Psychosocial Interventions for Child Disruptive Behaviors: A Meta-analysis

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abstract

BACKGROUND: Disruptive behavior disorders are among the most common child and adolescent psychiatric disorders and associated with significant impairment.

OBJECTIVE: Systematically review studies of psychosocial interventions for children with disruptive behavior disorders.

METHODS: We searched Medline (via PubMed), Embase, and PsycINFO. Two reviewers assessed studies against predetermined inclusion criteria. Data were extracted by 1 team member and reviewed by a second. We categorized interventions as having only a child component, only a parent component, or as multicomponent interventions.

RESULTS: Sixty-six studies were included. Twenty-eight met criteria for inclusion in our meta-analysis. The effect size for the multicomponent interventions and interventions with only a parent component had the same estimated value, with a median of −1.2 SD reduction in outcome score (95% credible interval, −1.6 to −0.9). The estimate for interventions with only a child component was −1.0 SD (95% credible interval, −1.6 to −0.4).

LIMITATIONS: Methodologic limitations of the available evidence (eg, inconsistent or incomplete outcome reporting, inadequate blinding or allocation concealment) may compromise the strength of the evidence. Population and intervention inclusion criteria and selected outcome measures eligible for inclusion in the meta-analysis may limit applicability of the results.

CONCLUSIONS: The 3 intervention categories were more effective than the control conditions. Interventions with a parent component, either alone or in combination with other components, were likely to have the largest effect. Although additional research is needed in the community setting, our findings suggest that the parent component is critical to successful intervention.

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Disruptive behavior disorders are a group of related psychiatric disorders of childhood and adolescence marked by behaviors such as temper tantrums, interpersonal aggression, defiance, and persistent impairment.[1–14] Recent estimates indicate that 3.5% of children between the ages of 3 and 17 years had behavioral or conduct problems from 2005 to 2011.[15] Estimates suggest that disruptive behaviors that are problematic but do not meet formal diagnostic criteria may be even more common than those meeting formal clinical diagnostic criteria.[16–20] The etiology of these disorders is unknown, but temperamental, biological, and environmental factors are associated with increased risk.[21–25]

Although effective preventive interventions have been developed for children and adolescents at risk for these disorders, practical considerations such as training requirements and cost often pose challenges to broad implementation.[26,27] The importance of preventive interventions notwithstanding, children and adolescents with clinically significant disruptive behaviors need intervention. Psychosocial interventions for children and adolescents with clinically significant disruptive behaviors are heterogeneous. Existing reviews report positive outcomes for cognitive–behavioral therapy,[28,29] behavior management,[30,31] and parenting interventions, either alone or in combination with family-based approaches.[32–35]

At the same time, data suggest that the use of general outpatient psychotherapy, either alone or in combination with psychotropic medication management, has been declining and that the use of psychotropic medications has been increasing.[36–43] Changing reimbursement rates and patterns have been suggested as a possible explanation for these trends,[44] but it is also possible that these trends may reflect dissatisfaction with the effectiveness of the psychosocial interventions for children and adolescents with disruptive behavior disorders that are widely available in the community.

To help address questions about the effectiveness of these interventions and provide information about which types of interventions are most likely to be best, we conducted a systematic review and meta-analysis to synthesize existing literature on the comparative effectiveness of psychosocial interventions for children and adolescents <18 years of age with disruptive behavior disorders. To accomplish this while accounting for the large number of heterogeneous psychosocial interventions, we used a Bayesian multivariate, mixed treatment (network) meta-analytic approach that classified each intervention arm of each included study into 3 groups based on whether it was a treatment-as-usual (TAU)/wait list control, an intervention with only a child component, an intervention with only a parent component, or a multicomponent intervention. The review was funded by the Agency for Healthcare Research and Quality. The full report is available at http://www.effectivehealthcare.ahrq.gov.

METHODS

Protocol and Registration

Our protocol is registered with PROSPERO, an international database of prospectively registered systematic reviews in health and social care (registration #CRD42014007552).

Eligibility Criteria

Eligible studies focused on treating disruptive behavior disorders and included children exhibiting disruptive behaviors as a primary problem. We excluded studies of children with attention-deficit/hyperactivity disorder (ADHD) unless the specific focus of treatment was on the non-ADHD disruptive behavior, because a recent and comprehensive review of ADHD interventions already exists.[45] We excluded studies of disruptive behavior secondary to conditions in which disruptive behaviors were studied as symptoms or comorbidities (eg, substance abuse, developmental delay, intellectual disability, pediatric bipolar disorder, and ADHD).

Information Sources

We searched the Medline medical literature database (via the PubMed interface), Embase, and PsycINFO using broad terms for psychosocial interventions, as well as interventions by name (eg, Parent–Child Interaction Therapy [PCIT], Incredible Years (IY) programs, and Positive Parenting Program [Triple P]). We also hand searched recent systematic reviews and other relevant publications to identify additional studies not captured by the database searches.

Data Extraction and Analysis

We extracted study design, the study population description, the intervention description, and baseline and outcome data on constructs of interest from eligible studies. Data were initially extracted by 1 team member and reviewed for accuracy by a second, and included studies were described.

