



UvA-DARE (Digital Academic Repository)

Meta-analysis: Which Components of Parent Training Work for Children With Attention-Deficit/Hyperactivity Disorder?

Dekkers, T.J.; Hornstra, R.; van der Oord, S.; Luman, M.; Hoekstra, P.J.; Groenman, A.P.; van den Hoofdakker, B.J.

DOI

[10.1016/j.jaac.2021.06.015](https://doi.org/10.1016/j.jaac.2021.06.015)

Publication date

2022

Document Version

Final published version

Published in

Journal of the American Academy of Child and Adolescent Psychiatry

License

CC BY

[Link to publication](#)

Citation for published version (APA):

Dekkers, T. J., Hornstra, R., van der Oord, S., Luman, M., Hoekstra, P. J., Groenman, A. P., & van den Hoofdakker, B. J. (2022). Meta-analysis: Which Components of Parent Training Work for Children With Attention-Deficit/Hyperactivity Disorder? *Journal of the American Academy of Child and Adolescent Psychiatry*, 61(4), 478-494.
<https://doi.org/10.1016/j.jaac.2021.06.015>

General rights








It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

UvA-DARE is a service provided by the library of the University of Amsterdam (<https://dare.uva.nl>)

Meta-analysis: Which Components of Parent Training Work for Children With Attention-Deficit/Hyperactivity Disorder?

Tycho J. Dekkers, PhD , Rianne Hornstra, MSc , Saskia van der Oord, PhD ,
Marjolein Luman, PhD , Pieter J. Hoekstra, MD, PhD , Annabeth P. Groenman, PhD ,
Barbara J. van den Hoofdakker, PhD 

Drs. Groenman and van den Hoofdakker shared senior authorship of this work.

Objective: Behavioral parent training is an evidence-based intervention for children with attention-deficit/hyperactivity disorder (ADHD), but it is unknown which of its components are most effective. This meta-regression analysis investigated which specific behavioral techniques that parents learn in parent training are associated with effects on parental outcomes.

Method: A search was performed for randomized controlled trials on parent training for children with ADHD, with positive parenting, negative parenting, parenting sense of competence, parent-child relationship quality, and parental mental health as outcome measures. After screening 23,026 publications, 29 studies contributing 138 effect sizes were included (N = 2,345). For each study, the dosage of 39 behavioral techniques was derived from intervention manuals, and meta-regression determined which techniques were related to outcomes.

Results: Parent training had robust small- to medium-sized positive effects on all parental outcomes relative to control conditions, both for unblinded and probably blinded measures. A higher dosage of techniques focusing on the manipulation of antecedents of behavior was associated with better outcomes on parenting sense of competence and parental mental health, and a higher dosage of techniques focusing on reinforcement of desired behaviors was related to larger decreases in negative parenting. Higher dosages of psychoeducation were negatively related to parental outcomes.

Conclusion: Although techniques were not investigated in isolation, the results suggested that manipulation of antecedents of behavior and reinforcement techniques are key components of parent training for children with ADHD in relation to parental outcomes. These exploratory findings may help to strengthen and tailor parent training interventions for children with ADHD.

Key words: ADHD, attention-deficit/hyperactivity disorder, behavioral parent training, meta-analysis, parenting

J Am Acad Child Adolesc Psychiatry 2022;61(4):478–494.   

Behavioral parent training is recommended as an evidence-based intervention for children with attention-deficit/hyperactivity disorder (ADHD) in clinical practice guidelines.^{1,2} The presumed working mechanism of behavioral parent training is to alter the child's behavior via parenting behaviors.³ Several meta-analyses demonstrated effects of parent training on several parental outcomes (see Fabiano *et al.*⁴ for a review of these meta-analyses), with largest and most robust effects on positive and negative parenting, smaller improvements in parenting sense of competence, but no effects on parental mental health.⁵ Behavioral parent training consists of many different behavioral techniques that are being taught to parents, and it is yet unknown which of these techniques are most effective. In the current study, we investigated which behavioral techniques contribute to the effects of parent training on parental outcomes.

Several studies show that improvements in parenting behaviors mediate improvements in the behavior of children with ADHD. There is consistent evidence that parent training for children with ADHD is less likely to improve the child's behavior when negative parenting practices, such as harsh and inconsistent discipline, do not decrease.^{6–8} Furthermore, increased parenting sense of competence and decreased parenting stress after parent training have repeatedly been found to be associated with behavioral improvements of children with ADHD.^{9,10}

Although the effectiveness of parent training on parenting outcomes is recognized by all major clinical practice guidelines on ADHD,^{1,2,11} there is surprisingly little research about which specific behavioral techniques that are being used in parent training contribute (most) to changes in parenting behaviors. Some examples of behavioral techniques are restructuring situations, offering

rewards, and time-out procedures.^{12,13} Most behavioral parent training programs are rooted in social learning theories,¹⁴ and the overarching aim of these programs is teaching parents to prevent and manage their child's behavior.¹⁵ The content of existing behavioral parent training programs, however, differs substantially: some mainly consist of psychoeducation (eg, Sunshine Program for ADHD^{16,17}), whereas others emphasize disciplinary communication (eg, Helping the Noncompliant Child¹⁸), observation and monitoring (eg, Family-School Success Early Elementary¹⁹), or positive reinforcement (eg, Incredible Years²⁰).

Knowing which specific behavioral techniques are effective components of parent training is crucial, as it could guide the development, improvement, and tailoring of interventions and thereby benefit the well-being of children with ADHD and their families.²¹ The current study is the first meta-analysis that disentangled the effects of these specific behavioral techniques of parent training for ADHD on parenting outcomes.

Two earlier endeavors examining the effectiveness of specific behavioral techniques of parent training are worth mentioning. First, for children with disruptive behavior disorders, the use of positive reinforcement (particularly praise) and natural/logical consequences was associated with stronger effects on disruptive child behavior.²² Second, a meta-analysis including a broad range of parenting programs²³ suggested that techniques focusing on positive parent-child interactions and emotional communication skills, time-out, parenting consistency, and practicing skills during the sessions were associated with higher effectiveness, as measured by child and parenting outcomes. Despite the valuable contribution of these studies, their conclusions were limited for several reasons. First, in the study by Leijten *et al.*,²² only child outcomes were assessed, whereas the presumed working mechanism of parent training is to change parenting behaviors. Second, both studies scored only the presence or absence of specific behavioral techniques, which ignores crucial and more nuanced information about the dosage of these techniques. Third, both studies used only information about the components of parent training that were provided in articles and supplements, which may be less detailed relative to information derived from treatment manuals. Finally, neither of the studies focused specifically on children with ADHD, and therefore the implications of these studies for children with ADHD are yet unclear, particularly as it is suggested that children with ADHD have specific underlying instrumental learning deficits, which potentially should be targeted with specific behavioral techniques.¹² Unique problems in intraindividual variability in responding (ie, increased

number of lapses of attention²⁴) as well as aberrant motivational processes are documented for children with ADHD relative to children with disruptive behavior disorders.²⁵⁻²⁷ Specifically, alterations in reward and punishment sensitivity may provide targets for behavioral parent training in this population (see van der Oord and Tripp¹² for a review on specific instrumental learning deficits in ADHD and the link with behavioral parent training).

The current meta-analysis took these limitations into account by including only randomized controlled trials with samples in which all children had a diagnosis of ADHD and by scoring the dosage of behavioral techniques (ie, the number and percentage of sessions in which a specific technique is being taught to parents). More specifically, we scored the behavioral techniques of all behavioral parent training manuals that were used in the included trials using a taxonomy consisting of 39 different behavioral techniques, grouped in 8 main categories (see Supplement 1, available online, for details).

In addition to the effects of the dosage of different techniques, we exploratively investigated whether other characteristics of the intervention (setting, delivery method, format, duration, collaboration with school, allowance of concurrent medication, and checking treatment integrity) or characteristics of the child (age, sex, comorbid disorders) were associated with the effectiveness of the intervention. So far, evidence for the possible moderating effect of these characteristics is mixed. One meta-analysis showed that individual parent training was more effective than group training on parenting outcomes,²⁸ whereas a meta-analysis on parent training in preschoolers with ADHD did not observe this effect.²⁹ Another meta-analysis on parent training in preschoolers with ADHD reported no moderation of age (within preschoolers) and duration of the intervention,³⁰ but a meta-analytic review on behavioral interventions for children with a wider age range demonstrated larger effects on positive parenting for younger children.⁵ Meta-analytic evidence for other moderator effects is scarce, but highly needed to establish who benefits most from behavioral parent training.³¹

The primary aim of the current study was to investigate whether the behavioral techniques that were included in our taxonomy were associated with the effects of behavioral parent training for parents of children with ADHD on 5 different parental domains, ie, positive parenting, negative parenting, parenting sense of competence, quality of the parent-child relationship, and parental mental health. A secondary aim was to investigate whether intervention and child characteristics influenced the training effects.

METHOD

Protocol and Registration

This meta-analysis was preregistered at PROSPERO (https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42018096768), and PRISMA guidelines³² were followed (see Supplement 2, available online, for the PRISMA checklist). Note that the preregistration also covers child outcomes, which is described in a separate article by the same research group (Hornstra, *et al.*, unpublished data, 2021). Also, for this reason, some of the wording in the Method sections of these articles may overlap.

Inclusion and Exclusion Criteria

Inclusion criteria for randomized controlled trials were as follows:

- Behavioral parent training or a multimodal intervention (the latter only if >50% of intervention time was spent with the parent) was compared with a control condition.
- The control condition consisted of (a) an active control treatment, (b) treatment as usual, or (c) no treatment/waitlist, and in case of multiple control conditions, the one with the highest quality was selected ($a > b > c$).
- Participants were (on average) <18 years old.
- Participants met criteria for ADHD, established either by meeting *DSM* (any edition) criteria for ADHD measured by diagnostic interviews or by scoring above clinical cutoffs on questionnaires measuring ADHD.

Studies were excluded if medication was used as a control condition or if medication was prescribed as part of the intervention. Behavioral parent training was defined as an intervention that teaches parents techniques to manipulate the antecedents of their child's behavior (ie, stimulus control techniques) and/or techniques to manipulate behavioral contingencies (ie, contingency management techniques), making children more likely to increase desired behaviors and to decrease unwanted behaviors.¹⁵

Outcome Variables

Five domains of outcome variables were selected: positive parenting, negative parenting, parenting sense of competence, parent-child relationship, and parental mental health. Positive parenting includes parenting behaviors such as reinforcement, monitoring, stimulating, and guiding the child. Negative parenting refers to behaviors such as corporal punishment, harsh discipline, inconsistent parenting, and poor monitoring. Parenting sense of competence is defined as the extent to which parents perceive themselves as competent or efficacious when raising their child. Outcomes were classified as measuring the

quality of the parent-child relationship when measuring display of affect, support, sensitivity, and/or responsiveness. For parental mental health, measures included parenting stress and several indices of parental psychopathology (eg, depression, anxiety, ADHD). Note that we performed a sensitivity analysis without parental ADHD symptoms as a measure of parental mental health, as improvements in parental ADHD symptoms after parent training may be smaller than in other domains of parental mental health. The categorization of all instruments is presented in Table 1. When one measure tapped multiple outcome domains, we assigned this measure to the outcome domain, which was reflected by most items of the measure. Measures were coded as either unblinded (parent-rated) or probably blinded (rated by independent coders).

