.1017/S1041610206003462>.
- Polanin, J. R., Tanner-Smith, E. E., & Hennessy, E. A. (2016). Estimating the difference between published and unpublished effect sizes: A meta-review. *Review of Educational Research*, 86(1), 207–236. <https://doi.org/10.3102/0034654315582067>.
- * Rayan, A., & Ahmad, M. (2016a). Effectiveness of mindfulness-based intervention on perceived stress, anxiety, and depression among parents of children with autism spectrum disorder. *Mindfulness*, 8(3), 677–690. <https://doi.org/10.1007/s12671-016-0595-8>.
- * Rayan, A., & Ahmad, M. (2016b). Effectiveness of mindfulness-based interventions on quality of life and positive reappraisal coping among parents of children with autism spectrum disorder. *Research in Developmental Disabilities*, 55, 185–196. <https://doi.org/10.1016/j.ridd.2016.04.002>.
- Richardson, K. M., & Rothstein, H. R. (2008). Effects of occupational stress management intervention programs: A meta-analysis. *Journal of Occupational Health Psychology*, 13(1), 69–93. <https://doi.org/10.1037/1076-8998.13.1.69>.
- Robinson, K. M., Buckwalter, K. C., & Reed, D. (2005). Predictors of use of services among dementia caregivers. *Western Journal of Nursing Research*, 27(2), 126–140. <https://doi.org/10.1177/0193945904272453>.
- Rosenthal, R. (1991). *Meta-analytic procedures for social research*. Beverly Hills: Sage.
- Rossiter, L., & Sharpe, D. (2001). The siblings of individuals with mental retardation: A quantitative integration of the literature. *Journal of Child and Family Studies*, 10(1), 65–84. <https://doi.org/10.1023/A:1016629500708>.
- * Ruiz-Robledillo, N., & Moya-Albiol, L. (2015). Effects of a cognitive-behavioral intervention program on the health of caregivers of people with autism spectrum disorder. *Psychosocial Intervention*, 24(1), 33–39. <https://doi.org/10.1016/j.psi.2015.01.001>.
- * Ruiz-Robledillo, N., Sariñana-González, P., Pérez-Blasco, J., González-Bono, E., & Moya-Albiol, L. (2015). A mindfulness-based program improves health in caregivers of people with autism spectrum disorder: A pilot study. *Mindfulness*, 6(4), 767–777. <https://doi.org/10.1007/s12671-014-0316-0>.
- Ryan, C. L., & Bauman, K. (2016). Educational attainment in the United States: 2015.
- * Samadi, S. A., McConkey, R., & Kelly, G. (2013). Enhancing parental well-being and coping through a family-centred short course for Iranian parents of children with an autism spectrum disorder. *Autism: The International Journal of Research and Practice*, 17(1), 27–43. <https://doi.org/10.1177/1362361311435156>.
- * Shu, B. C., & Lung, F. W. (2005). The effect of support group on the mental health and quality of life for mothers with autistic children. *Journal of Intellectual Disability Research*, 49(1), 47–53. <https://doi.org/10.1111/j.1365-2788.2005.00661.x>.
- Siman-Tov, A., & Kaniell, S. (2011). Stress and personal resource as predictors of the adjustment of parents to autistic children: A multivariate model. *Journal of Autism and Developmental Disorders*. <https://doi.org/10.1007/s10803-010-1112-x>.
- Singer, G. H. S., Ethridge, B. L., & Aldana, S. I. (2007). Primary and secondary effects of parenting and stress management interventions for parents of children with developmental disabilities: A meta-analysis. *Mental Retardation and Developmental Disabilities Research Reviews*, 13(4), 357–369. <https://doi.org/10.1002/mrdd.20175>.
- Sorensen, S., Pinquart, M., & Duberstein, P. (2002). How effective are interventions with caregivers? An updated meta-analysis. *Gerontologist*, 42(3), 356–372.
- Stuart, M., & McGrew, J. H. (2009). Caregiver burden after receiving a diagnosis of an autism spectrum disorder. *Research in Autism Spectrum Disorders*, 3(1), 86–97. <https://doi.org/10.1016/j.rasd.2008.04.006>.