We used Bayesian multivariate, mixed treatment (network) meta-analytic methods[46–48] to use both direct and indirect evidence for comparing a large number of different specific interventions. Of the 16 different measures used to assess parent reports of child disruptive behaviors about which we extracted data, we included in our analysis only the studies that used ≥1 of the 3 most prevalent: Eyberg Child Behavior Inventory (ECBI), Intensity Subscale[49,50]; ECBI, Problem Subscale[49,50]; or the Child Behavior Checklist (CBCL), Externalizing (T-score).[51]

To account for the large number of different specific interventions used by the constituent studies, we classified each arm of each study according to the most salient feature of the intervention. Specifically, intervention arms were categorized as TAU/wait list control, an intervention with only a child component, an intervention with only a parent component, or a multicomponent intervention. Multicomponent interventions were defined as including ≥2 of a child component, parent component, or other component (eg, teacher, family together). Although our definition of multicomponent interventions did not require a parent component be included, all of the interventions classified as multicomponent interventions in this study contained a parent component. We also included information about the control or TAU arms of included studies. Recognizing that these intervention categories encompass different individual interventions, we modeled each component as a random effect. This allowed variation in intervention effect within each category, because of factors not explicitly modeled here. All measurement instruments shared the same study arm treatment effect in our model, but the effect was scaled by the SD of the outcome variable.

Recognizing the potential for misclassification of treatments, there was some uncertainty about the correct classification of the PCIT intervention, here included with the multicomponent interventions because the focus of the intervention is on the parent–child interaction and includes the parent and child engaged together in activities even though the clinician interacts almost exclusively with the parent. To assess the effect of our decision, we ran our models under the alternative assumption that PCIT is an intervention with only a parent component. Doing so resulted in only nominal changes to the posterior estimates of the model parameters and did not affect the overall conclusions drawn from our results.

Randomized controlled trials (RCTs) that reported baseline and end-of-treatment (EOT) means and SDs from 1 of the 3 metrics listed earlier (n = 28) were included in the meta-analysis. The response measure was defined as the EOT mean minus the baseline mean, and the associated variances were calculated as the sum of the baseline and EOT variances. The 3 outcomes were modeled jointly as a multivariate normal likelihood, with any unmeasured outcomes treated as missing data; doing so allowed the covariance between measures to be accounted for and estimated.

We included the age of participants in each study arm (broadly grouped into preschool age, school age, or teenage) in the model as a categorical covariate. We used the school age category as the baseline value because it was the most prevalent among studies. The age covariate was combined additively with the intervention component effects and control/TAU means to model the observed treatment differences relative to baseline. Although we considered age–treatment interactions, there was not enough balance between the age and treatment combinations to include them in the final model.

We gave all unknown parameters weakly informative prior distributions and estimated them by using Markov chain Monte Carlo[52] methods via the PyMC 2.3 software package (Python Software Foundation).[53] The model was run for 200 000 iterations, with the first 150 000 samples conservatively discarded as burn-in, leaving 50 000 for inference. Convergence diagnostics showed no evidence for lack of convergence in the 50 000 samples used for inference. We assessed model fit by using posterior predictive checks,[54] which revealed no strong evidence of lack of fit.

Assessment of Study Quality and Strength of Evidence

Our primary outcomes for analysis and strength of evidence were parent reports of child disruptive behaviors as assessed using commonly used, validated measures. We used the Cochrane Risk of Bias Tool[55] to assess risk of bias for RCTs and the RTI Item Bank[56] to assess risk of bias for study designs other than RCTs. Two team members independently assessed each included study, with discrepancies resolved through discussion to reach consensus or adjudication by a senior reviewer. The results of these assessments were translated to low, moderate, or high risk of bias.

Two senior investigators graded the strength of the body of evidence by using methods based on the *Methods Guide for Effectiveness and Comparative Effectiveness Reviews*.[57] The team reviewed the final strength of evidence (SOE) designation, with possible grades being high SOE (high confidence that the evidence reflects the true effect, additional research is unlikely to change estimates), moderate SOE (moderate confidence that the evidence reflects the true effect, additional research may change our confidence in the estimate of effect and may change the estimate), low SOE (low confidence that the evidence reflects the true effect, additional research is likely to change confidence in the estimate of effect and is likely to change the estimate), or insufficient SOE (evidence is unavailable or does not permit a conclusion).

RESULTS

Study Selection and Study Characteristics

We identified 7470 potentially relevant titles or abstracts, of which 968 proceeded to full text review. We excluded 853 studies at full text review and included 84 unique studies (in 115 publications). Of the 84 unique studies, 66 studies (59 RCTs, 7 non-RCTs) addressed psychosocial interventions (Fig 1); the rest (n = 18)