Literature Search

The literature was searched up to May 13, 2020. Figure 1 shows the PRISMA flowchart, and Supplement 3, available online, contains the specific search terms per database. Selection and screening of the articles was performed by 2 out of 3 authors (T.J.D., A.P.G., R.H.) using Rayyan software.⁵⁷ Disagreement was resolved by debate or by consulting 2 other authors (S.v.d.O., B.J.v.d.H.).

Data Extraction

Included studies were independently rated by 2 out of 3 authors (T.J.D., A.P.G., R.H.), and disagreement was resolved by debate or by consulting the other authors. Our taxonomy, which was based on several influential reviews,^{23,58-60} included 8 categories (shaping knowledge; observation and monitoring; manipulating antecedents; positive consequences; negative consequences; combined techniques; practicing, generalization, and maintenance; relationship building and communication skills). These categories cover a total of 39 behavioral techniques (for details on the taxonomy, see Supplement 1, available online; for operational definitions of other extracted variables, see Supplement 4, available online). For each technique, we established the dosage of these techniques by scoring the number and the percentage of sessions in which this technique was used. If not publicly available, the manuals of the interventions used in the included studies were requested from the authors. The manual was unavailable for 3 studies,^{35,46,47} which were therefore excluded from the analyses on the effects of the dosage of behavioral techniques. Note that for the study by Chacko *et al.*,³⁵ the manual of the traditional behavioral parent training was unavailable. The same study also compared the Strategies to Enhance Positive Parenting (STEPP) program with a waitlist control, and this comparison is included in the analyses.

TABLE 1 Study Characteristics

Study	Intervention (n)	Control (n)	Positive Parenting	Negative Parenting	Parenting Sense of Competence	Parent–Child Relationship	Parental Mental Health	Setting/Format/Delivery	Duration	Age (cat.)	% Boys	% Ext. dis.	Home-school coll.	Med. all.	Integr. checks
Abikoff <i>et al.</i> , 2015 ¹⁸	HNC (63)	WL (34)	PPI-Total (N)	N/A	N/A	GIPCI-R-Total (Y), PSI-R and PPES Sum (N)	N/A	C/PT/I	480	3.6 (P)	74	42	N	N	Y
	NFPP (67)		PPI-Total (N)	N/A	N/A	GIPCI-R-Total (Y), PSI-R and PPES Sum (N)	N/A	H/PT/I	600	3.6 (P)	74	42	N	N	Y
Aghebati <i>et al.</i> , 2014 ³³	Triple P (14)	WL (13)	N/A	PS (N)	N/A	PBI-Care, Overprot. (N)	DASS-42-Anx., Depr., Stress (N)	C/PT/G	667.5	8.0 (S)	59	N/A	N	Y	N/A
Au <i>et al.</i> , 2014 ³⁴	Triple P (8)	WL (9)	N/A	N/A	PSOC Eff., Sat. (N)	N/A	SNQ-Stress (N)	M/PT/M	975	7.7 (S)	94	N/A	N	N	Y
Chacko <i>et al.</i> , 2009 ³⁵	BPT (40)	WL (40)	DPICS-PP (Y)	DPICS-NP (Y)	N/A	IRS-Par. (N)	BDI (N), PSI (N)	C/MM/G	1,350	7.9 (S)	71	71	N	Y	Y
	STEPP (40)		DPICS-PP (Y)	DPICS-NP (Y)	N/A	IRS-Par. (N)	BDI (N), PSI (N)	C/MM/G	1,350	7.9 (S)	71	70	Y	Y	Y
Daley <i>et al.</i> , 2013 ³⁶	NFPP SH (24)	WL (19)	GIPCI-Parent (Y)	N/A	PSOC Eff., Sat. (N)	N/A	GHQ (N)	H/PT/I	330	7.3 (S)	81	N/A	Y	N	Y
DuPaul <i>et al.</i> , 2018 ³⁷	F2F BPT (16)	WL (16)	N/A	N/A	PSI-SF-Dysf. Int. (N)	N/A	PSI-SF-Distress (N)	C/PT/G	900	4.4 (P)	64	60	Y	N/A	Y
	Online BPT (15)		N/A	N/A	PSI-SF-Dysf. Int. (N)	N/A	PSI-SF-Distress (N)	H/PT/I	900	4.4 (P)	64	60	Y	N/A	Y
Fabiano <i>et al.</i> , 2012 ³⁸	Coaches (28)	WL (27)	DPICS-Total Praise (N)	DPICS-Total Com., Neg. Talk (N)	N/A	N/A	N/A	C/PT/G	960	8.5 (S)	87	69	N	Y	Y
Ferrin <i>et al.</i> , 2014 ¹⁷	Ps.-Ed. (43)	AC (37)	N/A	N/A	N/A	N/A	PSI-SF (N)	C/PT/G	1,080	10.7 (S)	80	30	Y	Y	Y
Ferrin <i>et al.</i> , 2020 ¹⁶	Ps.-Ed. (35)	TAU (34)	N/A	N/A	N/A	N/A	PSI Total (N)	C/PT/G	720	10.7 (S)	87	97	Y	Y	Y
Franke <i>et al.</i> , 2016 ³⁹	TPOL (27)	WL (26)	N/A	PS-Laxness, Overreact., Verb. (N)	PSOC Eff., Sat. (N)	PSDQ-Auth. (N)	DASS-21-Anx., Depr., Stress (N)	H/PT/I	480	4.0 (P)	72	N/A	N	N/A	Y
Herbert <i>et al.</i> , 2013 ⁴⁰	BPT (17)	WL (14)	CCNES-Supp. (N), Audiotape- Comm. Qual. (Y)	CCNES-Unsupp. (N), PS-Laxness, Overreact., Verb. (N)	N/A	Audiotape-Neg. Aff., Pos. Par. (Y)	Audiotape- Distress (Y)	C/PT/G	1,260	4.6 (P)	74	N/A	N	Y	Y
Hoath and Sanders, 2002 ⁴¹	EGTP (9)	WL (11)	N/A	PS-Laxness, Overreact., Verb. (N)	PSBC (N)	N/A	DASS-Anx., Depr., Stress (N)	S/PT/G	574	7.7 (S)	80	N/A	N	Y	Y

(continued)

TABLE 1 Continued

Study	Intervention (n)	Control (n)	Positive Parenting	Negative Parenting	Parenting Sense of Competence	Parent-Child Relationship	Parental Mental Health	Setting/Format/Delivery	Duration	Age (cat.)	% Boys	% Ext. dis.	Home-school coll.	Med. all.	Integr. checks
Jiang et al., 2018 ⁴²	CLAS (74)	TAU (51)	APQ/PCRO-Pos. (N)	APQ/PCRO-Neg. (N)	PSOC, PCEQ (N)	N/A	N/A	M/MM/M	1,260	8.6 (S)	54	5	Y	Y	Y
	PFT (74)		APQ/PCRO-Pos. (N)	APQ/PCRO-Neg. (N)	PSOC, PCEQ (N)	N/A	N/A	C/PT/M	1,080	8.6 (S)	62	6	N	Y	Y
Lange et al., 2018 ⁴³	NFPP (86)	TAU (75)	GIPCI (Y)	N/A	PSOC Eff., Sat. (N)	N/A	N/A	M/PT/I	600	5.1 (P)	73	8	N	N	Y
Matos et al., 2009 ⁴⁴	PCIT (20)	WL (12)	PPI (N)	N/A	N/A	N/A	BDI-S (N)	C/PT/I	1,305	5.0 (P)	N/A	98	N	N	Y
Mautone et al., 2012 ¹⁹	FSS-EE (24)	CARE (29)	FIQ (N), DPICS-CU-DO (Y), DPICS-CP-DO (Y)	PCRS (N), DPICS-CU-DON'T (Y), DPICS-CP-DON'T (Y)	PES (N)	N/A	N/A	C/MM/M	980	N/A (P)	72	30	Y	Y	Y
Mikami et al., 2010 ⁴⁵	PFC (28)	No tr. (29)	Observation-Praise (Y)	Observation-Crit. (Y)	N/A	Observation-Warmth (Y)	N/A	C/PT/G	720	8.3 (S)	68	32	Y	Y	Y
Pisterman et al., 1989 ⁴⁶	BPT (23)	WL (23)	% Alpha comm. (Y), % Pos. (Y), Freq. Alpha (Y)	% Dir. (Y), % Neg. (Y), Freq. Beta (Y)	N/A	N/A	N/A	C/PT/M	720	4.2 (P)	80	N/A	N	Y	N
Pisterman et al., 1992 ⁴⁷	BPT (23)	WL (22)	% Alpha comm. (Y), % Pos. (Y), % Reinf. (Y)	% Dir. (Y), % Neg. (Y), Freq. Dir. (Y), Freq. Neg. Fb. (Y)	N/A	N/A	N/A	C/PT/G	720	4.1 (P)	84	N/A	N	Y	N
Pisterman et al., 1992 ⁴⁸	BPT (46)	WL (45)	N/A	N/A	PSCS-S, PSCS-V (N)	N/A	PSI-PD (N)	C/PT/M	720	4.2 (P)	82	N/A	N	Y	N
Power et al., 2012 ⁴⁹	FSS (92)	CARE (96)	N/A	PCRO-N/ID (N)	PES (N)	PCRO-PI (N)	N/A	M/MM/M	980	N/A (S)	68	27	Y	Y	Y
Shimabukuro et al., 2020 ⁵⁰	WPJ (28)	WL (24)	N/A	PS-Laxness, Overreact. (N)	PSOC Eff., Sat. (N), PLOC-Resp., Control (N)	Pasta Task-Pos., Neg. (Y)	PSI (N), BDI (N)	C/PT/G	1560	8.4 (S)	83	N/A	N	Y	N
Sibley et al., 2013 ⁵¹	STAND (18)	TAU (18)	N/A	N/A	N/A	CBQ (N)	CSQ (N)	C/MM/M	740	12.4 (S)	72	78	Y	Y	Y
Sibley et al., 2016 ⁵²	STAND (67)	TAU (61)	PAMS-Contr., Privil. (N)	N/A	N/A	CBQ (N)	CSQ (N)	C/MM/I	740	12.7 (S)	65	58	Y	Y	Y
Sonuga-Barke et al., 2001 ⁵³	BPT (30)	PC&S (28)	N/A	N/A	PSOC Eff., Sat. (N),	N/A	GHQ (N)	H/PT/I	480	3.5 (P)	62	N/A	N	N	Y
Sonuga-Barke et al., 2004 ⁵⁴	BPT (59)	WL (30)	N/A	N/A	PSOC Eff., Sat. (N),	N/A	GHQ (N)	H/PT/I	480	3.5 (P)	N/A	N/A	N	N	Y
Sonuga-Barke et al., 2018 ²⁰	IY (131)	TAU (42)	GIPCI (Y)	N/A	N/A	N/A	GHQ (N)	C/PT/G	1,620	3.5 (P)	71	73	N	N	Y
	NFPP (133)		GIPCI (Y)	N/A	N/A	N/A	GHQ (N)	H/PT/I	1,080	3.6 (P)	75	74	N	N	Y
Thompson et al., 2009 ⁵⁵	NFPP (17)	TAU (13)	GIPCI (Y)	N/A	N/A	PFMSS-Neg., Pos., Gl. (Y)	GHQ (N), AARS (N)	H/PT/I	600	4.5 (P)	76	N/A	N	N	Y

(continued)

TABLE 1 Continued

Study	Intervention (n)	Control (n)	Positive Parenting	Negative Parenting	Parenting Sense of Competence	Parent-Child Relationship	Parental Mental Health	Setting/Format/Delivery	Duration	Age (cat.)	% Boys	% Ext. dis.	Home-school coll.	Med. all.	Integr. checks
van den Hoofdakker et al., 2007 ⁵⁶	BPT (47)	RCC (47)	N/A	N/A	N/A	N/A	PSI-PD (N)	C/PT/I	1,440	7.4 (S)	76	76	N	Y	Y

Note: N = no; N/A = not available; Y = yes.

