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Short- and Long-Term Effects of Parent Training for Preschool Children With or at Risk of ADHD: A Systematic Review and Meta-Analysis

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Abstract

Objective: The aim of the study was to synthesize the evidence of parent training (PT) as an early intervention for preschool children aged 2.5 to 6 years with ADHD or ADHD symptoms. **Method:** A systematic review and meta-analysis was conducted. **Results:** Sixteen studies including 1,003 children were analyzed. Parent-rated outcomes revealed moderate effect sizes (ESs; Hedges' *g*) of 0.51 for ADHD symptoms, 0.44 for conduct problems, and 0.63 for negative parenting. Based on independent assessment, results were only significant for negative parenting. Parent-rated outcomes were sustained at follow-ups of 3 to 12 months. Program type, intervention modality, and child diagnostic status did not moderate the effect. **Conclusion:** PT was partially supported as an efficacious intervention for preschool children with ADHD or ADHD symptoms with moderate ESs on parent-rated outcomes, but no significant results on independently assessed ADHD symptoms. *(J. of Att. Dis. XXXX; XX(X) XX-XX)*

Keywords

ADHD, parent training, early intervention, meta-analysis

Introduction

ADHD is a neurodevelopmental disorder characterized by age inappropriate, persistent, and pervasive inattention and/or hyperactivity-impulsivity that interferes with daily functioning at home, school, or work (American Psychiatric Association, 2013). The disorder is associated with a host of problems, including emotion dysregulation (Shaw, Stringaris, Nigg, & Leibenluft, 2014), neuropsychological dysfunction (Pauli-Pott & Becker, 2011), social problems (Bagwell, Molina, Pelham, & Hoza, 2001), and academic underachievement (DuPaul & Stoner, 2014). ADHD may also increase the risk of developing oppositional defiant disorder (ODD) and conduct disorder (CD), disorders that are highly related to school dropout, delinquency, and crime (Beauchaine, Hinshaw, & Pang, 2010; Offord & Bennett, 1994). Even though the diagnostic criteria for ADHD were originally developed with a primary focus on school-age children, ADHD is also diagnosed in preschool children (Greenhill, Posner, Vaughan, & Kratochvil, 2008; Lahey et al., 2004; Sonuga-Barke, Auerbach, Campbell, Daley, & Thompson, 2005) with an estimated 2% to 6% of preschoolers meeting the criteria for ADHD (Lavigne, LeBailly, Hopkins, Gouze, & Binns, 2009). Given the negative impact of ADHD, there is an obvious need for an intervention that works. The question is when and how to intervene.

The risks associated with ADHD appear to increase with early onset (Barkley et al., 2000), just as the possibility of change may be greater early in life as the brain's ability to reorganize itself (i.e., neuroplasticity) is more pronounced in younger children (Halperin, Bédard, & Curchack-Lichtin, 2012). From a family perspective, the presence of ADHD symptoms may increase the likelihood of parents responding to their children with a negative parental style, which in turn might maintain or even enhance the disruptive difficulties of the child (Johnston & Mash, 2001). Therefore, early intervention that aims at altering inadequate parenting strategies before they consolidate might be beneficial (Thompson et al., 2009). If the developmental trajectory of the child is altered early on, some of the secondary difficulties related to ADHD such as peer rejection, low self-esteem, and

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comorbid ODD/CD might be prevented (Beauchaine et al., 2010; Halperin et al., 2012; Sonuga-Barke & Halperin, 2010), possibly resulting in a less severe condition (Sonuga-Barke et al., 2013).

ADHD can be treated pharmacologically (Banaschewski et al., 2006), but the efficacy is less consistent and associated with more adverse effects in preschool children (Kollins & Greenhill, 2006). Parent training (PT) is an early intervention that aims to alter inadequate parenting strategies, promote positive parent–child relationships, and in some cases target the underlying neuropsychological problems characteristic of ADHD (e.g., Abikoff et al., 2015; Sonuga-Barke, Daley, Thompson, Laver-Bradbury, & Weeks, 2001). Currently, PT programs fall into two categories, more generic programs that have been developed from ODD/CD PT programs and adapted for ADHD (Bor, Sanders, & Markie-Dadds, 2002; Jones, Daley, Hutchings, Bywater, & Eames, 2007; Webster-Stratton, Reid, & Beauchaine, 2011) and programs specifically developed for ADHD such as the Revised New Forest Parenting Programme (Sonuga-Barke et al., 2001; Thompson et al., 2009). Programs also differ with respect to delivery modus, that is, whether PT is delivered in groups or individually. The various programs do, however, have theoretical and methodological similarities. For instance, they all include tenets from social learning theory; apply psychoeducation; promote a positive focus on the child; train parents in the importance of structure, routines, and predictability in the everyday life of the child; and use praise and rewards as incentives.

Two prior meta-analyses by Sonuga-Barke et al. (2013) and Daley et al. (2014) investigated the effectiveness of behavioral interventions (including PT) for children and adolescents with ADHD aged 3 to 18 years. Both meta-analyses pointed to a discrepancy in the results depending on the assessor perspective; interventions were efficacious for parental reported ADHD symptoms but not for ADHD symptoms rated by independent assessors. A recent meta-analysis investigating PT for preschool ADHD (2.5-6 years; Mulqueen, Bartley, & Bloch, 2015) found a moderate effect on parental reported ADHD symptoms, the only outcome analyzed, based on a small number of studies ($n = 8$).

The primary aim of this article is to evaluate the effectiveness of PT programs, at post-treatment and follow-up, for preschool children with or at risk of ADHD (2.5-6 years) by means of a systematic review and meta-analysis. ADHD symptoms, child oppositionality and conduct problems (henceforth conduct problems), and negative parenting, parent-reported or rated by independent assessor, were examined. Moderator analyses were planned for methodological quality of studies, type of program (generic vs. specific PT programs), modality (group vs. individual intervention), and ADHD diagnostic status (diagnosis vs. ADHD symptoms).