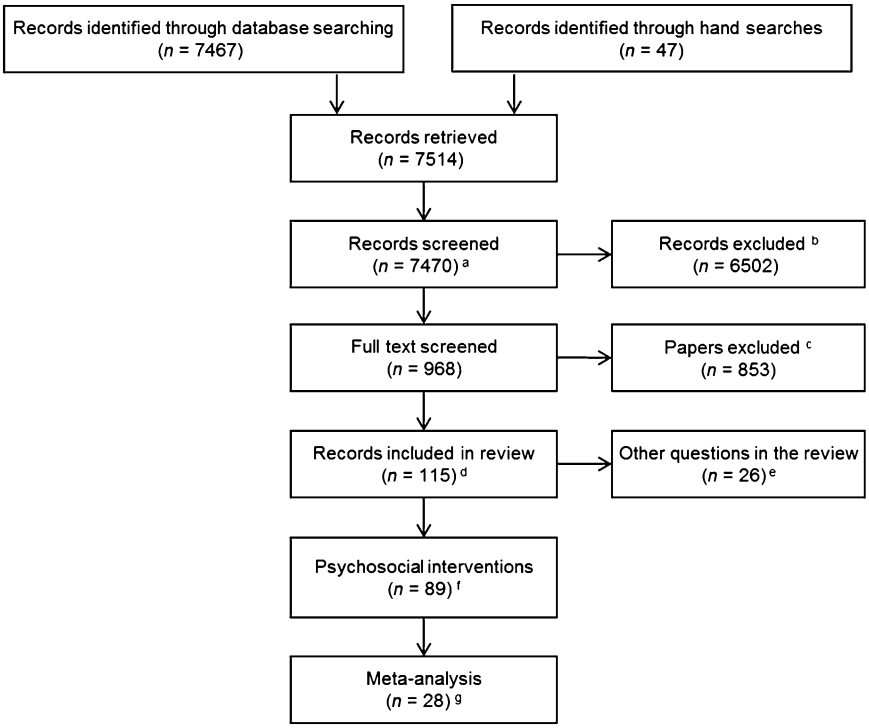

FIGURE 1

Study eligibility flowchart. [a]Excluding duplicates (n = 44). [b]Excluded at abstract screening level. [c]Excluded at full-text screening level. [d]115 publications representing 84 unique studies. [e]26 publications representing 18 unique studies. [f]89 publications representing 66 unique studies. [g]Subset of studies that met criteria for inclusion in a quantitative analysis.

addressed pharmacologic interventions, harms, or moderators of effects and are described in the full report and in a separate publication.

Table 1 describes the 66 studies[58–123] by age group. Twenty-four studies were rated as high risk of bias, 34 as moderate risk of bias, and 8 as low risk of bias. About half of the studies (25) were conducted in the United States; the remaining studies were conducted in Australia (11), Canada (4), Germany (3), Ireland (2), Israel (2), Italy (1), Netherlands (5), Norway (4), Puerto Rico (1), Sweden (3), and the United Kingdom (5). The "experimental" intervention arm of each study was used to broadly categorize studies as focusing on interventions with only a child component (2 studies), only a parent component (25 studies), or on multicomponent interventions (39 studies). Specific interventions were classified into these broad categories.

Two RCTs (1 high and 1 moderate risk of bias) evaluated interventions with only a child component (1 school age and 1 adolescent). Twenty-five studies evaluated interventions with only a parent component (14 preschool age, 11 school age). Twenty-one of these 25 studies were RCTs (7 high, 12 moderate, and 2 low risk of bias); 4 were non-RCTs (3 high and 1 moderate risk of bias). Thirty-nine studies evaluated multicomponent interventions (9 preschool age, 17 school age, 13 adolescent). Thirty-six were RCTs (11 high, 19 moderate, and 6 low risk of bias); 3 were non-RCTs (2 high and 1 moderate risk of bias).

Of the 66 studies (59 RCTs, 7 non-RCTs) that addressed psychosocial interventions, 28 studies* met the additional criteria for inclusion in our meta-analysis.

*Refs 60, 62, 64, 66, 72, 79, 80, 83, 85, 88, 91, 95, 99–101, 103–106, 108, 109, 113, 115, 117–120, and 123.

Quantitative Synthesis

Descriptive information about the studies that qualified for inclusion in our meta-analysis are included in Tables 2, 3, and 4.

Results from our meta-analysis show that all intervention categories were more effective than the TAU/control category, with high residual variability within category and overlap between categories (Fig 2, Supplemental Fig 3). The effect size for the multicomponent and parent-only intervention categories had the same estimated value, with a median of −1.2 SD reduction in outcome score (95% credible interval [CI], −1.6 to −0.9). The estimate for interventions with only a child component was −1.0 SD (95% CI, −1.6 to −0.4). The multicomponent intervention and parent-only intervention categories also had identical posterior probabilities of being the best treatment (both 43%), followed by interventions with only a child component (14%). Table 5 shows the estimated probability of remaining above the clinical cutoff for each intervention category by age group and outcome measure.

Age effects were more subtle, with an additive median effect of −0.4 SD (95% CI, −0.6 to −0.3) for preschool relative to school-age children (baseline level) and of −0.1 SD (95% CI, −0.5 to 0.2) for adolescents relative to school-age children. For example, in comparison with school-age children, preschool-age children experienced greater improvement in parent reports of child disruptive behaviors. These trends were evident across each of the outcome measures included in the analysis.

Random effect variances describe additional variation in the output beyond that accounted for by the factors included in the model. The mean estimates were 0.18 (SD 0.034; 95% CI, 0.12 to 0.25) for ECBI Intensity score, 0.17 (SD 0.038; 95% CI, 0.09

TABLE 1 Study Characteristics

Characteristic	Preschool Age	School Age	Adolescent	All Ages
	23	29	14	66
Study design				
RCT	22	24	13	59
Cohort	1	5	1	7
Location				
USA and Canada	10	13	6	29
Europe	4	13	7	23
Australia	8	2	0	11
Other	1	1	1	3
Population characteristics				
Mean age, y	4.26	7.98	15.34	8.21
Proportion male, %	68.25	77.73	71.40	72.94
Randomized	2011	3585	1579	7175
Analyzed[a]	1815	3019	1471	6305
Intervention component				
Child only	0	1	1	2
Parent only	14	11	0	25
Multiple components	9	17	13	39
Intervention				
IY	5	7	0	12
Triple P	5	0	0	5
PCIT	7	0	0	7
MST	0	0	5	5
BSFT	0	0	3	3
Other	6	22	6	34
Outcome measure[b]				
ECBI	20	10	1	31
CBCL	8	15	8	31
SDQ	2	4	0	6
Observation	4	3	0	7
Other	14	22	12	48
Risk of bias (quality)				
High	10	9	5	24
Moderate	11	18	5	34
Low	2	2	4	8
Total	23	29	14	66

BSFT, Brief Strategic Family Therapy; IY, Incredible Years; MST, multisystemic therapy; SDQ, Strengths and Difficulties Questionnaire.