Intervention: BPT = behavioral parent training; CLAS = Child Life and Attention Skills; EGTP = Enhanced Group Triple P; F2F BPT = Face-to-face Behavioral Parent Training; FSS-EE = Family School Success Early Elementary; HNC = Helping the Noncompliant Child; IY = Incredible Years; NFPP = New Forest Parenting Programme; NFPP-SH = New Forest Parenting Programme Self Help; PCIT = parent-child interaction therapy; PFC = parental friendship coaching; PFT = parent-focused treatment; Ps.-Ed. = Psychoeducation; STAND = Supporting Teens' Academic Needs Daily; TPOL = Triple P Online; WPJ = Well Parent Japan.

Control: AC = active control; CARE = Coping With ADHD Through Relationships and Education; No tr. = no treatment; PC&S = parent counseling and support; RCC = routine clinical care; TAU = treatment as usual; WL = waitlist.

Outcomes (positive parenting, negative parenting, parenting sense of competence, parent-child relationship, parental mental health; in parentheses: probably blinded or not [Y/N]): AARS = Adult ADHD Rating Scale; APQ = Alabama Parenting Questionnaire; BDI = Beck Depression Inventory; CBQ = Conflict Behavior Questionnaire; CCNES = Coping with Children's Negative Emotion Scale; Comm. = commands; Comm. Qual. = command quality; Contr. = contracting; CP = child-led play; CSQ = Caregiver Strain Questionnaire; CU = clean-up; DASS = Depression Anxiety Stress Scale (Anx. = anxiety; Depr. = depression); Dir. = directive; DPICS = Dyadic Parent-Child Interaction Coding System; Dysf. Int. = dysfunctional interactions; FIQ = Family Involvement Questionnaire; Freq. Neg. Fb. = frequency of negative feedback; GHQ = General Health Questionnaire; GIPCI-R = Global Impressions of Parent-Child Interactions-Revised; Gl. = global; IRS = Impairment Rating Scale; Neg. Aff. = negative affect; N/ID = negative/ineffective discipline; NP = negative parenting; Overreact. = overreactivity; PAMS = Parent Academic Management Scale; PBI = Parental Bonding Instrument; PCEQ = Parent Cognitive Error Questionnaire; PCRO = Parent-Child Relationship Questionnaire; PES = Parent as Educator Scale; PFMSS = Preschool Five Minute Speech Sample; PI = positive involvement; PLOC = Parental Locus of Control Scale; PP = positive parenting; PPES = parent perceptions of parents efficacy scale; PPI = Parenting Practices Interview; Priv. = privileges; PSDQ-Auth. = Parenting Styles and Dimensions Questionnaire-Authoritative Parenting; PS = parenting scale; PSCS-S = Parenting Sense of Competence Scale-Skills; PSCS-V = Parenting Sense of Competence Scale-Valuing; PSI-PD = Parenting Stress Index-Parent Domain; PSI-R = Parenting Stress Index-Revised; PSI-SF = Parent Stress Index-Short Form; PSOC = Parenting Sense of Competence scale [Eff. = efficacy (subscale); Resp. = responsibility; Sat. = satisfaction (subscale)]; SNQ = Service Needs Questionnaire; Supp. = supportive; Unsupp. = unsupportive; Verb. = verbosity.

Setting: C = clinic; H = home; M = mixed; S = school.

Format: MM = multimodal; PT = parent training.

Delivery: G = group; I = individual; M = mixed.

Duration: total duration of intervention in minutes.

Age: mean age of children in intervention condition in years.

Age cat. (category): P = preschool; S = school-age.

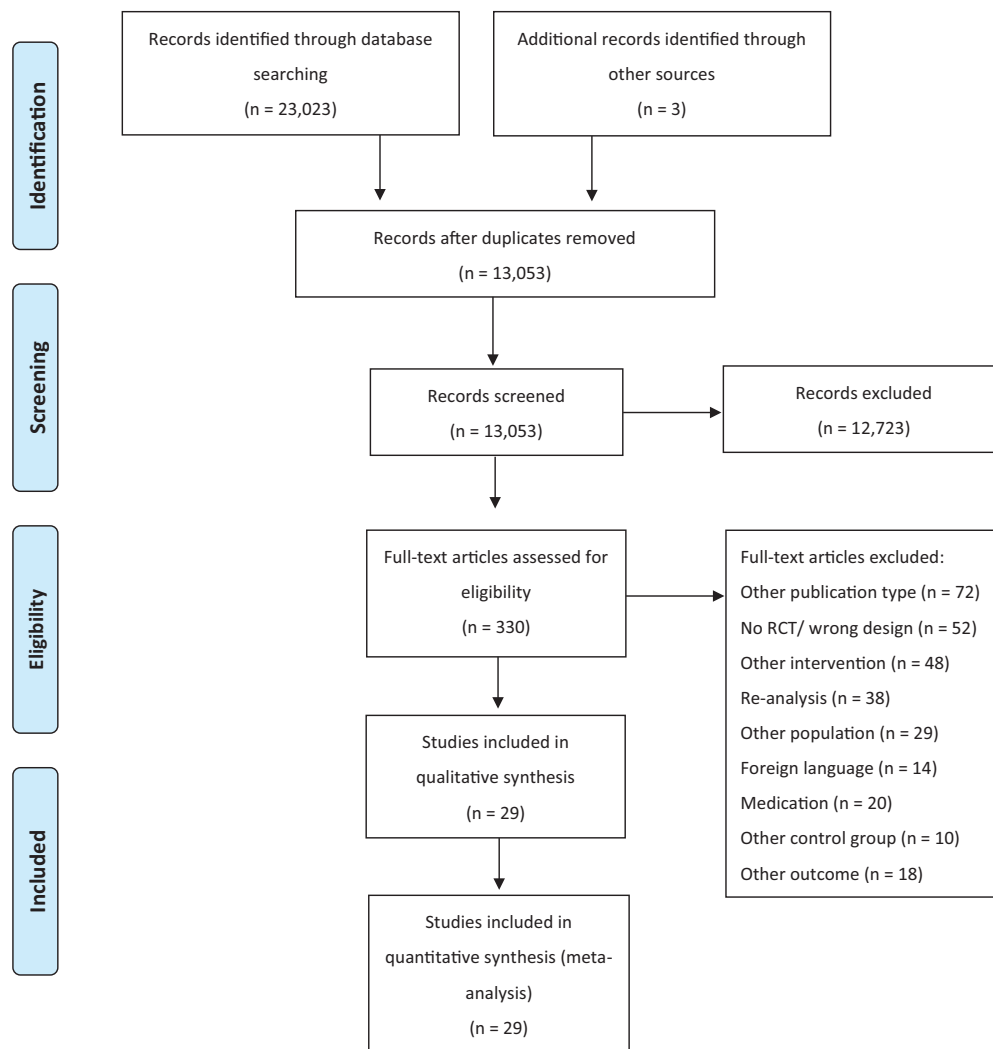
% boys: percentage of boys in intervention condition.

% ext. dis.: percentage of children with comorbid externalizing disorder in intervention condition.

Home-school coll.: collaboration between home and school was actively encouraged in the intervention (Y/N).

Med. all.: whether medication was allowed next to the intervention (Y/N).

Integr. checks: whether integrity checks were performed in the study (Y/N).

FIGURE 1 PRISMA Flowchart

Note: RCT = randomized controlled trial.

Risk of Bias

We used Grading of Recommendations Assessment, Development and Evaluation (GRADE)⁶¹ to assess the quality of the included studies, which was performed independently by 2 authors (A.P.G. and R.H.). GRADE uses 6 criteria to assess selection, detection, attrition, and reporting bias: random sequence generation, allocation concealment, blinding of outcome assessment, incomplete outcome data, vested interest, and selective outcome reporting. All studies were scored individually on these criteria.

Data Analytic Approach

Effect sizes of every outcome were calculated in terms of standardized mean difference (SMD) (Hedges' g), based

on pre-post intervention differences standardized by the postintervention standard deviation, using Comprehensive Meta-Analysis software⁶² and, if applicable, recoded to ensure that positive effect sizes on that outcome indicate beneficial effects of the intervention relative to the control condition (ie, increases in positive parenting, parenting sense of competence and parent-child relationship quality, and decreases in negative parenting and parental mental health problems). The metafor and dmetar packages in R were used for further analyses.^{63,64} Main effects of each outcome were calculated using multilevel meta-analyses. After main effects were estimated, a random-effects meta-regression analysis was performed for each of the 5 outcome domains. Because several studies contributed multiple effect sizes, the analysis concerned 3 levels

(ie, participants, effect sizes, and studies; see Konstantopoulos⁶⁵ for background on multilevel meta-regression). This approach thereby accounted for dependency between effect sizes within studies (eg, when 2 different measures for positive parenting were used in one study, or when a study reported scores from 2 informants on one measure). Five studies compared 2 intervention arms with one control condition; we performed a sensitivity analysis to assess the potential influence of the dependency between these arms (Supplement 5, available online). For meta-regression analyses, we report β coefficients, with β_1 indicating the change in the SMD when the moderating variable increases with one unit and β_0 indicating the intercept, which is equal to the SMD for a specific value of the reference category of the moderator.⁶⁶

Potential differences between probably blinded and unblinded measures were investigated in a categorical moderation analysis (probably blinded vs unblinded), and differences based on the type of control condition were assessed with a similar analysis (active vs waitlist control). Publication bias was assessed using Egger's test for funnel plot asymmetry,⁶⁷ and trim-and-fill analyses were performed to estimate the number of studies that are needed to counter potential funnel plot asymmetry.⁶⁸ To estimate evidential value and potential flexibility in data analysis, p -curves were calculated,⁶⁹ and leave-one-out analyses were performed to assess the potential influence of single studies. For all analyses, I^2 statistics were used as indication of heterogeneity, separated for between-variables and between-studies heterogeneity (level 2 and 3, respectively). To estimate main effects and for continuous moderation analyses, at least 10 effect sizes were required, and subgroups required at least 4 effect sizes for categorical moderation analyses.⁷⁰

For our primary aim, we assessed associations between behavioral techniques and outcomes using meta-regression analyses. To limit the number of analyses, we first tested whether the 8 overall categories of behavioral techniques were associated with outcomes in 2 ways: by assessing the influence of the percentage of sessions in which at least one technique from a category occurs and the number of sessions in which at least one of the techniques from a specific category occurs. If the percentage of sessions in which at least one technique from a category occurs was (borderline) significantly ($p < .10$) related to an outcome domain, we conducted follow-up analyses for all specific techniques within that category. The same procedure was adopted when the number of sessions in which a certain category of techniques was represented was associated with the outcome.