Method

The study was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009).

Inclusion Criteria

Randomized controlled trials (RCTs) of PT programs and interventions published in peer-reviewed English language articles were included in the review. Participants were parents of preschool children aged 2.5 to 6 years with ADHD symptoms according to a formal diagnostic system or rated on a validated rating scale. Studies comparing PT with systematic medication were excluded, although use of medication as part of treatment as usual was allowed. Control conditions had to be no or minimal intervention groups (e.g., waitlist, treatment as usual, minimal intervention, or attention control).

Search Strategy and Data Extraction

The electronic databases of PsycInfo and PubMed were searched in May 2015 using the following keywords: "Attention* Deficit* Disorder*" or "Attention* Deficit* Disorder* with Hyperactivity*" or "adhd" or "hyperkin* disorder*" and "parent AND train*" or "interven*." Relevant Medical Subject Headings (MESH terms) were included in the PubMed search. The search was not restricted by year. Article titles, abstracts, and in some cases full texts were screened to evaluate eligibility, just as reference lists of included studies were screened to identify published follow-ups of studies included in the review, separate searches were conducted. The first author (MLR) and the third author (HZC) independently conducted the literature search, and disagreements were resolved through discussion ($n = 3$). An excel spreadsheet with coding variables was created and data were extracted independently by MLR and HZC regarding program, diagnosis or rating scale symptoms, age of the children, percentage of girls, intervention modality, control condition, duration of intervention as well as measures of ADHD, conduct problems, and negative parenting. Furthermore, the PT program was coded according to whether it was initially and specifically developed for treating ADHD. If more than one active intervention was reported in a study, the most ADHD specific intervention was analyzed. Intention to treat (ITT) data were analyzed if they were available, alternatively completer data were analyzed.

Outcome Measures

The following outcomes were included in the analyses: (a) child ADHD symptoms, (b) child conduct problems, and (c) negative parenting; each measured through two separate

informants, parents and independent raters. Child symptoms reported in semi-structured interviews with parents (e.g., Parental Account of Child's Symptoms, PACS; Chen & Taylor, 2006) were coded as parent-reported outcomes. Independent assessment was conducted by raters probably blinded to intervention condition based on naturalistic observations or on observations in experimental setups (e.g., "Fun Park"; Sonuga-Barke et al., 2001). Because only a few studies reported teacher ratings (n = 4), they were omitted from the meta-analysis.

Methodological Quality Assessment

Methodological quality of studies was assessed independently by the first author (MLR) and the third author (HZC) according to the Jadad criteria (Jadad et al., 1996), where studies are coded according to randomization, blinding, and description of withdrawal and dropout. Furthermore, the scoring was adjusted for multiple outcomes following Daley et al. (2014) so that studies with at least one blinded outcome receive a score of 1 on the blinding item. The scores range from 0 to 4, with a score of three indicative of acceptable methodological quality. Disagreements between the first and third author with respect to scores (n = 2) were solved through discussion.

Statistical Strategy

For post-treatment outcomes, effect sizes (ESs) were calculated from the differences between the pre- and post-scores for the intervention and control group standardized by use of change scores. The change score strategy is less sensitive to pre-treatment differences between groups than ESs based on post-scores (Borenstein, Hedges, Higgins, & Rothstein, 2009). Calculation of change score ESs requires, however, knowledge of the pre–post correlation of measures, which is typically not reported in the studies. In case of no information, we imputed a conservative estimate of r = .5 for the pre–post correlation, a value that would make the ES comparable with a standardized mean difference based on post-scores (Borenstein et al., 2009). A Hedges' g correction was applied to correct for possible bias in small samples (Hedges & Olkin, 1985). In case of several measures within a given outcome category, measures were standardized and averaged. Outcomes at follow-ups were calculated as within-group ESs from post-treatment to follow-up in the intervention group, as most participants receive interventions in the follow-up period. Because independent assessment is rare at follow-up, these analyses were based on parental report alone.

All analyses were conducted within the inverse variance random effects model where individual studies are treated as if they were a random sample from a larger population. This model is generally preferable to a fixed model because it allows for generalizations (Borenstein et al., 2009). Heterogeneity was examined using Q and I^2 statistics (Higgins & Thompson, 2002). Q statistic calculates the probability value for heterogeneity of studies. Significant heterogeneity is indicated by $p \leq .05$. I^2 statistic estimates the amount of variance in a pooled ES that can be accounted for by heterogeneity in the sample of studies. I^2 values of 25%, 50%, and 75% indicate low, moderate, and high degrees of heterogeneity, respectively. Publication bias was examined through Eggers' test (Egger, Davey, Schneider, & Minder, 1997). If Eggers' test was significant, indicating risk of publications bias, the Trim and Fill method was applied to impute missing studies to adjust estimates (Duval & Tweedie, 2000). Following the Cochrane guidelines on publication bias, only analyses including more than 10 studies were subjected to Eggers' test (Higgins & Green, 2011).

The association between ES and study methodological quality (i.e., Jadad score) was investigated using meta-regression. The other planned moderator analyses (generic vs. specific programs, group vs. individual treatment, diagnosis vs. rating scale) were conducted by use of meta-ANOVA. All moderator analyses were based on parental reports on ADHD symptoms, since parental reports are most widely used as outcome measures in PT, and ADHD symptoms may be considered a primary outcome in this meta-analysis. However, generic versus specific programs as a moderator was also analyzed on independent assessments of ADHD symptoms.

All analyses were conducted using the Comprehensive Meta-Analysis program, version 3.2.00089.

Results

In total, 16 studies were included in the analysis. The selection process is illustrated in Figure 1.