[a] Some studies do not report the number analyzed.

[b] Numbers do not tally because studies could use >1 measure.

to 0.24) for ECBI Problem score, and 0.13 (SD 0.027; 95% CI, 0.08 to 0.18) for CBCL Externalizing T score.

DISCUSSION

Our review of the literature examining psychosocial interventions for child disruptive behavior included 66 studies (59 RCTs, 7 non-RCTs). Among the 66 studies, the "experimental" treatment arm of 2 studies examined interventions with only a child component, 25 studies examined interventions with only a parent component, and 39 studies examined multicomponent interventions. This categorization describes the treatment arm regarded as the experimental group. Specific named interventions were categorized accordingly, with the most common named interventions including the Incredible Years, PCIT, Triple P, and Multisystemic Therapy.

Of those 66 studies, 28 met the additional criteria for inclusion in our Bayesian multivariate, mixed treatment (network) meta-analysis. Our meta-analytic model suggested that interventions categorized as multicomponent interventions and interventions with only a parent component were approximately equivalent in their expected effectiveness (43% probability of being best treatment), whereas interventions with only a child component were estimated to be less effective (14% probability of being best). However, it should be noted that the estimate for child-only interventions was imprecise.

Our overall assessment is that there is a moderate strength of evidence supporting the effectiveness of multicomponent interventions and interventions with only a parent component, and because there were so few studies designed to evaluate interventions with only a child component, there is insufficient evidence to support interventions with only a child component. It is important to note that all interventions categorized as multicomponent interventions in this study included a parent component. Given recent trends indicating reduced use of behavioral health services and increasing use of psychotropic medications, especially for children with disruptive behavior disorders,[36–39,41–43,124] we believe these findings have important policy and practice implications. For example, it might be possible for policymakers to incentivize provision of interventions including a parent component, either alone or in combination with other components, as opposed to TAU.

It should be noted that the populations studied in the articles we reviewed were mostly male and that approximately half of the studies included in the review were of school-age children. We defined a study as focusing on school-age children if it had a sample with a mean age between 5 and 12 years. We established 5 years of age as the lower bound because this is the age at which children typically begin attending kindergarten in the United States. We established 12 years of age as the upper bound because 13 years is regarded as the beginning of adolescence in casual parlance. For precisely these reasons, the age group classification has face validity in the United States but is somewhat arbitrary.

TABLE 2 Summary of Studies Included in the Network Meta-Analysis Reporting Baseline and EOT Child Disruptive Behavior Outcome Measured by ECBI-Intensity Subscale