For our secondary aim, we assessed the influence of the following factors on treatment effects on parenting outcomes: setting (home, clinic, school), delivery method (individual, group, mixed), format (parent training only vs parent training as part of multimodal treatment), the presence of home-school collaboration (yes/no), medication use at study entry (allowed vs not allowed), and the presence of integrity checks (yes/no) as intervention/study characteristics and age (both continuously and categorical), sex (percentage boys), and comorbid externalizing disorders as child characteristics. For all analyses, we did not control for multiple testing, as the analyses were hypothesis generating, and not confirming.

RESULTS

Study Selection

In total, 29 studies with 35 interventions and 138 relevant effect sizes were included (Figure 1). Study characteristics are presented in Table 1. The mean and the range of the dosage of all scored techniques are provided in Supplement 6, available online.

Risk of Bias

Risk-of-bias analyses are presented in Supplement 7, available online (interrater reliability $\kappa = 0.96$). Few studies included blinded measures; most studies reported complete outcome data. Overall, the information in the published articles of many studies was not sufficient to determine the risk of bias for the categories random sequence generation, allocation concealment, vested interest, and selective outcome reporting.

Main Effects

Significant small- to medium-sized main effects (range 0.41–0.60, all p 's $< .001$) favoring parent training over control conditions were found for all outcome categories (Table 2 and Figure 2). Effect sizes were not significantly different for probably blinded and unblinded measures on positive parenting ($\beta_1 = 0.05$, $p = .82$), negative parenting ($\beta_1 = -0.15$, $p = .52$), and parent-child relationship ($\beta_1 = 0.02$, $p = .95$) (Table 2). None or too few blinded measures were available for parenting sense of competence and parental mental health.

Visual inspection of the forest plot (Figure 2) depicted one outlying study with particularly high effect sizes on the outcome domain of parental mental health.³³ As noted in Table 2, the effect size decreased and the heterogeneity between studies dropped considerably after removing that study. For the forthcoming analyses on the parental mental health domain, we therefore decided to exclude that study from further analyses

TABLE 2 Main Effects per Outcome Domain

	k	n_es	SMD	95% CI	I² (level 2, %)	I² (level 3, %)
Positive parenting	19	27	0.60***	0.39, 0.81	72.9	5.3
Probably blinded	12	17	0.58***	0.30, 0.86	71.3	7.8
Unblinded	9	10	0.63**	0.28, 0.98	71.3	7.8
After trim-and-fill correction	22	30	0.49***	0.24, 0.73	81.2	
Negative parenting	15	31	0.59***	0.36, 0.82	56.3	18.1
Probably blinded	6	12	0.68***	0.32, 1.04	59.2	15.6
Unblinded	10	19	0.54***	0.25, 0.83	59.2	15.6
After trim-and-fill correction	24	40	0.35**	0.12, 0.59	81.9	
Parenting sense of competence	17	29	0.54***	0.35, 0.73	0.0	64.8
After trim-and-fill correction	18	30	0.54***	0.36, 0.72	63.1	
Parent–child relationship	13	18	0.53***	0.29, 0.77	44.5	19.6
Probably blinded	6	10	0.53**	0.17, 0.88	43.8	23.5
Unblinded	7	8	0.54**	0.18, 0.90	43.8	23.5
After trim-and-fill correction	17	22	0.37*	0.07, 0.67	72.2	
Parental mental health	23	33	0.41***	0.20, 0.61	0.0	69.2
After trim-and-fill correction	29	39	0.30*	0.03, 0.57	75.1	
Without Aghebati study	22	30	0.34***	0.22, 0.45	3.1	16.6
Without Aghebati study and after trim-and-fill correction	26	34	0.29***	0.17, 0.41	32.8	

Note: Overall main effects, main effects on probably blinded and unblinded measures separately, and main effects after trim-and-fill correction. *k* represents the number of studies, with the number of effect sizes (*n_es*) in parentheses. The trim-and-fill correction calculates the effect size after correcting for funnel plot asymmetry. *I*² represents “the proportion of variation in study estimates that is due to heterogeneity,”⁷¹ separately for heterogeneity between variables (level 2) and between studies (level 3). SMD = standardized mean difference in terms of Hedges’ *g*. **p* < .05; ***p* < .01; ****p* < .001.

(analyses including this study were also performed and are described in Supplement 8, available online). A sensitivity check excluding one study measuring parental ADHD revealed highly similar results (Supplement 9, available online).

A sensitivity check comparing studies with active control conditions and studies with waitlist control conditions demonstrated that, as expected, effect sizes for most of the outcome domains were smaller when parent training was compared with an active control condition than when it was compared with a waitlist. However, this difference in effect sizes was significant only for negative parenting (see Supplement 10, available online, for detailed results).

Robustness Analyses

Egger’s test⁶⁷ indicated signs of funnel plot asymmetry (which potentially indicates publication bias) on negative parenting ($t = 2.57$, $p = .02$), parenting sense of competence ($t = 2.17$, $p = .04$), and parent–child relationship ($t = 2.46$, $p = .03$), but not on positive parenting ($t = 1.83$, $p = .08$) and parental mental health ($t = 0.55$, $p = .59$). Note that Egger’s test and trim-and-fill analyses were performed without modeling for dependency between effect sizes, as this is currently not possible.

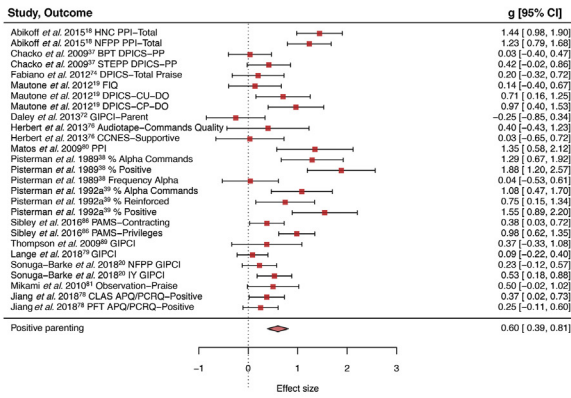
Trim-and-fill analyses⁶⁸ demonstrated that on the left side of the funnel plot 9 studies were missing for negative parenting, 4 studies were missing for parental mental health, 4 studies were missing for parent–child relationship, 3 studies were missing for positive parenting, and 1 study was missing for parenting sense of competence (see Supplement 11, Figure S1, available online, for funnel plots with estimated missing effect sizes). After taking into account these missing studies, the effect size slightly decreased (but remained significant) for positive parenting, negative parenting, parent–child relationship, and parental mental health and remained similar for parenting sense of competence (effect sizes range 0.29–0.54, all p ’s < .05) (Table 2).

The p -curves⁶⁹ were created for all outcome categories. In all cases, p -curves were right-skewed and indicated evidential value (all p values for the half p -curve < .05) (see Supplement 11, Figures S2–S6, available online, for p -curves).

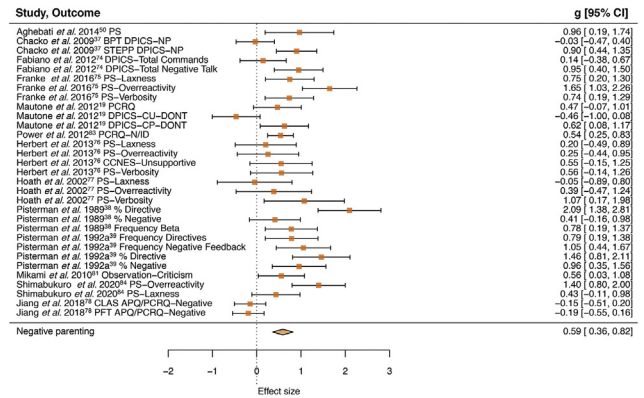
Sensitivity analyses (ie, leave-one-out) indicated that effect sizes were not heavily dependent on single studies, as the minimum and maximum effect size calculated by the leave-one-out analyses did not differ substantially for all outcome domains, and all were within the range of the CIs of the main effects: for positive parenting (minimum SMD = 0.53, $p < .001$; maximum SMD = 0.64, $p < .001$), for negative

FIGURE 2 Forest Plots With all Effect Sizes Sorted per Outcome Domain

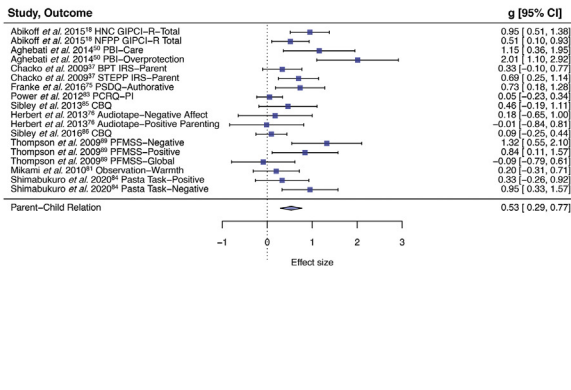
A Positive parenting



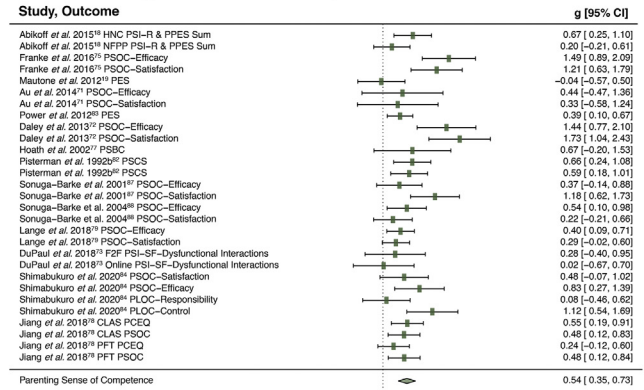
B Negative parenting



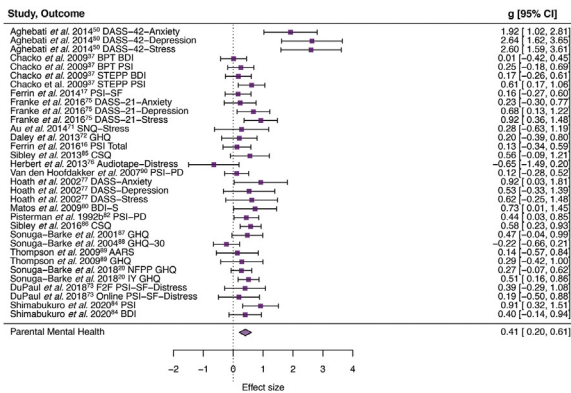
C Parent-Child Relation



D Parenting Sense of Competence



E Parental Mental Health



Note: AARS = Adult ADHD Rating Scale; APQ = Alabama Parenting Questionnaire; BDI = Beck Depression Inventory; BPT = behavioral parent training; CBO = Conflict Behavior Questionnaire; CCNES = Coping with Children’s Negative Emotion Scale; CLAS = Child Life and Attention Skills; CU = clean-up; DASS = Depression Anxiety Stress Scale; DPICS = Dyadic Parent-Child Interaction Coding System; F2F = Face-to-face; FIQ = Family Involvement Questionnaire; GHQ = General Health Questionnaire; GIPCI = Global Impressions of Parent-Child Interactions-Revised; HNC = Helping the Noncompliant Child; IRS = Impairment Rating Scale; IY = Incredible Years; NID = negative/ineffective discipline; NFPP = New Forest Parenting Programme; NP = negative parenting; PCEQ = Parent Cognitive Error Questionnaire; PCRQ = Parent-Child Relationship Questionnaire; PD = parent domain; PES = Parent as Educator Scale; PFT = parent-focused treatment; PFMSS = Preschool Five Minute Speech Sample; PP = positive parenting; PPES = parent perceptions of parents efficacy scale; PPI = Parenting Practices Interview; PS = parenting scale; PSI = Parenting Stress Index; PSOC = Parenting Sense of Competence scale; R = revised; STEPP = Strategies to Enhance Positive Parenting; SF = short form; SNQ = Service Needs Questionnaire.

parenting (minimum SMD = 0.53, $p < .001$; maximum SMD = 0.63, $p < .001$), for parenting sense of competence (minimum SMD = 0.49, $p < .001$; maximum SMD = 0.57, $p < .001$), for parent–child relationship quality (minimum SMD = 0.45, $p < .001$; maximum SMD = 0.58, $p < .001$), and for parental mental health (minimum SMD = 0.32, $p < .001$; maximum SMD = 0.37, $p < .001$). Additional sensitivity analyses were performed to assess the influence of dependency in studies that compared 2 intervention arms with 1 control condition. The influence was minimal (see Supplement 5, available online, for details).