Characteristics of Studies

Characteristics of studies are seen in Table 1. The total number of children included in the meta-analysis was 1,003. Study sample sizes ranged from 22 to 149 children, with a mean sample size of 77. In nine studies (Studies 1, 4, 7, 9, 10, 12, 13, 15, 16; see Table 1), children were diagnosed with ADHD; in six studies (2, 3, 5, 6, 8, 14), children had symptoms above clinical cut-off on a validated rating scale. In one study (11), ADHD was measured but was not an inclusion criterion. The two most frequently adopted interventions were the Incredible Years Parent Training Program (n = 6; 2, 6, 8, 9, 11, 16) and The New Forest Parent Training Programme (n = 4; 1, 12, 13, 15). Most PT programs were delivered in groups (n = 9; 2, 3, 5, 6, 8, 9, 10, 11, 16), as compared with individually (n = 6; 1, 4, 7, 12, 13, 15); in one case (14), both delivery approaches were applied. Specific programs were delivered in four studies (1, 12, 13,

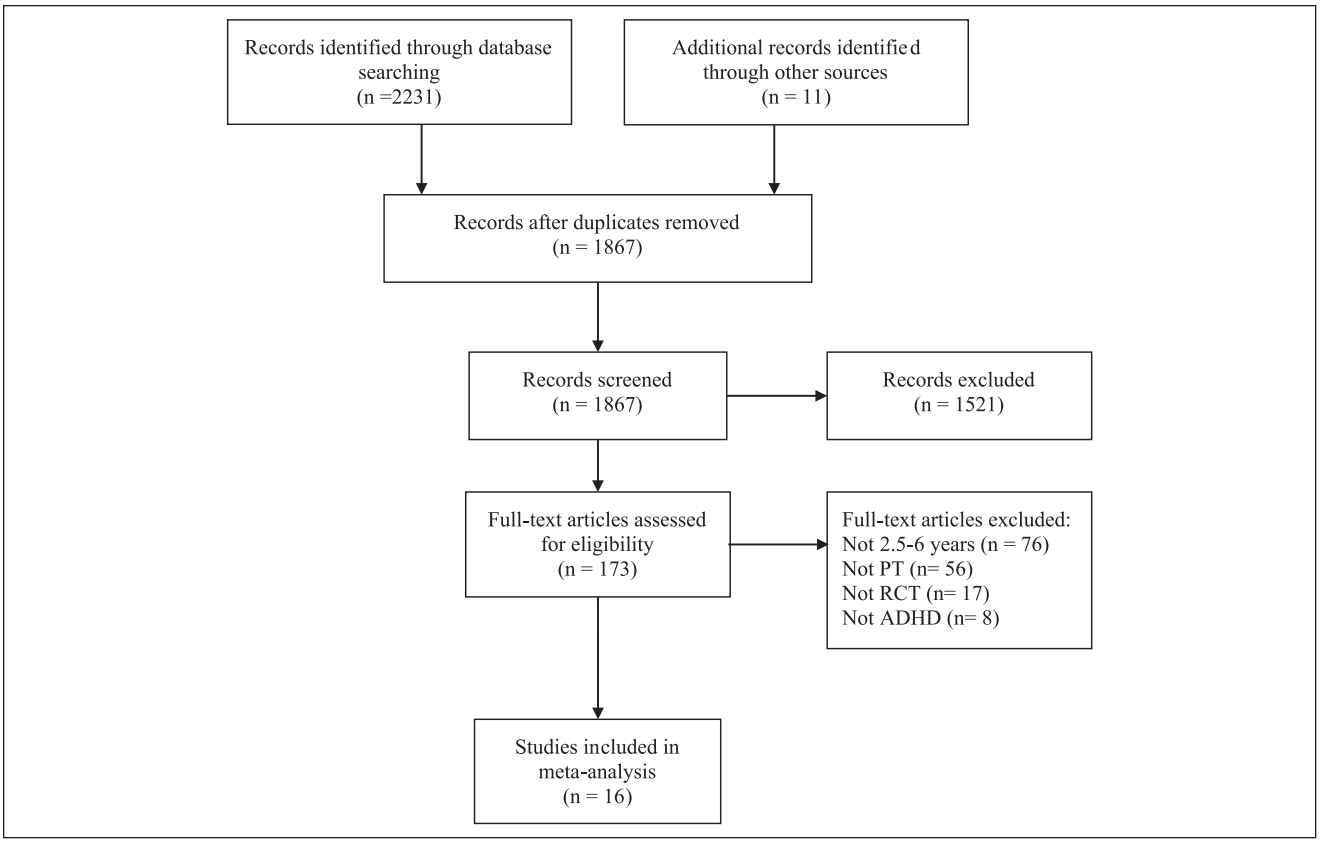

Figure 1. PRISMA flowchart illustrating the search process.
Note. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

15), all in the form of the Revised New Forest Parenting Programme. Parent-reported measures were most often provided by mothers; only one study (16) presented father-reported data as well. The methodological quality of studies was generally acceptable with a mean Jadad score of 3. For follow-up studies, time points ranged from 3 to 12 months, with five studies (2, 4, 6, 8, 16) reporting 12 months' follow-up, one study (1) reporting 6 months' follow-up, and two studies (10, 12) reporting approximately 3 months' follow-up.

Outcomes

Post-intervention

ADHD symptoms. The ES of PT on parent-reported ADHD symptoms compared with WL, PLA, or TAU (n = 15) was significant and moderate (0.51, CI = [0.33, 0.69], $p < .001$; see Figure 2). Heterogeneity was significant and large ($Q = 51.5$, $df = 14$, $p <. 001$, $I^2 = 72.8$). Egger's test (Egger et al., 1997) was insignificant ($p = .189$). The ES of PT on independently assessed ADHD symptoms ($n = 9$) was insignificant and small (0.12, CI = [−0.12, 0.36], $p = .325$) with significant and moderate to large heterogeneity ($Q = 13.9$, $df = 5$, $p = .016$, $I^2 = 64.2$).