Citation Risk of Bias (*N* Randomized)	Group: Intervention (*N* Analyzed)	ECBI-I Score at Baseline, Mean (SD)	ECBI-I Score at End-of-Treatment, Mean (SD)
Jones et al 2014[60]	G1: HNC, technology enhanced (7)	G1: 148.9 (22.5)	G1: 83.0 (15.3)
High (22)	G2: HNC, standard (8)	G2: 131.5 (23.9)	G2: 91.6 (21.3)
Kjøbli et al 2012[62]	G1: PMTO (108)	G1: 124.9 (27.6)	G1: 106.1 (27.8)
High (216)	G2: Regular services (108)	G2: 124.8 (28.4)	G2: 114.4 (28.8)
Axberg et al 2012[64]	G1: IY-PT (34)	G1: 160.0 (20.3)	G1: 128.6 (26.5)
High (62)	G2: WLC (20)	G2: 152.9 (23.6)	G2: 147.1 (26.0)
McCabe et al 2009[72]	G1: PCIT, culturally adapted (21)	G1: 178.53 (31.27)	G1: 95.44 (45.2)
Low (58)	G2: PCIT, standard (19)	G2: 181.67 (22.49)	G2: 84.3 (34.4)
	G3: TAU (18)	G3: 186.44 (28.04)	G3: 118.5 (48.34)
Larsson et al 2009[79]	G1: IY-PT + IY-CT (52)	G1: 156.5 (22)	G1: 121.8 (31.9)
Moderate (138)	G2: IY-PT (45)	G2: 157.1 (24.2)	G2: 116.5 (27.0)
	G3: WLC (28)	G3: 159.7 (23.1)	G3: 137.3 (28.6)
Gardner et al 2006[85]	G1: IY-PT (34)	G1: 152.7 (39.2)	G1: 130.7 (29.9)
Moderate (77)	G2: WLC (26)	G2: 156.1 (32.9)	G2: 148.5 (34.7)
Nixon et al 2003[91]	G1: PCIT, abbreviated (20)	G1: 156.3 (16.8)	G1: 126.6 (18.39)
Moderate (54)	G2: PCIT, standard (17)	G2: 166.6 (18.9)	G2: 125.24 (21.67)
	G3: WLC (17)	G3: 173.8 (22.7)	G3: 148.35 (19.05)
Markie-Dadds et al 2006[95]	G1: Triple P, enhanced (14)	G1: 149.77 (29.01)	G1: 100.69 (17.41)
Moderate (41)	G2: Triple P, self-directed (15)	G2: 160.2 (35.12)	G2: 129.87 (35.12)
	G3: WLC (12)	G3: 145.75 (28.44)	G3: 146.92 (15.53)
McGilloway et al 2012[99]	G1: IY-PT (103)	G1: 156.5 (30.0)	G1: 121.3 (40.7)
Low (149)	G2: WLC (46)	G2: 159.1 (31.7)	G2: 144.9 (33.2)
Markie-Dadds et al 2006[100]	G1: Triple P, self-directed (21)	G1: 126.67 (20.93)	G1: 100.76 (29.9)
Moderate (63)	G2: WLC (22)	G2: 138.5 (26.94)	G2: 136.23 (31.62)
Sanders et al 2000[103]	G1: Triple P, enhanced (76)	G1: 155.91 (27.37)	G1: 111.14 (31.94)
Moderate (305)	G2: Triple P, standard (77)	G2: 144.52 (22.51)	G2: 108.38 (25.59)
	G3: Triple P, self-directed (75)	G3: 155.03 (27.13)	G3: 120.65 (30.1)
	G4: WLC (77)	G4: 155.91 (26.65)	G4: 136.79 (28.42)
Schuhmann et al 1998[104]	G1: PCIT (37)	G1: 170.3 (26.4)	G1: 117.6 (40.4)
Moderate (64)	G2: WLC (27)	G2: 172.9 (25.8)	G2: 169.7 (34.1)
Connell et al 1997[105]	G1: Triple P, self-directed family intervention (12)	G1: 155.83 (18.85)	G1: 117.33 (22.77)
High (24)	G2: WLC (11)	G2: 158.36 (11.92)	G2: 159.0 (10.58)
Webster-Stratton et al 1997[106]	G1: IY-PT + IY-CT (22)	G1: 161.55 (33.43)	G1: 121.4 (24.25)
Moderate (97)	G2: IY-CT (27)	G2: 155.52 (29.06)	G2: 121.7 (22.96)
	G3: IY-PT (26)	G3: 166.46 (23.72)	G3: 118.73 (27.71)
	G4: WLC (22)	G4: 163.67 (30.47)	G4: 155.57 (27.86)
Eyberg et al 1995[108]	G1: PCIT (19)	G1: 159.5 (16.6)	G1: 117.5 (18.8)
High (50)	G2: WLC (8)	G2: 170.7 (40.3)	G2: 177.2 (62.0)
Sanders et al 2012[113]	G1: Triple P, online (60)	G1: 154.35 (19.08)	G1: 121.05 (22.09)
High (116)	G2: WLC (56)	G2: 152.46 (20.06)	G2: 142.09 (25.2)
Nixon et al 2001[117]	G1: PCIT (17)	G1: 166.58 (18.93)	G1: 117.47 (31.69)
RCT (high)	G2: WLC (17)	G2: 173.82 (22.72)	G2: NA
Brestan et al 1997[118]	G1: PCIT	G1: 173 (29.5)	G1: 133 (37.7)
Moderate (30)	G2: WLC	G2: 176 (30.2)	G2: 170 (36)
Azrin et al 2001[119]	G1: FBT (23)	G1: 133.55 (38.26)	G1: 90.72 (36.37)
High (56)	G2: ICPS (16)	G2: 145.93 (35.58)	G2: 110.35 (45.92)
Havighurst et al 2013[123]	G1: TIK (30)	G1: 169.34 (2.99)	G1: 141.26 (23.79)
Moderate (62)	G2: TAU (23)	G2: 165.99 (28.82)	G2: 157.46 (31.30)

ECBI-I, Eyberg Child Behavior Inventory–Intensity; FBT, family-behavioral therapy; HNC, Helping the Noncompliant Child; IY-CT, Incredible Years–Child Training; ICPS, individual cognitive problem solving; IY-PT, Incredible Years–Parent Training; PMTO, Parent Management Training Oregon Model; TIK, Tuning Into Kids; WLC, waitlist control.

In addition to the age restriction, our definition of the target population included children with disruptive behaviors receiving treatment in health care settings. We did not restrict our study population to children meeting formal diagnostic criteria for a disruptive behavior disorder and allowed children without a diagnosed disruptive behavior disorder but with disruptive behaviors above a measure-specific threshold on well-validated measures of child disruptive behavior to be included. Furthermore, our review did not focus on preventive interventions for an at-risk population.

Additionally, the interventions most commonly examined in the studies included in this review were typically provided in academic settings and may not be widely available in real-world

TABLE 3 Summary of Studies Included in the Network Meta-analysis Reporting Baseline and EOT Child Disruptive Behavior Outcomes Measured by the ECBI-P Subscale