In sum, although some analyses indicate the presence of publication bias (Egger's test, trim-and-fill analyses), the main effects are robust given the results of the trim-and-fill corrected analyses, p -curves, and leave-one-out analyses.

Primary Analyses: Does the Dosage of Behavioral Techniques Influence the Effects of Parent Training?

All results regarding the association between the overall effect size and the dosage of technique categories or specific techniques (measured by both the percentage and the number of sessions in which a technique from a certain category/a specific technique occurs) are presented in Supplement 12, available online. In Table 3, we summarized the categories/techniques that were significantly associated with outcomes. We found the following:

- The dosage of psychoeducation was negatively associated with treatment effects on positive parenting and the quality of the parent–child relationship.
- The dosage of teaching parents to manipulate antecedents, and in particular to anticipate misbehaviors, was positively associated with treatment effects on parenting sense of competence and parental mental health.
- The dosage of teaching parents to work with positive consequences was associated with larger treatment effects on negative parenting.
- The dosage of practicing/generalization techniques was negatively associated with the effect of treatment on the parent–child relationship.

Dosage was established by either the number or the percentage of sessions in which the techniques occur (Table 3). Most of the analyses, however, were not significant (Supplement 12, available online).

Secondary Analyses: Moderation by Intervention and Participant Characteristics

Intervention Characteristics. Secondary analyses of intervention characteristics on all outcomes were all nonsignificant except for 2 findings. First, on negative parenting, parent

training only was associated with a larger effect than parent training as part of multimodal treatment. Second, interventions without integrity checks (although only 2 studies containing 6 effect sizes) were more effective than interventions with integrity checks on positive and negative parenting. See Table 3 for significant findings, and see Supplement 13, Tables S1–S3, available online, for all results.

Child Characteristics. Effects of parent training on negative parenting were higher when the child was younger, and effects on positive parenting were higher for preschoolers than for school-age children (the latter were more pronounced when 2 studies on adolescents were excluded; see Supplement 14, available online, for details on these sensitivity analyses). Sex of the child moderated the effect on negative parenting: the higher the percentage of boys in the sample, the higher the effects. Finally, the percentage of comorbid externalizing disorders in the sample did not moderate any outcomes. All analyses containing moderation by participant characteristics are presented in Supplement 13, Table S3, available online; significant findings are also presented in Table 3.

DISCUSSION

Behavioral parent training for children with ADHD consists of many different techniques that are taught to parents. To enhance the development of more effective future parent training interventions, the primary aim of the current study was to investigate which behavioral techniques were associated with better or worse parental outcomes.

First, we found that higher dosages of behavioral techniques teaching parents to manipulate the antecedents of behavior (ie, stimulus control techniques), in particular, by explicitly anticipating potential misbehavior of the child (eg, thinking ahead, preparing a plan before entering a problematic situation), were associated with positive effects on parenting sense of competence and parental mental health. Stimulus control techniques may be particularly relevant for children with ADHD, with their noted disorganization and executive functioning deficits.^{12,72–74} These intervention components are (relative to, for example, techniques focusing on relationship building and teaching communication skills) relatively straightforward for parents and focus on the prevention of nonadaptive behavior, which may provide a sense of control. This may give parents immediate mastery of these skills. Also, it may well be that children respond quickly to these techniques and thereby reinforce parents, altogether leading to an increased sense of competence and a decrease of stress. Additionally, stimulus control techniques, such as applying more structure and clear rules, may also be beneficial for parents themselves, as a significant proportion of the

parents of children with ADHD have impairing ADHD symptoms.⁷⁵ This may explain our finding that a higher dosage of stimulus control techniques was associated with improved parental mental health. This is an important finding, as parental ADHD symptoms have been found to attenuate effects of behavioral parent training.^{6,76}

Second, higher dosages of behavioral techniques teaching parents to provide children with positive consequences after showing desired behavior, in particular, offering social rewards and responding in a consistent way, were associated with decreased negative parenting. The importance of the effects on negative parenting is emphasized by previous studies that consistently demonstrated that decreases in negative parenting mediated behavioral improvements in children. Decreases in negative parenting practices predicted improvements in child outcomes in the Multimodal Treatment of ADHD (MTA) study,⁸ and a recent telephone-assisted self-help parent training study found that changes in negative parenting mediated effects on children's ADHD symptoms.⁷ Also, in response to behavioral parent training, changes in negative parenting mediated the link between maternal ADHD symptoms and the child's behavioral problems after parent training,⁶ and improved discipline techniques by parents predicted decreased disruptive behavior by the child.⁷⁷ This suggests that changing negative parenting is pivotal to ultimately improving the child's behavior.

Third, higher dosages of psychoeducation were associated with lower effects on positive parenting and the quality of the parent-child relationship. This seemingly surprising finding does not necessarily imply that psychoeducation is ineffective, but rather suggests that other behavioral techniques, such as manipulating antecedents and providing positive consequences, warrant a higher dosage, given the limited time that is often available for behavioral parent training (usually 8–12 sessions). On average, psychoeducation occurred in 7 sessions and in 69% of the total number of sessions, which was substantial. A limitation of the current approach, however, is that the content of the psychoeducation was not scored. This could be relevant, as deterministic, biologically based psychoeducation potentially increases the perceived burden of the disorder by caregivers.⁷⁸ This could lead to more parental awareness of the child's problems and potentially also result in discouragement about the influence of parents on the problems of their children, ultimately resulting in lower effects of interventions. Future research should disentangle which specific forms of psychoeducation are, and are not, useful in parent training for ADHD.

Fourth, higher dosages of techniques aimed at practicing, generalization, and maintenance of learned skills (eg, problem-solving techniques) were associated with lower effects on the quality of the parent-child relationship, but there also was a trend toward a positive association between these

techniques and positive parenting. Implications of these mixed findings with regard to practicing, generalization, and maintenance techniques are not straightforward. Techniques from this category occurred in almost 90% of the sessions, with homework assignments as specific technique that was most frequently included in interventions (78% of the sessions). Potentially, the generally high rates of these techniques observed across studies may have obscured their effects. Earlier studies point to the importance of these techniques, as assigning homework, for example, was associated with higher efficacy of behavioral treatment for ADHD.⁷⁹

Directly studying which techniques are related to the core mechanism of change of behavioral parent training—parenting—is the ultimate way of advancing our psychological treatments.⁸⁰ The main findings of our study therefore provide directions to better tailor behavioral parent training for children with ADHD and to improve current interventions. This, however, does not imply that parent training in its current form is not effective: in correspondence with previous meta-analyses and reviews,^{4,5} we observed robust medium-sized effect sizes of parent training on all 5 outcome domains related to parenting. Effect sizes were lower when parent training was compared with active control conditions relative to waitlists, but only the effect size for negative parenting dropped to nonsignificant when including only studies with active control conditions. A reassuring finding was that effect sizes on positive parenting, negative parenting, and parent-child relationship did not differ between probably blinded and unblinded measures, indicating that effects are not merely attributable to parents' investment affecting their assessment of outcome measures. This corresponds with an earlier meta-analysis of behavioral interventions for ADHD, which reported medium-sized effects on both positive and negative parenting, as measured by probably blinded assessments.⁵ These robust effects of behavioral parent training on parenting outcomes are imperative, as improvements in parenting are a prerequisite to ultimately lead to improvements in child functioning, as these are the core mediators of change.^{6,8,9}

The secondary aim of this study was to investigate whether several child and intervention characteristics were associated with parenting outcomes. The most relevant finding was that effects of parent training on both positive and negative parenting were higher when children were younger, which is consistent with a previous meta-analysis on psychosocial interventions for ADHD.⁵ Potentially, at an early age, not only the child's behavior but also parenting behavior is less engrained and more prone to change relative to later ages. Together with observations that early onset of ADHD is associated with more severe long-term outcomes,²⁹ these findings emphasize the need for early

TABLE 3 Significant Effects of Primary and Secondary Analyses

Primary analyses	k	n_es	$\hat{\beta}_1$	95% CI	I^2 (levels 2, 3), %
Positive parenting					
1. Shaping knowledge (no. sessions)	16	20	-0.05	-0.11, 0.01 [†]	69.2, 0.0
1. Shaping knowledge (% sessions)	16	20	-0.01	-0.01, -0.00*	66.5, 0.0
1a. Psychoeducation parent (% sessions)	16	20	-0.01	-0.01, -0.00*	66.7, 0.0
7. Practicing/generalization/maintenance (% sessions)	16	20	0.04	-0.00, 0.09 [†]	66.9, 0.0
Negative parenting					
4. Positive consequences (% sessions)	12	23	0.01	-0.00, 0.02 [†]	65.4, 0.0
4d. Social reward (% sessions)	12	23	0.01	0.00, 0.02*	63.2, 0.0
4j. Consistent responding (% sessions)	12	23	0.01	0.00, 0.03*	64.6, 0.0
Parenting sense of competence					
3. Manipulating antecedents (% sessions)	16	27	0.01	0.00, 0.03*	5.7, 53.2
Parent-child relationship					
1. Shaping knowledge (no. sessions)	12	17	-0.08	-0.15, -0.00*	54.8, 0.0
1a. Psychoeducation parent (no. sessions)	12	17	-0.08	-0.16, -0.00*	54.8, 0.0
7. Practicing/generalization/maintenance (no. sessions)	12	17	-0.09	-0.17, -0.01*	52.8, 0.0
Parental mental health					
3. Manipulating antecedents (no. sessions)	20	27	0.05	0.01, 0.09*	0.0, 7.2
3b. Plan misbehavior (no. sessions)	20	27	0.03	0.00, 0.06*	0.0, 11.8
3. Manipulating antecedents (% sessions)	20	27	0.01	0.00, 0.01*	4.8, 0.0
3b. Plan misbehavior (% sessions)	20	27	0.00	0.00, 0.01*	0.2, 10.1
Secondary analyses					
Positive parenting					
Age (categorical): preschool vs school-age	19	27	-0.42	-0.84, -0.01*	75.4, 0.0
Integrity checked vs not checked	19	27	0.58	0.10, 1.07*	73.9, 0.0
Negative parenting					
Age (continuous)	13	27	-0.12	-0.22, -0.01*	62.0, 5.5
Sex (% boys)	15	31	0.03	0.00, 0.05*	62.6, 6.8
Parent training vs multimodal	15	31	-0.46	-0.91, -0.00*	67.2, 4.2
Integrity checked vs not checked	14	30	0.59	0.17, 1.00**	68.7, 0.0