Conduct problems. The ES of PT on parent-reported conduct problems ($n = 13$) was small to moderate and significant (0.44, CI = [0.17-0.70], $p = .001$; see Figure 3). Heterogeneity was large and significant ($Q = 67.1$, $df = 12$, $p < .001$, $I^2 = 82.1$). Egger's test was insignificant ($p = .242$). Analysis of independently assessed child conduct problems ($n = 5$) revealed a small and insignificant ES (0.31, CI = [−0.07−0.69], $p = .117$) and heterogeneity was insignificant and small to moderate ($Q = 8.04$, $df = 4$, $p = .091$, $I^2 = 50.0$).

Negative parenting. The ES of PT on self-reported negative parental style ($n = 8$) was significant and moderate to large (0.63, CI = [0.32– 0.93], $p < .001$; see Figure 4). Heterogeneity was significant and large ($Q = 28.9$, $df = 7$, $p < .001$, $I^2 = 75.2$). The ES on independently assessed negative parental style ($n = 9$) was significant and small (0.33, CI = [0.13–0.53], $p = .001$) and heterogeneity was insignificant and small to moderate ($Q = 13.8$, $df = 9$, $p = .139$, $I^2 = 34.8$).

Table 1. Characteristics of Included Studies (*N* = 16).

Study	n (% girls/M age of child in years)	Intervention (modus)	Control condition	Duration of intervention in weeks/FU in months	ADHD measure (informant)	Oppositional and conduct measure (informant)	Negative parenting measure (informant)	Jadad score
(1) Abikoff et al. (2015)	101 (26.4/ 3.57)	The Revised New Forest Parenting Programme (I)	WL	8/6	CPRS (P,T,C) PLAY PARK (P)	NYPRS (P) NYTRS (T)	PPI (P) GIPCI (R)	4
(2) Azevedo, Seabra-Santos, Gaspar, and Homem (2013, 2014)	100 (28/ 4.65)	Incredible Years (G)	WL	14 /12	WWP (P) PKSB (P, T) PACS (P)	PKBS (P, T) PACS (P)		2
(3) Barkley et al. (2000)	81 (36/N/A)	Defiant Children (G)	NTCG	10	CBCL (P, T) CPT (R)	CBCL (P,T)	PPS (P)	3
(4) Bor, Sanders, and Markie-Dadds (2002)	58 (32/3.47)	Triple-P-enhanced (I)	WL	12 /12	ECBI (P)	ECBI (P) FOS-RII (R)	FOS-RII (R) PS (P)	3
(5) Herbert, Harvey, Roberts, Wichowski, and Lugo-Candelas (2013)	31 (24.8 /4.56)	Parenting Your Hyperactive Preschooler (G)	WL	14	DBRS-I, (P) DBRS–h-i (P)	DBRS-odd (P)	Naturalistic observation (R) PS (P)	4
(6) Jones Daley, Hutchings, Bywater, and Eames (2007)/ Jones Daley, Hutchings, Bywater, and Eames (2008)	79 (32/3.86)	Incredible Years (G)	WL	12/12	CPRS (P)	N/A	N/A	4
(7) Matos, Bauermeister, and Bernal (2009)	22 (N/A/N/A)	Parent–Child Interaction Training Programme (I)	WL	Flexible, max 17.	BASC-PRS- h (P) DBRS-h (P)	DBRS-odd (P) ECBI-problem (P)	PPI (P)	1
(8) McGilloway et al. (2012)/ McGilloway et al. (2014)	149 (49/4.76)	Incredible Years (G)	WL	14/12	CPRS (P)	ECBI (P)	DPICS (R)	4
(9) McGoey, DuPaul, Eckert, Volpe, and Van Brakle (2005)	57 (14/4.0)	Incredible Years + Teachers Training (G)	CCG	21	PDT (R) PSA (R) PKBS-o/i (P,T)	PDT (R) PSA (R) PKBS-o/a (P,T)	PDT (R) PSA (R)	2
(10) Pisterman et al. (1992)	45 (19/4.1)	Group Parent Training Programme for Compliance (G)	WL	12/3	PDT (R)	PDT (R)	PDT (R)	3
(11) Scott et al. (2010)	112 (29.5/5.21)	Incredible Years (G)	HL	28	PACS (P)	PACS (P) ECBI (P)	EE (R) PPI-Neg (P)	4
(12) Sonuga-Barke, Daley, Thompson, Laver-Bradbury, and Weeks (2001)	78 (38.5 /N/A)	New Forest Parent Training Programme (I)	PACS	8/3,5	PACS (P) FP (R)	PACS (P)	N/A	3
(13) Sonuga-Barke, Thompson, Daley, and Laver-Bradbury (2004)	89 (N/A)	The Revised New Forest Parent Training Programme (I)	WL	8	PACS (P) WWP (P)	BCL (P)	N/A	2
(14) Strayhorn and Weidman(1989)	89 (56/3.75)	Training Exercises for Parents of Preschoolers (I + G)	NTCG	NR	BPB (P, T) DSM-III (P)	BPB (P,T) DSM-III (P)	PPS (P)	2
(15) Thompson et al. (2009)	41 (26.8/4.26)	New Forest Parent Training Programme (I)	TAU	8/1,5	WWP (P) PACS (P) FY (R)	N/A	EE-neg (R)	4
(16) Webster-Stratton, Reid, and Beauchaine (2011)/ Webster-Stratton, Reid, and Beauchaine (2013)	99 (25/5.23)	Incredible Years (G) + Incredible Years Dinosaur Child Training (G)	WL	20/12	CPRS (P,T)	ECBI (P,T)	DPICS (R)	3