Citation Risk of Bias (*N* Randomized)	Group: Intervention (*N* Analyzed)	ECBI-P Score at Baseline, Mean (SD)	ECBI-P Score at EOT, Mean (SD)
Jones et al 2014[60]	G1: HNC, technology enhanced (7)	G1: 22.6 (5.2)	G1: 6.1 (5.7)
High (22)	G2: HNC, standard (8)	G2: 20.5 (4.8)	G2: 8.9 (8.2)
Kjøbli et al 2012[62]	G1: PMTO (108)	G1: 15.5 (7.2)	G1: 9.8 (7.6)
High (216)	G2: Regular services (108)	G2: 15.0 (7.4)	G2: 11.6 (7.9)
Axberg et al 2012[64]	G1: IY-PT (34)	G1: 20.8 (4.2)	G1: 11.1 (7.9)
High (62)	G2: WLC (20)	G2: 20.4 (6.6)	G2: 17.5 (8.0)
McCabe et al 2009[72]	G1: PCIT, culturally adapted (21)	G1: 28.62 (3.94)	G1: 7.35 (9.86)
Low (58)	G2: PCIT, standard (19)	G2: 28.21 (4.69)	G2: 11.71 (11.06)
	G3: TAU (18)	G3: 27.83 (5.78)	G3: 15.38 (8.98)
Larsson et al 2009[79]	G1: IY-PT + IY-CT (52)	G1: 20.2 (6.3)	G1: 10.0 (8.0)
Moderate (138)	G2: IY-PT (45)	G2: 20.7 (6.2)	G2: 10.8 (8.9)
	G3: WLC (28)	G3: 19.8 (4.8)	G3: 14.1 (8.4)
Gardner et al 2006[85]	G1: IY-PT (34)	G1: 20.8 (6.5)	G1: 12.4 (7.8)
Moderate (77)	G2: WLC (26)	G2: 20.3 (7)	G2: 16.3 (8.6)
McGilloway et al 2012[99]	G1: IY-PT (103)	G1: 20.3 (7.0)	G1: 11.6 (9.0)
Low (149)	G2: WLC (46)	G2: 20.5 (6.7)	G2: 17.6 (8.4)
Markie-Dadds et al 2006[100]	G1: Triple P, self-directed (21)	G1: 15.71 (7.37)	G1: 7.95 (6.27)
Moderate (63)	G2: WLC (22)	G2: 15.23 (6.26)	G2: 14.55 (7.0)
Schuhmann et al 1998[104]	G1: PCIT (37)	G1: 21.9 (6.5)	G1: 10.9 (9.6)
Moderate (64)	G2: WLC (27)	G2: 21.2 (6.1)	G2: 22.1 (8.0)
Connell et al 1997[105]	G1: Triple P, self-directed family intervention (12)	G1: 20.75 (4.45)	G1: 8.33 (5.84)
High (24)	G2: WLC (11)	G2: 18.55 (5.26)	G2: 17.73 (5.2)
Eyberg et al 1995[108]	G1: PCIT (19)	G1: 20.7 (4.8)	G1: 6.6 (6.7)
High (50)	G2: WLC (8)	G2: 23.0 (10.3)	G2: 21.5 (9.9)
Webster-Stratton et al 1994[109]	G1: IY-PT, advance (39)	G1: 21.16 (5.34)	G1: 12.16 (5.88)
Moderate (85)	G2: IY-PT, basic (38)	G2: 21.26 (5.65)	G2: 12.46 (6.45)
Sanders et al 2012[113]	G1: Triple P, online (60)	G1: 22.13 (4.82)	G1: 13.1 (6.33)
High (116)	G2: WLC (56)	G2: 21.75 (5.57)	G2: 18.0 (7.53)
Brestan et al 1997[118]	G1: PCIT (16)	G1: 23 (5.8)	G1: 11 (10.7)
Moderate (30)	G2: WLC (13)	G2: 24 (5.4)	G2: 24 (7.5)
Azrin et al 2001[119]	G1: FBT (29)	G1: 17.86 (8.52)	G1: 8.58 (9.09)
High (56)	G2: ICPS (27)	G2: 21.52 (6.12)	G2: 11.95 (9.46)
Havighurst et al 2013[123]	G1: TIK (21)	G1: 23.14 (5.15)	G1: 16.86 (6.66)
Moderate (62)	G2: TAU (15)	G2: 21.00 (8.26)	G2: 20.27 (9.04)

ECBI-P, Eyberg Child Behavior Inventory–Problem; FBT, family-behavioral therapy; HNC, Helping the Noncompliant Child; ICPS, individual cognitive problem solving; IY-CT, Incredible Years–Child Training; IY-PT, Incredible Years–Parent Training; PMTO, Parent Management Training Oregon Model; TIK, Tuning Into Kids; WLC, waitlist control.

clinical settings. If and when they are available in real-world clinical settings, it can be difficult, if not impossible, to determine whether they are being implemented with fidelity to the intervention model. Similarly, the studies did not address the effectiveness of psychosocial interventions delivered concurrently with pharmacologic interventions. Thus, there may be limited ability to assess the applicability of our findings to clinical settings in which many children and adolescents seeking treatment of disruptive behaviors may have complex challenges[125] and are increasingly likely to receive psychotropic medications.[36–39,41–43,124]

The literature we reviewed did not clearly identify primary outcomes or report random sequence generation or allocation concealment procedures. In addition, blinding was rarely attempted. Although there are well-recognized challenges and valid reasons for not achieving this level of control in the studies, this limitation introduces potential risk of bias to studies in this literature.

Few studies measure similar outcomes for synthesis. The lack of clearly identified primary outcomes reflects a lack of consensus on the most important outcomes. Methodologically, outcomes such as direct observation by a blinded and independent observer are arguably the most valid. However, direct observations can be expensive and are not always logistically feasible. From the perspective of patient-centered outcome research, we believe that there is a strong argument in this literature to be made in favor of the importance of parent-reported outcomes, even though it introduces a risk of bias in the absence of patient blinding because most psychosocial interventions included a parent component. Furthermore, results from mixed models are not always presented in a straightforward manner, making it very difficult to tease out effects of specific treatment approaches.