- * Suzuki, M., Yamada, A., Watanabe, N., Akechi, T., Katsuki, F., Nishiyama, T., ... Furukawa, T. A. (2014). A failure to confirm the effectiveness of a brief group psychoeducational program for mothers of children with high-functioning pervasive developmental disorders: A randomized controlled pilot trial. *Neuropsychiatric Disease and Treatment*, 10, 1141–1153. Retrieved August 30, 2017 from <http://www.dovepress.com/getfile.php>.
- The Cochrane Collaboration. (2011). Cochrane handbook for systematic reviews of interventions version 5.1.0 [updated March 2011]. 2011. Available from www.cochrane-handbook.org.
- Thomas, B. H. (2009). Dictionary for the effective public health practice project quality assessment tool for quantitative studies. Retrieved August 30, 2017, from <http://www.ehphp.ca/index.html>.
- * Timmons, L. N. (2015). The effectiveness of a gratitude intervention at improving well-being for parents of children with autism spectrum disorder. ProQuest Dissertations and Theses. Texas Christian University, Ann Arbor. Retrieved August 30, 2017 from <http://ulib.iupui.edu/cgi-bin/proxy.pl?url=http://search.proquest.com/docview/1689898963?accountid=7398>.
- * Tonge, B., Brereton, A., Kiomall, M., Mackinnon, A., King, N., & Rinehart, N. (2006). Effects on parental mental health of an education and skills training program for parents of young children with autism: A randomized controlled trial. *Journal of the American Academy of Child and Adolescent Psychiatry*, 45(5), 561–569. <https://doi.org/10.1097/01.chi.0000205701.48324.26>.
- Van Daele, T., Hermans, D., Van Audenhove, C., & Van den Bergh, O. (2012). Stress reduction through psychoeducation. *Health Education & Behavior*, 39(4), 474–485. <https://doi.org/10.1177/1090198111419202>.
- Virués-Ortega, J. (2010). Applied behavior analytic intervention for autism in early childhood: Meta-analysis, meta-regression and dose-response meta-analysis of multiple outcomes. *Clinical Psychology Review*, 30(4), 387–399. <https://doi.org/10.1016/j.cpr.2010.01.008>.

- Wainer, A. L., Hepburn, S., & McMahon Griffith, E. (2017). Remembering parents in parent-mediated early intervention: An approach to examining impact on parents and families. *Autism, 21*(1), 5–17. <https://doi.org/10.1177/1362361315622411>.
- * White, C. J. (2011). The effect of an Integrative Parent Education Program on quality of life for families of children with an Autism Spectrum Disorder. Dissertation Abstracts International: Section B: The Sciences and Engineering. ProQuest Information & Learning, US. Retrieved August 30, 2017 from <http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2011-99140-551&site=ehost-live>.
- Wong, C., & Kasari, C. (2012). Play and joint attention of children with autism in the preschool special education classroom. *Journal of Autism and Developmental Disorders, 42*(10), 2152–2161. <https://doi.org/10.1016/j.str.2010.08.012>.
- Yu, Y., McGrew, J. H., Rand, K. L., & Mosher, C. E. (2018). Using a model of family adaptation to examine outcomes of caregivers of individuals with autism spectrum disorder transitioning into adulthood. *Research in Autism Spectrum Disorders, 54*, 37–50. <https://doi.org/10.1016/J.RASD.2018.06.007>.
- Zarit, S. H., Reever, K. E., & Bach-Peterson, J. (1980). Relatives of the impaired elderly: Correlates of feelings of burden. *The Gerontologist, 20*(6), 649–655. <https://doi.org/10.1093/geront/20.6.649>.
- * Zimmerman, E. T. (2013). A pilot study exploring the educational and social/emotional benefits of web-based groups for parents of adolescents with Autism Spectrum Disorders. ProQuest Dissertations and Theses. University of Denver, Ann Arbor. Retrieved August 30, 2017 from <http://search.proquest.com>.
- * Zody, M. C. (2017). Acceptance and commitment therapy (ACT) as a one-day workshop for parents of children with an autism spectrum disorder. ProQuest Dissertations and Theses. The Wright Institute, Ann Arbor. Retrieved August 30, 2017 from <http://ulib.iupui.edu/cgi-bin>.

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