Note. FU = follow-up; I = individually administered program; CPRS = Conners' Rating Scale–Revised; P = parent rated; T = teacher rated; C = clinician rating; NYPRS/NYTRS = New York Rating Scale Parent or Teacher; PPI = Parenting Practices Interview; GIPCI = Global Impressions of Parent–Child Interactions–Revised; G = group administered program; R = observational rating; WWP = Werry-Weiss-Peters Activity Scale; PACS = Parental Account of Child's Symptoms; ; DPICS = Dyadic Parent–Child Interaction Coding System; PS = Parenting Scale; CBCL = Child Behaviour Checklist; CPT = Continuous Performance Test; PPS = Parenting Practices Scale; ECBI = Eyberg Child Behaviour Inventory; FOS-RII = Revised Family Observation Schedule; DBRS = Disruptive Behaviour Rating Scale; DBRS-I = Disruptive behaviour Inattention subscale; DBRS–i-h = Disruptive Behaviour Impulsivity-Hyperactivity subscale; DBRS-odd = Oppositionality Subscale; PDT = Parent Directed Task; PSA = Parent Supervised Activit; PKBS = Preschool and Kindergarten Behavior Scales; PKBS-o/i = Preschool and Kindergarten Behavior Scales Overactivity/Inattention subscale; PKBS-o/a = Preschool and Kindergarten Behavior Scales Oppositional/Aggressive subscale; EE = expressed emotions; PPI-Neg = Parental Practices inventory negativity subscale; FP = Fun Park Observation; BCL = Behaviour Checklist hyperactivity factor; N/A= not available; BPB = Behar Preschool Behaviour; *DSM-III-R* = parent ratings on *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., rev.; *DSM-III-R*; American Psychiatric Association, 1987); FY = FarmYard Observation; EE-neg = Expressed emotions negativity Subscale; WL = Waitlist; NTCG = No Treatment Control Group; CCG = Community Control Group; HL = Helpline; BASC-PRS-h = Hyperactivity and Aggression Subscales of the Behavioral Assessment System for Childre-Parent Rating Scale.

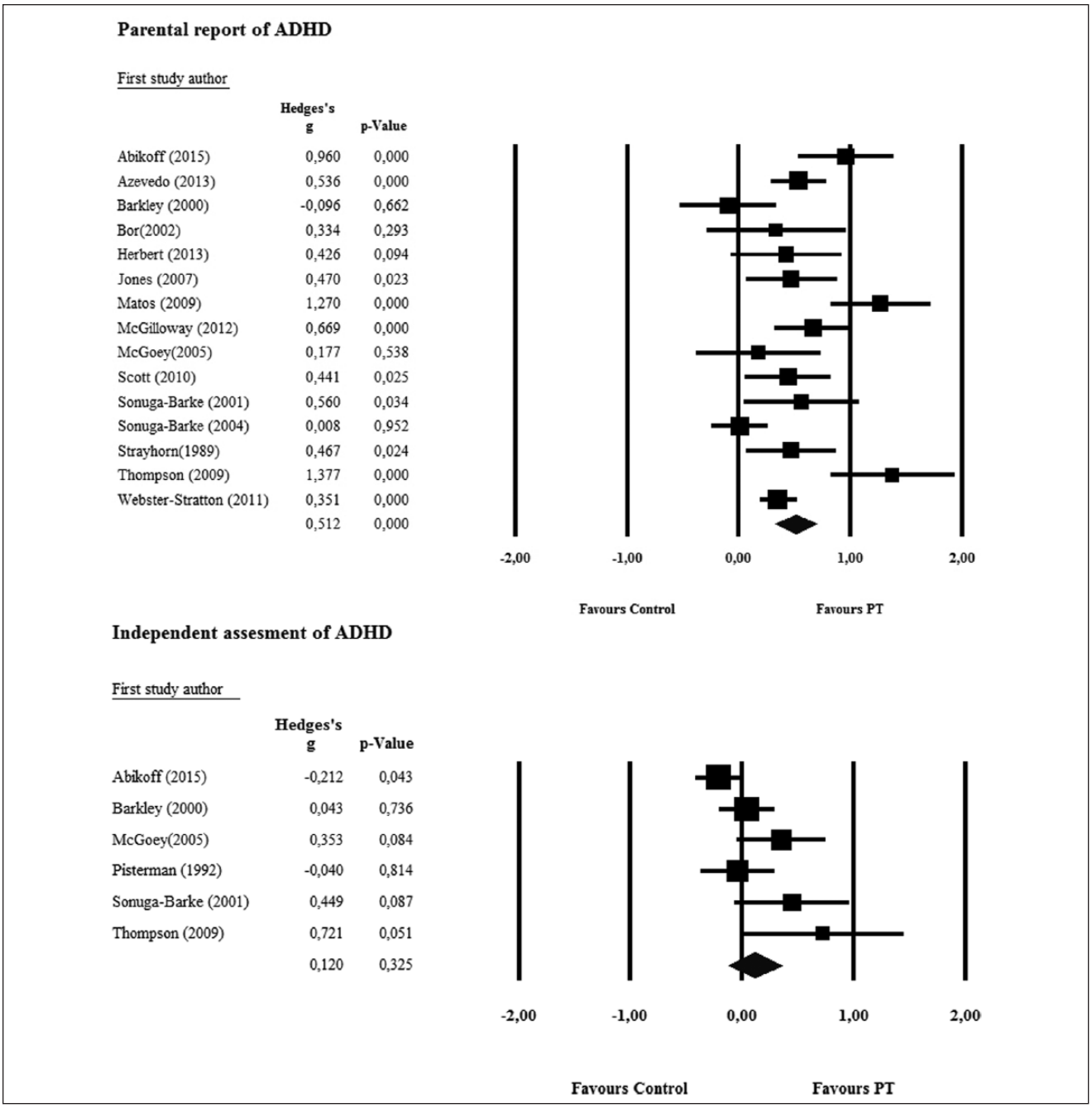

Figure 2. Parental and independent assessment of ADHD.

Follow-up

ADHD symptoms. The ES of PT on parent-rated ADHD symptoms from post-treatment to follow-up (n = 8) was slightly positive, and marginally significant (0.07, CI = [−0.01, 0.15], p = .059). There was no indication of heterogeneity (Q = 4.9, df = 7, p = .664, I^2 = 0.0).