Conflict of interest is a concern in this evidence base. Many studies that evaluated a psychosocial intervention for a child disruptive behavior were conducted by the developer of the

TABLE 4 Summary of Studies Included in the Network Meta-analysis Reporting Baseline and EOT Child Disruptive Behavior Outcome Measured by CBCL Externalizing T-Score

Citation Risk of Bias (*N* Randomized)	Group: Intervention (*N* Analyzed)	CBCL T-Score at Baseline, Mean (SD)	CBCL T-Score at EOT, Mean (SD)
Butler et al 2011[66]	G1: MST (53)	G1: 67.7 (8.4)	G1: 63.4 (10.2)
Low (108)	G2: TAU (51)	G2: 66.4 (9.8)	G2: 63.7 (9.9)
McCabe et al 2009[72]	G1: PCIT, culturally adapted (21)	G1: 66.95 (8.95)	G1: 45.83 (11.28)
Low (58)	G2: PCIT, standard (19)	G2: 67.21 (11.99)	G2: 48.82 (13.31)
	G3: TAU (18)	G3: 69.22 (12.27)	G3: 58.73 (11.62)
Cummings et al 2008[80]	G1: SET-PC (16)	G1: 65 (4.64)	G1: 57.53 (6.85)
High (54)	G2: IYPP (16)	G2: 69.89 (7.77)	G2: 59.78 (10.72)
van de Wiel et al 2007[83]	G1: Coping power program (38)	G1: 74.6 (6.4)	G1: 69.6 (8.4)
Moderate (77)	G2a: Family therapy (10)	G2a: 77.1 (6.4)	G2a: 72.6 (7.9)
	G2b: Behavior therapy (16)	G2b: 73.3 (8.9)	G2b: 67.8 (9.8)
van Manen et al 2004[88]	G1: Social cognitive (42)	G1: 66.8 (9.5)	G1: 63.3 (10.8)
Moderate (97)	G2: Social skills training (40)	G2: 69.7 (6.6)	G2: 61.6 (8.4)
	G3: WLC (15)	G3: 68.3 (5.9)	G3: 63.7 (7.1)
Jouriles et al 2001[101]	G1: MFT (18)	G1: 66.28 (10)	G1: 57.0 (11.1)
High (36)	G2: Comparison (18)	G2: 65.56 (9.13)	G2: 60.11 (10.81)
Hutchings et al 2002[115]	G1: PT, intensive (21)	G1: 74.2 (9.3)	G1: 63.9 (11.1)
Moderate (42)	G2: Standard (13)	G2: 75.3 (5.9)	G2: 67.0 (9.23)
Barrett et al 2000[120]	G1: RST (23)	G1: 67.4 (7.0)	G1: 59.8 (11.5)
High (57)	G2: TAU (12)	G2: 70.0 (5.8)	G2: 74.0 (5.0)

IY-PT, Incredible Years–Parent Training; IYPP, Incredible Years Parenting Program; MFT, multigroup family therapy; MST, multisystemic therapy; PMTO, Parent Management Training Oregon Model; PT, parent training; SET-PC, Supportive Expressive Therapy–Parent Child; RST, reciprocal skills training; WLC, waitlist control.

intervention or by an "intellectual descendant" of the developer. Although this conflict is understandable and akin to that of industry-sponsored clinical drug trials, the evidence from this body of literature could be strengthened with more studies replicated by researchers having no intellectual conflict of interest.

For these reasons, future research needs are both substantive and methodological. Future research should consistently and adequately describe randomization and allocation procedures and attempt blinding when feasible. Future research should clearly describe the duration of time from baseline to posttreatment and from posttreatment to follow-up and should more clearly describe results from mixed models. Future research should clearly identify the target population and address the portability of