Note: Significant effects of dosage of categories of behavioral techniques and specific techniques (primary analyses) and significant effects of intervention and participant characteristics (secondary analyses). *k* represents the number of studies, with the number of effect sizes (*n_es*) in parentheses. $\hat{\beta}_1$ denotes the change in standardized mean difference (in terms of Hedges' *g*) when the moderator increases with one unit (95% CIs are depicted in parentheses). I^2 represents "the proportion of variation in study estimates that is due to heterogeneity,"⁷¹ separately for heterogeneity between variables (level 2) and between studies (level 3). Category numbers (and specific techniques within categories with numbers and letters) correspond with the taxonomy (Supplement 1, available online).

p* < .05; *p* < .01; [†]*p* < .10.

psychosocial interventions for children with ADHD.⁸¹ Other secondary findings were more surprising. First, studies without integrity checks had higher effect sizes on positive and negative parenting than studies with integrity checks. The large majority of studies included integrity checks, and our findings on this variable were likely driven by 2 old studies^{46,47} that did not report such checks and obtained medium-to-large effects on positive and negative parenting. Second, studies investigating parent training only had higher effect sizes on the reduction of negative parenting relative to studies on multimodal treatment. A likely explanation is that multimodal interventions focused less specifically on parenting (eg, many of the multimodal interventions included in our study also involved school consultations), which could limit the impact of such interventions on parenting skills. Third, a higher proportion of boys was associated with stronger effects on negative parenting. A very tentative explanation for this finding could be that there is some evidence of higher (baseline) levels of negative parenting for boys relative to girls,^{82,83} which potentially leaves more room for improvement of negative parenting in parents of boys.

Although the current investigation has several strong aspects, including thorough investigation of the dosage of 39 behavioral techniques by scoring all original treatment manuals, inclusion of a large number of studies, and the use of state-of-the-art multilevel meta-regression analyses, a few limitations warrant mentioning. First, by using the current method we could not examine the effects of separate techniques, as these were not investigated in isolation. Therefore, potential effects of combinations of techniques, or sequencing of techniques, could not be ruled out and could have confounded the results. Correlations between dosages of different techniques (see Supplement 6, Table S2, available online, for the correlation matrix) further underline this issue: especially the dosage of positive consequences was associated with the dosage of several other techniques. Multicollinearity was not a problem, as none of the correlations between technique categories was >0.8 .

Second, the current investigation should be primarily regarded as hypothesis generating instead of confirming. For hypothesis-generating studies, correcting for multiple testing is not advised.^{84,85} This implies that results should be interpreted with caution and should be confirmed, or falsified, by future empirical studies.

A third limitation is that only effects at the end of the intervention were taken into account. Potentially, some behavioral techniques are more effective in the longer term. For example, there were no direct posttreatment effects in a study particularly focusing on psychoeducation, but substantial effects of psychoeducation were observed after 6 months.¹⁶ Similar

mechanisms may apply for generalization techniques, as transfer of skills from therapy to daily life logically takes time.

Fourth, although our technique categories showed substantial variation, some of the separate techniques occurred only in a small number of studies (Supplement 6, Table S1, available online). This may have limited the power of our analyses on these techniques.

Fifth, we did not compute interrater reliability statistics about the coding of the intervention manuals. However, we do not believe this limitation affects our findings, as all manuals were independently scored by 2 raters, and senior authors were consulted in rare cases of disagreement.

Sixth, we scored the dosage of techniques in terms of number and percentage of sessions, but not the total amount of time spent on specific techniques within sessions. The latter may yield more definitive information for intervention optimization (eg, how to best balance the time spent during sessions between homework review vs teaching a new skill).

Future studies are needed to test the hypothesis based on our current results that focusing on teaching parents to manipulate antecedents of behavior and to provide positive consequences for desired behavior is particularly effective to change child behavior in ADHD samples. Two recent microtrials (one for parents and one for teachers) provided evidence in this direction: when provided in isolation, both stimulus control and contingency management techniques were found to be effective in improving the child's behavior (Hornstra *et al.*, unpublished data, 2021).⁸⁶ Future studies should further test whether the current findings also apply for child outcomes, as the ultimate goal of parent training is to change the child's behavior via parental behavior. These studies could also investigate associations between changes in parental outcomes and child outcomes.

The current study has several implications for clinical practice. First, the robust small- to medium-sized main effects of parent training on all domains of parenting and parental well-being add to the evidence base regarding parent training as an effective intervention for children with ADHD.^{4,5,15} Second, this evidence, combined with our finding that parent training was particularly effective in ameliorating parenting for preschool-age children with ADHD, suggests that parent training should be delivered early in the potential chain of mental health care for children with ADHD (see also Pelham *et al.*⁸⁷ and Coles *et al.*⁸⁸). Third, although techniques were not investigated in isolation, our results suggest that the manipulation of antecedents of behavior and reinforcement techniques are key components of parent training for children with ADHD in relation to parental outcomes. These exploratory findings may help to strengthen and tailor parent training interventions for children with ADHD.

Accepted June 25, 2021.

Drs. Dekkers, Hoekstra, Groenman, and van den Hoofdakker and Ms. Hornstra are with the University of Groningen, the Netherlands. Drs. Dekkers, Groenman, and van der Oord are with the University of Amsterdam, the Netherlands. Drs. Dekkers and Luman are with Level, Academic Center for Child- and Adolescent Psychiatry and Specialized Youthcare, Amsterdam, the Netherlands. Dr. Dekkers is also with Amsterdam University Medical Center, the Netherlands. Dr. van der Oord is also with KU Leuven, Research Group Clinical Psychology, Belgium. Dr. Luman is also with Vrije Universiteit Amsterdam, the Netherlands.

This research was funded by the Netherlands Organisation for Health Research and Development (ZonMw) under grant number 729300013 to Barbara J. van den Hoofdakker. The funder had no role in the design of this protocol, the collection of data, the data analysis, or the interpretation or publication of the study results.

This article is part of a special series devoted to the subject of child and adolescent attention-deficit/hyperactivity disorder (ADHD). The series covers a range of topics in the area including genetics, neuroimaging, treatment, and others. The series was edited by Guest Editor Jonathan Posner, MD, along with Deputy Editor Samuele Cortese, MD, PhD.

This work has been prospectively registered: https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42018096768

Author Contributions

Conceptualization: van der Oord, Groenman, van den Hoofdakker

Formal analysis: Groenman

Funding acquisition: van der Oord, Luman, Hoekstra, van den Hoofdakker

Methodology: Dekkers, Groenman

Project administration: Dekkers, Hornstra, Groenman

Supervision: van der Oord, Groenman, van den Hoofdakker

Writing – original draft: Dekkers

Writing – review and editing: Dekkers, van der Oord, Luman, Hoekstra, Groenman, van den Hoofdakker

The authors thank Lieke Bruinsma, MSc, and Simone Breider, PhD student, of the University of Groningen, for assistance in scoring the manuals and gratefully acknowledge all authors who provided their data. The authors thank Nico Flierman, PhD student, of the University of Amsterdam, for assistance with the figures.

Disclosure: Dr. van der Oord has co-developed a planning-focused and solution-focused treatment and other behavioral treatments but has no financial interest in any of these. She has received research grants from ZonMw and the Research Foundation–Flanders (FWO); she was an advisor of the Dutch ADHD guideline groups and is a member of a working group on ADHD of the Superior Health Council of Belgium. Dr. Luman has co-developed a self-help teacher training program, without financial interests. She has received research grants from ZonMw and was an advisor of the Dutch ADHD guideline groups. Dr. van den Hoofdakker has received royalties as one of the editors of *Sociaal Onhandig* (published by Van Gorcum), a Dutch book for parents that can be used in parent training. She has been involved in the development and evaluation of several parent and teacher training programs, without financial interests; she has been a member of Dutch ADHD guideline and practice standard groups. Drs. Dekkers, Hoekstra, and Groenman and Ms. Hornstra have reported no biomedical financial interests or potential conflicts of interest.

Correspondence to Tycho J. Dekkers, PhD, Department of Child and Adolescent Psychiatry, University Medical Center Groningen, Lübeckweg 2, 9723 HE, Groningen, the Netherlands; e-mail: t.dekkers@accare.nl

0890-8567/\$36.00/©2021 The Authors. Published by Elsevier Inc. on behalf of American Academy of Child & Adolescent Psychiatry. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