Conduct problems. The ES of PT on parent-rated conduct problems from post-treatment to follow-up (n = 8) was slightly positive, but insignificant (0.07, CI = [0.01, 0.15], p = .103). There was no indication of heterogeneity (Q = 1.1, df = 7, p = .98, I^2 = 0.0).

Negative parenting. The ES of PT on parent-rated negative parenting from post-treatment to follow-up (n = 5) was small, but positive and marginally significant (0.12, CI = [−0.01, 0.24], p = .059). There was no indication of heterogeneity (Q = 1.1, df = 4, p = .895, I^2 = 0.0).

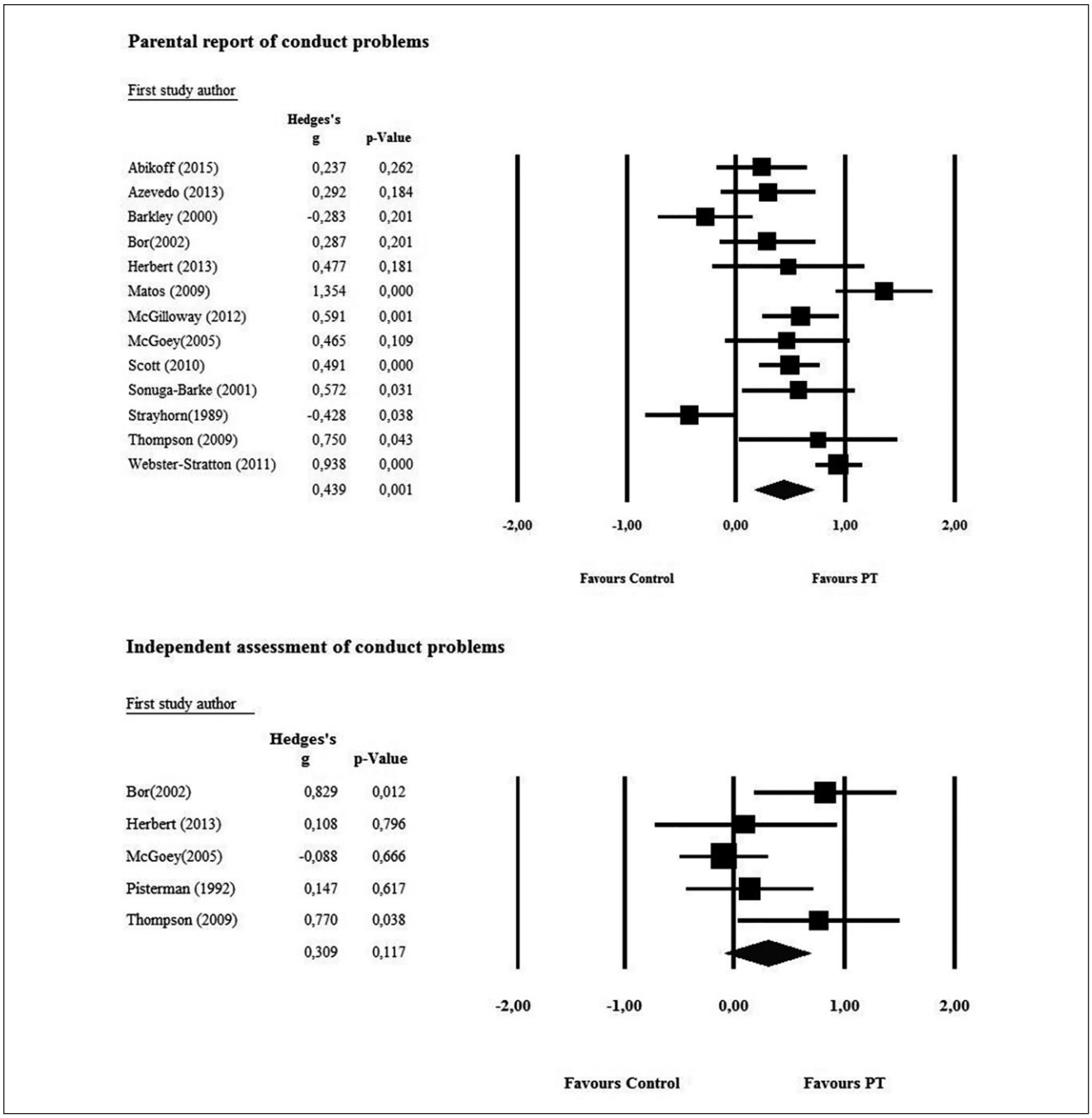

Figure 3. Parental and independent assessment of conduct problems.

Moderators

Study quality. No significant association between the Jadad score and effect on parental reported ADHD symptoms was found (β = .12, p = .320).

Specific vs. generic programs. There was no significant difference in parent-reported reduction in ADHD symptoms (Q = 0.697, df =1, p = .404) between the four studies on specific PT programs (ES = 0.65, CI = [0.27, 1.04], p < .001) and the 11 studies applying generic PT programs (ES = 0.47, CI = [0.24, 0.69], p < .001). Furthermore, there was no significant difference on independently assessed reduction in ADHD symptoms (Q = 0.06, df =1, p = .803) between the specific programs (ES = 0.18, CI = [−0.23, 0.58], p = .398) and the generic programs (ES = 0.11, CI = [−0.26, 0.48], p = .569).