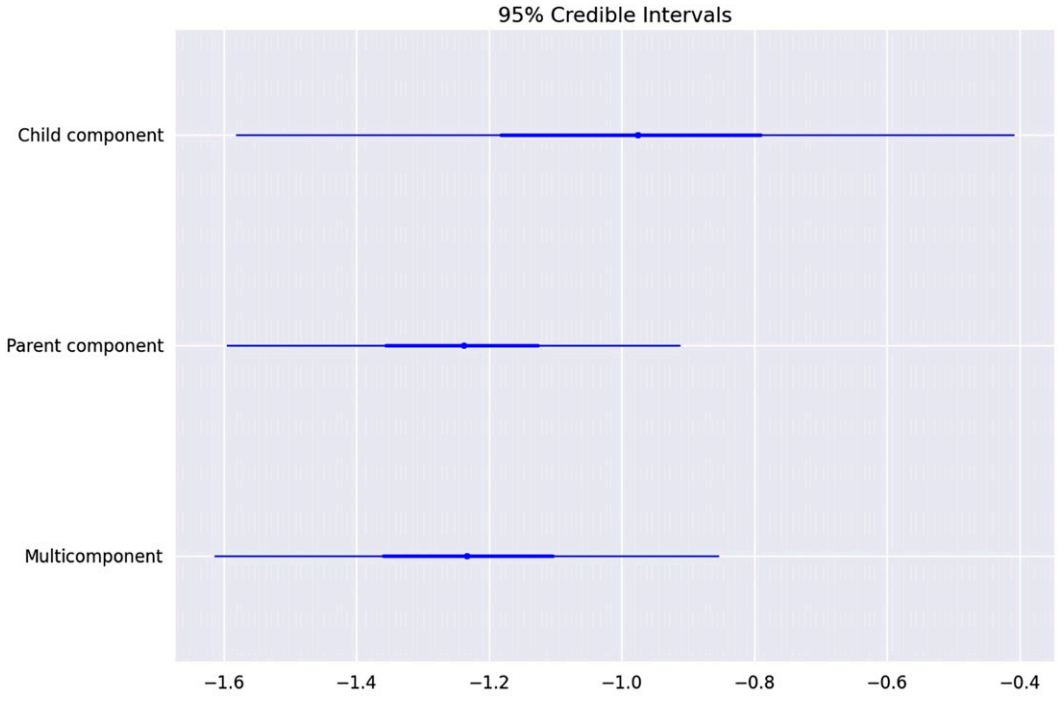

FIGURE 2
Effect size estimates relative to TAU/control.

TABLE 5 Posterior Probabilities of Treatment Outcome Values Being Above Standard Threshold for 3 Instruments (ECBI, Intensity; ECBI, Problem; CBCL, Externalizing T-score) by Age Group

Instrument	Age Group	Child Only	Parent Only	Multicomponent	TAU/Control
ECBI, Intensity Subscale	Preschool	0.34	0.16	0.17	0.95
	School	0.66	0.46	0.47	0.95
	Adolescent	0.56	0.36	0.37	0.95
ECBI, Problem Subscale	Preschool	0.62	0.40	0.42	1
	School	0.82	0.77	0.77	1
	Adolescent	0.78	0.66	0.68	1
CBCL, Externalizing (T-score)	Preschool	0.30	0.19	0.19	1
	School	0.59	0.36	0.37	1
	Adolescent	0.48	0.31	0.31	1

Standard threshold values: ECBI, Intensity, 127; ECBI Problem, 11; CBCL, Externalizing T-score = 60.

interventions from predominantly university research clinics to real-world clinical settings with implementation fidelity. Information from additional well-designed and reported head-to-head comparisons of psychosocial interventions, the effectiveness of psychosocial interventions as compared with pharmacologic interventions, and the effectiveness of combined psychosocial and pharmacologic interventions is urgently needed to aid clinical decision-making.

In conclusion, this review suggests that psychosocial interventions for children with disruptive behavior disorders that include a parent component, either alone or in combination with other intervention components, are most likely to reduce problem behaviors. Although this conclusion must be considered in light of the methodological limitations of the existing literature and current review, we believe these findings have potentially important implications. Parents need this information to make informed decisions about which treatments to seek for their children. For practitioners, these findings suggest the importance of working with parents when attempting to reduce disruptive child behaviors. This information is needed by clinicians to help them decide which interventions to be trained to deliver and to recommend to their patients. Policymakers may consider incentivizing psychosocial interventions that include a parent component to increase the delivery of interventions that have the greatest potential to improve care for these vulnerable children and families. Finally, our findings can help guide both clinicians and funders in addressing important gaps in research regarding these interventions.

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ABBREVIATIONS

ADHD: attention-deficit/hyperactivity disorder
CBCL: Child Behavior Checklist
CI: 95% confidence interval
ECBI: Eyberg Child Behavior Inventory
EOT: end-of-treatment
PCIT: Parent–Child Interaction Therapy
RCT: randomized controlled trial
SOE: strength of evidence
TAU: treatment as usual
Triple P: Positive Parenting Program

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FOOD FIGHT OVER MAYO: *I don't eat much mayonnaise at home, except when I make a tuna or chicken salad sandwich. However, when I vacation in Belgium (which is not too often), I tend to eat a lot more of it. That may be due to some wonderful formative experiences wolfing down hot potato fries (what we in America know as "French" fries) slathered in mayonnaise at many Belgium village square fry shacks. In Belgium, the mayonnaise tastes richer and more flavorful, and seems so much better on fries than ketchup. It turns out that mayonnaise is big business in Belgium. As reported in* The Wall Street Journal *(A-Hed: September 20, 2015), national sales of mayonnaise exceed $1.2 billion a year and few nations consume more mayonnaise per head than Belgium. Mayonnaise is so important in Belgium that a food fight has broken out over a 60-year-old royal decree that governs the amount of fat and egg yolk in mayonnaise. By decree Belgian mayonnaise must contain at least 80% fat and 7.5% egg yolk. In other European countries, mayonnaise needs only to have 70% fat and 5% egg yolk. In the U.S., the standards dating from 1977 are even more lax: here mayonnaise only needs to be at least 65% vegetable oil and to contain some egg yolk.*

The problem is that European producers can make the mayonnaise more cheaply than their Belgium counterparts, and the Belgium food producers' association wants a more even financial playing field. Chefs are resistant to any change in the royal decree, lauding the richness and full body of Belgium mayonnaise compared to their European counterparts. Some argue that decreasing the amount of fat and oil in the Belgium mayonnaise may have important health benefits. I find that argument may be lacking substantive evidence. Mayonnaise just is not a health food. I suspect that eventually there will be a compromise and Belgium mayonnaise manufacturers will develop two separate labels: one for products made according to royal decree and one for those not. I for one will look for the mayonnaise made according to the royal standard – even if it costs a bit more.

Noted by WVR, MD

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