<https://doi.org/10.1016/j.jaac.2021.06.015>

REFERENCES

- American Academy of Child and Adolescent Psychiatry. Practice parameters for the assessment and treatment of children and adolescents with attention deficit/hyperactivity disorder. *J Am Acad Child Adolesc Psychiatry.* 2007;46:894-921.
- NICE. Attention Deficit Hyperactivity Disorder: Diagnosis and Management. 2018. Accessed May 14, 2021; <https://www.nice.org.uk/guidance/ng87>.
- Barkley RA. Attention-Deficit Hyperactivity Disorder: A Handbook for Diagnosis and Treatment. New York: Guilford Publications; 2014.
- Fabiano GA, Schatz NK, Aloe AM, Chacko A, Chronis-Tuscano A. A systematic review of meta-analyses of psychosocial treatment for attention-deficit/hyperactivity disorder. *Clin Child Fam Psychol Rev.* 2015;18:77-97. <https://doi.org/10.1007/s10567-015-0178-6>.
- Daley D, van der Oord S, Ferrin M, *et al.* Behavioral interventions in attention-deficit/hyperactivity disorder: A meta-analysis of randomized controlled trials across multiple outcome domains. *J Am Acad Child Adolesc Psychiatry.* 2014;53:835-847.e5. <https://doi.org/10.1016/j.jaac.2014.05.013>.
- Chronis-Tuscano A, O'Brien KA, Johnston C, *et al.* The relation between maternal ADHD symptoms and improvement in child behavior following brief behavioral parent training is mediated by change in negative parenting. *J Abnorm Child Psychol.* 2011;39:1047-1057. <https://doi.org/10.1007/s10802-011-9518-2>.
- Dose C, Hautmann C, Bürger M, Schürmann S, Döpfner M. Negative parenting behaviour as a mediator of the effects of telephone-assisted self-help for parents of pharmacologically treated children with attention-deficit/hyperactivity disorder. *Eur Child Adolesc Psychiatry.* 2021;30:861-875. <https://doi.org/10.1007/s00787-020-01565-w>.
- Hinshaw SP, Owens EB, Wells KC, *et al.* Family processes and treatment outcome in the MTA: Negative/ineffective parenting practices in relation to multimodal treatment. *J Abnorm Child Psychol.* 2000;28:555-568. <https://doi.org/10.1023/A:1005183115230>.
- Larsen LB, Daley D, Lange AM, Sonuga-Barke EJ, Thomsen PH, Rask CU. Effect of parent training on health-related quality of life in preschool children with attention-deficit/hyperactivity disorder: A secondary analysis of data from a randomized controlled trial. *J Am Acad Child Adolesc Psychiatry.* 2021;60:734-744.e3. <https://doi.org/10.1016/j.jaac.2020.04.014>.
- Heath CL, Curtis DF, Fan W, McPherson R. The association between parenting stress, parenting self-efficacy, and the clinical significance of child ADHD symptom change following behavior therapy. *Child Psychiatry Hum Dev.* 2014;46:118-129. <https://doi.org/10.1007/s10578-014-0458-2>.
- Taylor E, Döpfner M, Sergeant J, *et al.* European clinical guidelines for hyperkinetic disorder—first upgrade. *Eur Child Adolesc Psychiatry.* 2004;13(Suppl 1):17-130. <https://doi.org/10.1007/s00787-004-1002-x>.
- van der Oord S, Tripp G. How to improve behavioral parent and teacher training for children with ADHD: Integrating empirical research on learning and motivation into treatment. *Clin Child Fam Psychol Rev.* 2020;23:577-604. <https://doi.org/10.1007/s10567-020-00327-z>.
- Fabiano GA, Pelham WE, Manos MJ, *et al.* An evaluation of three time-out procedures for children with attention-deficit/hyperactivity disorder. *Behav Ther.* 2004;35:449-469. [https://doi.org/10.1016/S0005-7894\(04\)80027-3](https://doi.org/10.1016/S0005-7894(04)80027-3).
- Antshel KM, Barkley RA. Psychosocial interventions in attention deficit hyperactivity disorder. *Child Adolesc Psychiatr Clin N Am.* 2008;17:421-437. <https://doi.org/10.1016/j.chc.2007.11.005>.
- Evans SW, Owens JS, Wymbs BT, Ray AR. Evidence-based psychosocial treatments for children and adolescents with attention deficit/hyperactivity disorder. *J Clin Child Adolesc Psychol.* 2018;47:157-198. <https://doi.org/10.1080/15374416.2017.1390757>.
- Ferrin M, Perez-Ayala V, El-Abd S, *et al.* A randomized controlled trial evaluating the efficacy of a psychoeducation program for families of children and adolescents with ADHD in the United Kingdom: Results after a 6-month follow-up. *J Atten Disord.* 2020;24:768-779. <https://doi.org/10.1177/1087054715626509>.
- Ferrin M, Moreno-Granados JM, Salcedo-Marin MD, Ruiz-Veguilla M, Perez-Ayala V, Taylor E. Evaluation of a psychoeducation programme for parents of children and adolescents with ADHD: Immediate and long-term effects using a blind randomized controlled trial. *Eur Child Adolesc Psychiatry.* 2014;23:637-647. <https://doi.org/10.1007/s00787-013-0494-7>.
- Abikoff HB, Thompson M, Laver-Bradbury C, *et al.* Parent training for preschool ADHD: A randomized controlled trial of specialized and generic programs. *J Child Psychol Psychiatry Allied Discip.* 2015;56:618-631. <https://doi.org/10.1111/jcpp.12346>.
- Mautone JA, Marshall SA, Sharman J, Eiraldi RB, Jawad AF, Power TJ. Development of a family-school intervention for young children with attention deficit hyperactivity disorder. *School Psych Rev.* 2012;44:7-466.
- Sonuga-Barke EJ, Barton J, Daley D, *et al.* A comparison of the clinical effectiveness and cost of specialised individually delivered parent training for preschool attention-deficit/

- hyperactivity disorder and a generic, group-based programme: A multi-centre, randomised controlled trial of the New Forest Parenting Programme versus Incredible Years. *Eur Child Adolesc Psychiatry*. 2018;27:797-809. <https://doi.org/10.1007/s00787-017-1054-3>.
21. DuPaul GJ, Evans SW, Mautone JA, Owens JS, Power TJ. Future directions for psychosocial interventions for children and adolescents with ADHD. *J Clin Child Adolesc Psychol*. 2020;49:134-145. <https://doi.org/10.1080/15374416.2019.1689825>.
 22. Leijten P, Gardner F, Melendez-Torres GJ, *et al*. Meta-analyses: Key parenting program components for disruptive child behavior. *J Am Acad Child Adolesc Psychiatry*. 2019;58:180-190. <https://doi.org/10.1016/j.jaac.2018.07.900>.
 23. Kaminski JW, Valle LA, Filene JH, Boyle CL. A meta-analytic review of components associated with parent training program effectiveness. *J Abnorm Child Psychol*. 2008;36:567-589. <https://doi.org/10.1007/s10802-007-9201-9>.
 24. Kofler MJ, Rapport MD, Sarver DE, *et al*. Reaction time variability in ADHD: A meta-analytic review of 319 studies. *Clin Psychol Rev*. 2013;33:795-811. <https://doi.org/10.1016/j.cpr.2013.06.001>.
 25. Luman M, Sergeant JA, Knol DL, Oosterlaan J. Impaired decision making in oppositional defiant disorder related to altered psychophysiological responses to reinforcement. *Biol Psychiatry*. 2010;68:337-344. <https://doi.org/10.1016/j.biopsych.2009.12.037>.
 26. Salum GA, Sato JR, Manfro AG, *et al*. Reaction time variability and attention-deficit/hyperactivity disorder: Is increased reaction time variability specific to attention-deficit/hyperactivity disorder? Testing predictions from the default-mode interference hypothesis. *Atten Defic Hyperact Disord*. 2019;11:47-58. <https://doi.org/10.1007/s12402-018-0257-x>.
 27. Hobson CW, Scott S, Rubia K. Investigation of cool and hot executive function in ODD/CD independently of ADHD. *J Child Psychol Psychiatry*. 2011;52:1035-1043. <https://doi.org/10.1111/j.1469-7610.2011.02454.x>.
 28. Lundahl B, Risser HJ, Lovejoy MC. A meta-analysis of parent training: Moderators and follow-up effects. *Clin Psychol Rev*. 2006;26:86-104. <https://doi.org/10.1016/j.cpr.2005.07.004>.
 29. Rimestad ML, Lambek R, Zacher Christiansen H, Hougaard E. Short- and long-term effects of parent training for preschool children with or at risk of ADHD: A systematic review and meta-analysis. *J Atten Disord*. 2019;23:423-434. <https://doi.org/10.1177/1087054716648775>.
 30. Mulqueen JM, Bartley CA, Bloch MH. Meta-analysis: Parental interventions for preschool ADHD. *J Atten Disord*. 2015;19:118-124. <https://doi.org/10.1177/1087054713504135>.
 31. Daley D, Van Der Oord S, Ferrin M, *et al*. Practitioner review: Current best practice in the use of parent training and other behavioural interventions in the treatment of children and adolescents with attention deficit hyperactivity disorder. *J Child Psychol Psychiatry Allied Discip*. 2017;59:932-947. <https://doi.org/10.1111/jcpp.12825>.
 32. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *J Clin Epidemiol*. 2009;62:1006-1012. <https://doi.org/10.1016/j.jclinepi.2009.06.005>.
 33. Aghebati A, Gharraee B, Shoshtari MH, Gohari MR. Triple P-positive parenting program for mothers of ADHD children. *Iran J Psychiatry Behav Sci*. 2014;8:59-65.
 34. Au A, Lau KM, Wong AHC, Lam, *et al*. The efficacy of a Group Triple P (Positive Parenting Program) for Chinese parents with a child diagnosed with ADHD in Hong Kong: A pilot randomised controlled study. *Aust Psychol*. 2014;49:151-162. <https://doi.org/10.1111/ap.12053>.
 35. Chacko A, Wymbs BT, Wymbs FA, *et al*. Enhancing traditional behavioral parent training for single mothers of children with ADHD. *J Clin Child Adolesc Psychol*. 2009;38:206-218. <https://doi.org/10.1080/15374410802698388>.
 36. Daley D, O'Brien M. A small-scale randomized controlled trial of the self-help version of the New Forest Parent Training Programme for children with ADHD symptoms. *Eur Child Adolesc Psychiatry*. 2013;22:543-552. <https://doi.org/10.1007/s00787-013-0396-8>.
 37. DuPaul GJ, Kern L, Belk G, *et al*. Face-to-face versus online behavioral parent training for young children at risk for ADHD: Treatment engagement and outcomes. *J Clin Child Adolesc Psychol*. 2018;47(Suppl 1):S369-S383. <https://doi.org/10.1080/15374416.2017.1342544>.
 38. Fabiano GA, Pelham WE, Cunningham CE, *et al*. A waitlist-controlled trial of behavioral parent training for fathers of children with ADHD. *J Clin Child Adolesc Psychol*. 2012;41:337-345. <https://doi.org/10.1080/15374416.2012.654464>.
 39. Franke N, Keown LJ, Sanders MR. An RCT of an online parenting program for parents of preschool-aged children with ADHD symptoms. *J Atten Disord*. 2020;24:1716-1726. <https://doi.org/10.1177/1087054716667598>.
 40. Herbert SD, Harvey EA, Roberts JL, Wichowski K, Lugo-Candelas CI. A randomized controlled trial of a parent training and emotion socialization program for families of hyperactive preschool-aged children. *Behav Ther*. 2013;44:302-316. <https://doi.org/10.1016/j.beth.2012.10.004>.
 41. Hoath FE, Sanders MR. A feasibility study of Enhanced Group Triple P-positive parenting program for parents of children with attention-deficit/hyperactivity disorder. *Behaviour Change*. 2002;19:191-206. <https://doi.org/10.1375/bech.19.4.191>.
 42. Jiang Y, Haack LM, Delucchi K, *et al*. Improved parent cognitions relate to immediate and follow-up treatment outcomes for children with ADHD—predominantly inattentive presentation. *Behav Ther*. 2018;49:567-579. <https://doi.org/10.1016/j.beth.2017.11.007>.
 43. Lange AM, Daley D, Frydenberg M, *et al*. Parent training for preschool ADHD in routine, specialist care: A randomized controlled trial. *J Am Acad Child Adolesc Psychiatry*. 2018;57:593-602. <https://doi.org/10.1016/j.jaac.2018.04.014>.
 44. Matos M, Bauermeister JJ, Bernal G. Parent-child interaction therapy for Puerto Rican preschool children with ADHD and behavior problems: A pilot efficacy study. *Fam Process*. 2009;48:232-252. <https://doi.org/10.1111/j.1545-5300.2009.01279.x>.
 45. Mikami AY, Lerner MD, Griggs MS, McGrath A, Calhoun CD. Parental influence on children with attention-deficit/hyperactivity disorder: II. Results of a pilot intervention training parents as friendship coaches for children. *J Abnorm Child Psychol*. 2010;38:737-749. <https://doi.org/10.1007/s10802-010-9403-4>.
 46. Pisterman S, McGrath P, Goodman JT, Webster I, Mallory R. Outcome of parent-mediated treatment of preschoolers with attention deficit disorder with hyperactivity. *J Consult Clin Psychol*. 1989;57:628-635. <https://doi.org/10.1037/0022-006X.57.5.628>.
 47. Pisterman S, Firestone P, McGrath P, *et al*. The role of parent training in treatment of preschoolers with ADDH. *Am J Orthopsychiatry*. 1992;62:397-408. <https://doi.org/10.1037/h0079356>.
 48. Pisterman S, Firestone P, McGrath P, *et al*. The effects of parent training on parenting stress and sense of competence. *Can J Behav Sci*. 1992;24:41-58. <https://doi.org/10.1037/h0078699>.
 49. Power TJ, Mautone JA, Soffer SL, *et al*. A family-school intervention for children with ADHD: Results of a randomized clinical trial. *J Consult Clin Psychol*. 2012;80:611-623. <https://doi.org/10.1037/a0028188>.
 50. Shimabukuro S, Daley D, Thompson M, Laver-Bradbury C, Lovern K, Tripp G. Supporting Japanese mothers of children at risk for attention deficit hyperactivity disorder (ADHD): A small scale randomized control trial of Well Parent Japan. *J Child Fam Stud*. 2020;29:1604-1616. <https://doi.org/10.1007/s10826-020-01704-6>.
 51. Sibley MH, Pelham WE, Derefinko KJ, Kuriyan AB, Sanchez F, Graziano PA. A pilot trial of Supporting Teens' Academic Needs Daily (STAND): A parent-adolescent collaborative intervention for ADHD. *J Psychopathol Behav Assess*. 2013;35:436-449. <https://doi.org/10.1007/s10862-013-9353-6>.
 52. Sibley MH, Graziano PA, Kuriyan AB, *et al*. Parent-teen behavior therapy + motivational interviewing for adolescents with ADHD. *J Consult Clin Psychol*. 2016;84:699-712. <https://doi.org/10.1037/ccp0001106>.
 53. Sonuga-Barke EJ, Daley D, Thompson M, Laver-Bradbury C, Weeks A. Parent-based therapies for preschool attention-deficit/hyperactivity disorder: A randomized, controlled trial with a community sample. *J Am Acad Child Adolesc Psychiatry*. 2001;40:402-408. <https://doi.org/10.1097/00004583-200104000-00008>.
 54. Sonuga-Barke EJ, Thompson M, Daley D, Laver-Bradbury C. Parent training for attention deficit/hyperactivity disorder: Is it as effective when delivered as routine rather than as specialist care? *Br J Clin Psychol*. 2004;43:449-457. <https://doi.org/10.1348/0144665042388973>.
 55. Thompson MJ, Laver-Bradbury C, Ayres M, *et al*. A small-scale randomized controlled trial of the revised New Forest Parenting Programme for preschoolers with attention deficit hyperactivity disorder. *Eur Child Adolesc Psychiatry*. 2009;18:605-616. <https://doi.org/10.1007/s00787-009-0020-0>.
 56. van den Hoofdakker BJ, van der Veen-Mulders L, Sytema S, Emmelkamp PMG, Minderaa RB, Nauta MH. Effectiveness of behavioral parent training for children with ADHD in routine clinical practice: A randomized controlled study. *J Am Acad Child Adolesc Psychiatry*. 2007;46:1263-1271. <https://doi.org/10.1097/chi.0b013e3181354bc2>.
 57. Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. *Syst Rev*. 2016;5:1-10. <https://doi.org/10.1186/s13643-016-0384-4>.
 58. Chorpita BF, Daleiden EL. Mapping evidence-based treatments for children and adolescents: Application of the distillation and matching model to 615 treatments from 322 randomized trials. *J Consult Clin Psychol*. 2009;77:566-579. <https://doi.org/10.1037/a0014565>.
 59. Michie S, Richardson M, Johnston M, *et al*. The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: Building an international consensus for the reporting of behavior change interventions. *Ann Behav Med*. 2013;46:81-95. <https://doi.org/10.1007/s12160-013-9486-6>.
 60. Lee PC, Niew WI, Yang HJ, Chen VCH, Lin KC. A meta-analysis of behavioral parent training for children with attention deficit hyperactivity disorder. *Res Dev Disabil*. 2012;33:2040-2049. <https://doi.org/10.1016/j.ridd.2012.05.011>.
 61. Guyatt GH, Oxman AD, Vist GE, *et al*. GRADE: An emerging consensus on rating quality of evidence and strength of recommendations. *BMJ*. 2008;336:924-926. <https://doi.org/10.1136/bmj.39489.470347.ad>.