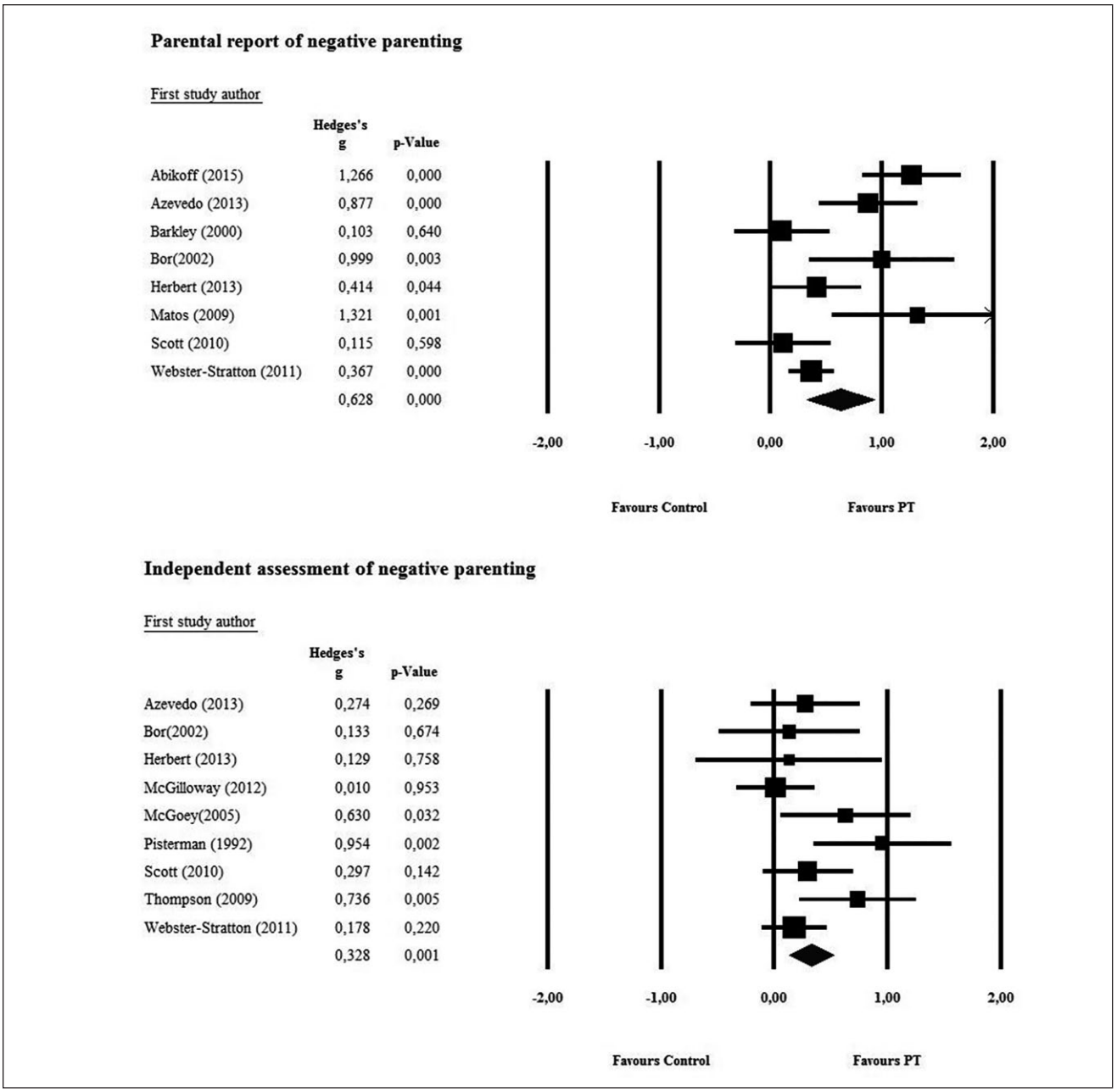

Figure 4. Parental and independent assesment of negative parenting.

Modality of intervention. There was no significant difference in parent-reported ADHD symptoms on delivery modus (Q = 1.0, df =1, p = .320) between the eight interventions being delivered in a group (ES = 0.38, CI = [0.12, 0.65], p = .004) and the six interventions delivered individually (ES = 0.72, CI = [0.40, 1.94], p < .001).

Diagnostic status. When analyzing efficacy of PT on parent-reported ADHD symptoms, there was no significant difference (Q = 0.76, df = 1, p = .385) between the eight studies with children diagnosed with ADHD (ES = 0.60, CI = [0.32, 0.71], p < .001) compared with the seven studies with children with symptoms above clinical cut-off on a validated rating scale (ES = 0.43, CI = [0.41, 0.71], p = .003).

Discussion

The present meta-analysis partially supports the effectiveness of PT for preschool children with ADHD or ADHD

symptoms and a probable risk of developing ADHD. The ESs based on parental reports were in the moderate range (0.44-0.63), comparable with ESs often reported for psychological interventions for psychiatric disorders (Lambert, 2013). An ES = 0.51 for parent-reported ADHD symptoms could be estimated to correspond to a difference between PT and control conditions of 25% units (Rosenthal & Rubin, 1982), so that, for instance, 62.5% children in PT achieved favorable outcome, compared with 37.5% in the control conditions. The parental reported outcomes were stable at follow-ups of 3 to 12 months. ESs based on independent assessments were, however, all small, and only significant for negative parenting. Independently assessed ADHD symptoms achieved a statistically insignificant ES of 0.12.

Our results for parental reported ADHD symptoms are in line with Mulqueen et al.'s (2015) meta-analysis on PT for ADHD preschoolers. Their meta-analysis was conducted on parent-reported ADHD symptoms in studies with clinician provided diagnoses with an ES of 0.61, almost exactly the same as the ES found for diagnosed children in our study (0.60; there was an overlap of six studies).