62. Borenstein M, Hedges LV, Higgins JPT, Rothstein HR. *Comprehensive Meta-Analysis (Version 2.2.027)*. Englewood, NJ: Biostat; 2006. Accessed November 11, 2020; <https://www.meta-analysis.com/>.
63. Viechtbauer W. Conducting Meta-Analyses in R with the metafor Package. *J Stat Softw*. 2015;36:1-48. <https://doi.org/10.18637/jss.v036.i03>.
64. Harrer M, Cuijpers P, Furukawa T, Ebert DD. dmetar. Accessed November 11, 2020; <https://dmetar.proteclab.org/>.
65. Konstantopoulos S. Fixed effects and variance components estimation in three-level meta-analysis. *Res Synth Methods*. 2011;2:61-76. <https://doi.org/10.1002/jrsm.35>.
66. Dekkers TJ, Popma A, Agelink van Rentergem JA, Bexkens A, Huijzena HM. Risky decision making in attention-deficit/hyperactivity disorder: A meta-regression analysis. *Clin Psychol Rev*. 2016;45:1-16. <https://doi.org/10.1016/j.cpr.2016.03.001>.
67. Egger M, Smith D, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. *Br Med J*. 1997;315:629-634. <https://doi.org/10.1136/bmj.315.7109.629>.
68. Duval S, Tweedie R. Trim and fill: A simple funnel-plot-based method of testing and adjusting for publication bias in meta-analysis. *Biometrics*. 2000;56:455-463. <https://doi.org/10.1111/j.0006-341X.2000.00455.x>.
69. Simonsohn U, Nelson LD, Simmons JP. p-curve: A key to the file-drawer. *J Exp Psychol Gen*. 2014;143:534-547.
70. Fu R, Gartlehner G, Grant M, *et al.* AHRQ methods for effective health care conducting quantitative synthesis when comparing medical interventions: AHRQ and the Effective Health Care Program, *Methods Guide for Effectiveness and Comparative Effectiveness Reviews*. Rockville, MD: Agency for Healthcare Research and Quality; 2008. Accessed September 23, 2020; <https://www.ncbi.nlm.nih.gov/books/NBK49407/>.
71. Higgins JP, Thompson SG. Quantifying heterogeneity in a meta-analysis. *Stat Med*. 2002;21:1539-1558. <https://doi.org/10.1002/sim.1186>.
72. Kasper LJ, Alderson RM, Hudec KL. Moderators of working memory deficits in children with attention-deficit/hyperactivity disorder (ADHD): A meta-analytic review. *Clin Psychol Rev*. 2012;32:605-617. <https://doi.org/10.1016/j.cpr.2012.07.001>.
73. Willcutt EG, Doyle AE, Nigg JT, Faraone SV, Pennington BF. Validity of the executive function theory of attention-deficit/hyperactivity disorder: A meta-analytic review. *Biol Psychiatry*. 2005;57:1336-1346. <https://doi.org/10.1016/j.biopsych.2005.02.006>.
74. Martinussen R, Hayden J, Hogg-Johnson S, Tannock R. A meta-analysis of working memory impairments in children with attention-deficit/hyperactivity disorder. *J Am Acad Child Adolesc Psychiatry*. 2005;44:377-384. <https://doi.org/10.1097/01.CHI.0000153228.72591.73>.
75. Faraone SV, Perlis RH, Doyle AE, *et al.* Molecular genetics of attention-deficit/hyperactivity disorder. *Biol Psychiatry*. 2005;57:1313-1323. <https://doi.org/10.1016/j.biopsych.2004.11.024>.
76. Sonuga-Barke EJ, Daley D, Thompson M. Does maternal ADHD reduce the effectiveness of parent training for preschool children's ADHD? *J Am Acad Child Adolesc Psychiatry*. 2002;41:696-702. <https://doi.org/10.1097/00004583-200206000-00009>.
77. van der Veen-Mulders L, Hoekstra PJ, Nauta MH, van den Hoofdakker BJ. Are parental changes related to improvements in preschool children's disruptive behaviours? *Clin Psychol Psychother*. 2020;27:24-33. <https://doi.org/10.1002/cpp.2402>.
78. Read J. Why promoting biological ideology increases prejudice against people labelled "schizophrenic". *Aust Psychol*. 2007;42:118-128. <https://doi.org/10.1080/00050060701280607>.
79. Clarke AT, Marshall SA, Mautone JA, *et al.* Parent attendance and homework adherence predict response to a family-school intervention for children with ADHD. *J Clin Child Adolesc Psychol*. 2015;44:58-67. <https://doi.org/10.1080/15374416.2013.794697>.
80. Emmelkamp PM, David D, Beckers T, *et al.* Advancing psychotherapy and evidence-based psychological interventions. *Int J Methods Psychiatr Res*. 2014;23(Suppl 1): 58-91. <https://doi.org/10.1002/mpr.1411>.
81. Sonuga-Barke EJ, Halperin JM. Developmental phenotypes and causal pathways in attention deficit hyperactivity disorder: Potential targets for early intervention? *J Child Psychol Psychiatry*. 2010;51:368-389. <https://doi.org/10.1111/j.1469-7610.2009.02195.x>.
82. Barnett MA, Scaramella LV. Mothers' parenting and child sex differences in behavior problems among African American preschoolers. *J Fam Psychol*. 2013;27:773-783. <https://doi.org/10.1037/a0033792>.
83. Hughes C, Deater-Deckard K, Cutting AL. "Speak roughly to your little boy"? Sex differences in the relations between parenting and preschoolers' understanding of mind. *Soc Dev*. 1999;8:143-160. <https://doi.org/10.1111/1467-9507.00088>.
84. Streiner DL, Norman GR. Correction for multiple testing: Is there a resolution? *Chest*. 2011;140:16-18. <https://doi.org/10.1378/CHEST.11-0523>.
85. Bender R, Lange S. Adjusting for multiple testing—when and how? *J Clin Epidemiol*. 2001;54:343-349. [https://doi.org/10.1016/S0895-4356\(00\)00314-0](https://doi.org/10.1016/S0895-4356(00)00314-0).
86. Staff AL, van den Hoofdakker BJ, van der Oord S, *et al.* Effectiveness of specific techniques in behavioral teacher training for childhood ADHD: A randomized controlled microtrial. *J Clin Child Adolesc Psychol*. Published online January 21, 2021. <https://doi.org/10.1080/15374416.2020.1846542>
87. Pelham WE, Fabiano GA, Waxmonsky JG, *et al.* Treatment sequencing for childhood ADHD: A multiple-randomization study of adaptive medication and behavioral interventions. *J Clin Child Adolesc Psychol*. 2016;45:396-415. <https://doi.org/10.1080/15374416.2015.1105138>.
88. Coles EK, Pelham WE, Fabiano GA, *et al.* Randomized trial of first-line behavioral intervention to reduce need for medication in children with ADHD. *J Clin Child Adolesc Psychol*. 2020;49:673-687. <https://doi.org/10.1080/15374416.2019.1630835>.