ESs on outcome provided by most proximal assessors in Daley et al.'s (2014) meta-analysis on behavioral interventions for children aged 3 to 18 years were in line with our parent-reported ES for negative parenting (0.57 vs. 0.63), but numerically (although not significantly) smaller than ours for ADHD symptoms (0.35 vs. 0.51) and conduct problems (0.26 vs. 0.44). Daley et al. (2014) found age to moderate ESs for their most proximal assessment with larger ESs for younger children. Most proximal outcomes in their study could include both assessment by parents and by involved teachers, but in case both were reported, parent ratings were preferred. Similar to our study, Daley et al. found significant results for independently assessed negative parenting but not for ADHD symptoms. Differently, they found a significant effect for independently assessed conduct problems, although their ES (0.31) is similar to ours (0.31). In contrast to Daley et al. (2014), we did not include teachers as independent assessors, because the teachers' blinded status of treatment condition can be uncertain. Differences between the studies may reflect the broader range of behavioral interventions and ages of children included (3-18 vs. 2.5-6) in Daley et al. (2014), as well as, of course, differences in sample sizes influencing significance of results.

The current meta-analysis found consistent effect of PT on negative parenting across assessment perspectives, although the ES was numerically smaller when rated by independent assessors (0.33 vs. 0.63). Parents are the direct recipients of PT, and therefore, changes in parenting should be considered necessary if changes in off-spring behavior are to occur. Hinshaw et al. (2000) found that a reduction in negative parenting partially mediated the effect of PT on children in the Multimodal Treatment Studies of ADHD (MTA). Although there is no evidence of parenting practices as fundamental causes of ADHD (Barkley, 2014; Johnston & Mash, 2001), harsh and negative parenting has been hypothesized to maintain or exacerbate child ADHD and conduct problems in a developmental psychopathology perspective (Mash & Johnston, 2005).

Because all moderator analyses (study methodological quality, specific vs. generic programs, individual vs. group delivered interventions, ADHD diagnosis vs. symptoms on rating scales) were insignificant, they could not assist in clarifying the high levels of heterogeneity in most analyses. Although the small number of studies limits the power of these analyses, differences in pairwise comparisons only in one case exceeded a small ES of 0.20; individually conducted interventions achieved a numerical higher ES than group-based interventions (0.72 vs. 0.38).

No differences were found between specific and generic programs on either parent-reported or independently assessed ADHD symptoms; both types of programs achieved small and insignificant ESs based on independent assessment (0.18 vs. 0.11). There was overlap between this analysis and the analysis of modality, because the specific program, in all cases, was individually delivered, while generic programs in most cases were group based. It should be noted that the small number of studies in the moderator analyses warrants caution in the interpretations of these results.

The discrepancy between parental and independently rated assessment of child ADHD symptoms revealed in the present meta-analysis was also found by Sonuga-Barke et al. (2013) and Daley et al. (2014). It raises the question, whether parental reports or independent assessment most adequately reflect the results on ADHD symptoms. On one hand, parents of preschool children may be the most ecologically valid assessors of children's symptoms, because they observe them across different contexts during extensive amounts of time. This stands in contrast to the generally brief independent assessment periods in the PT studies, ranging from 5 to 30 min, and often conducted in laboratory settings. Consequently, PT could have an effect on ADHD symptoms, albeit one that is difficult to measure objectively. On the other hand, and as previously discussed by Zwi, Joens, Thorgaard, York, and Dennis (2011) and Sonuga-Barke et al. (2013), parent-reported outcomes in PT could be inflated due to satisfaction with treatment or the parents' active role in the treatment of their children. If independent assessment is considered most valid, the lack of efficacy could suggest that ADHD symptoms are difficult to change by psychological means, possibly because they are rooted in a neurological dysfunction. A similar discrepancy between proximal ratings and independent assessment has been found in studies on cognitive training for ADHD (Cortese et al., 2015).

The stable parent-reported outcomes from post-intervention to follow-up may indicate that results are not just temporary "honey-moon effects" (LaBarbera & Dozier, 1985) due to immediate satisfaction with treatment or gratitude to therapists. Furthermore, the sustained efficacy after termination of the intervention may point to an advantage of PT over for instance medication.

The findings in this meta-analysis on preschool PT are generally in line with those of Daley et al. (2014) of behavioral interventions for children aged 3 to 18. Daley et al. (2014) underlined the broad range of beneficial effects of behavioral interventions on families with ADHD children including more efficient parenting and reduction in children's conduct problems, problems that may seriously stress families. Our study also found consistent evidence across rater perspectives for such beneficial effects, although results for independently assessed conduct problems only bordered on significance, maybe due to insignificant power (ESs were quite similar in the two studies).

The proposal that ADHD may be most efficiently treated in the preschool years was not directly supported in our study, since results were similar to those of behavioral interventions for a broader age span in Daley et al. (2014). Parent-rated outcomes were, however, numerically higher in our meta-analysis. It could be argued that an efficacious intervention should be provided as early as possible to prevent further distress. The finding of parent-reported stable positive outcomes in follow-up periods of up to 1 year also points to the benefits of early PT for ADHD. Longer follow-up periods are necessary to investigate possible long-term effects of such interventions in the prevention of negative developmental paths with further disabilities and comorbid ODD or CD, although it could be difficult to conduct such studies without adequate control conditions.

This meta-analysis has some limitations. First, there are relatively few PT studies. The high degree of heterogeneity among the studies could not be explained through the moderation analyses, maybe due to low statistical power. Moreover, the follow-up analyses could not be based on between-group analyses and were conducted on parent rating alone with 1 year constituting the longest follow-up period. Finally, no grey/unpublished literature was included in the review, which could possibly have excluded any unpublished studies revealing little or no efficacy.

Conclusion

Taken together, the present meta-analysis partially supports PT as treatment for preschool children with ADHD with moderate parent-reported ESs for ADHD symptoms, conduct problems, and negative parenting. These results were stable at follow-ups of 3 to 12 months. For independently assessed outcomes, a significant result was found for negative parenting, while conduct problems bordered on significance. In line with previous meta-analyses, there was no effect of PT on independently assessed ADHD symptoms. Early PT interventions may be beneficial for family functioning and child conduct problems, but thus far, there is no objective documentation of an effect on ADHD symptoms. Further studies are needed to investigate study heterogeneity and the possible long-term preventive effects of early PT interventions on negative developmental trajectories.

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