

# Journal of the American Academy of Child and Adolescent Psychiatry

## Systematic Review and Meta-Analysis: Psychosocial Treatments for Disruptive Behavior Symptoms and Disorders in Adolescence

--Manuscript Draft--

<b>Manuscript Number:</b>	
<b>Full Title:</b>	Systematic Review and Meta-Analysis: Psychosocial Treatments for Disruptive Behavior Symptoms and Disorders in Adolescence
<b>Short Title:</b>	Psychosocial Treatments for DBDs
<b>Article Type:</b>	Review Article
<b>Keywords:</b>	Meta-Analysis; Psychosocial Treatment; Adolescents; Disruptive Behaviour
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<b>Manuscript Region of Origin:</b>	ITALY
<b>Abstract:</b>	<p>Objectives. Disruptive behaviour disorders (DBDs) are common reason for referral among children/adolescents. The present meta-analysis aims to estimate the efficacy of psychosocial treatments for adolescents with DBDs. Method. PRISMA-compliant systematic review, MEDLINE/PubMED/PsycINFO/Cochrane Central Register of Controlled Trials, last search April 5th, 2020. Eligible were randomized controlled trials (RCTs) administering psychosocial interventions to adolescents with symptoms of/full-blown DBDs. Out of 6,006 initial hits, random-effect meta-analysis (with sensitivity, subgroup and meta-regression analyses) was conducted on 18 cohorts, in 17 RCTs from 16 publications. Primary outcome: externalizing behaviors at RCT endpoint (standardized mean difference [SMD]). Secondary outcome: acceptability (drop-out odds ratio [OR]). Risk of bias was assessed with Risk of Bias Tool 2. Results. Seventeen RCTs, including 1,954 adolescents, were included. Mean age was 14.09 (DS 1.33), 61% were male. Mean duration of RCT was 12 weeks, and of follow-up eight (DS 3.98) months. Some concern on risk of bias emerged in twelve studies, high in six. In main analyses, psychosocial interventions had a large effect size at RCT endpoint (SMD=0.98, 95%CI -0.55 to -1.38, k=18), and were acceptable (drop-out OR=1.29, 95%CI 0.62 to 2.70, k=13). Such beneficial effect did not persist at follow-up (SMD=-0.36, 95%CI 0.06 to -0.78, k=10). Family format was the most effective. No clinically significant moderator was found. Conclusion. In conclusion, psychosocial interventions involving family of adolescents with DBDs symptoms/disorders are effective, and acceptable in the short term, but not effective at follow-up. Future studies should focus on strategies to maintain short-term efficacy of psychosocial interventions in DBDs.</p>

August the 10<sup>th</sup> 2020

Dear Editor,

We wish to submit our manuscript entitled “Systematic Review and Meta-Analysis: Psychosocial Treatments for Disruptive Behavior Symptoms and Disorders in Adolescence” to the Journal of American Academy of Child and Adolescent Psychiatry.

We believe that our manuscript contributes to an exchange of scientific information relevant to the definition of the efficacy of psychosocial interventions for adolescents showing disruptive behavior symptoms and disorders. Our study employs a methodology based on gold standard methods (i.e., PRISMA and Cochrane guidelines), and provides a in-depth investigation of psychosocial interventions (as well as treatments of different therapeutics approaches and psychotherapies of various theoretical orientations) relevant for the reduction of externalizing symptomatology. In addition, this paper has considered the effectiveness of intervention in adolescents, a population usually less considered than children, for whom there is less consensus regarding best intervention practices.

We confirm that this manuscript has not yet been published nor is it under consideration for publication elsewhere. The Authors have no conflict of interest to disclose.

We would like to thank you for considering our manuscript.

Kind regards,

Tommaso Boldrini (PhD) and Colleagues

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## **Systematic Review and Meta-Analysis: Psychosocial Treatments for Disruptive Behavior Symptoms and Disorders in Adolescence**

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Keywords: Meta-Analysis; Psychosocial Treatment; Adolescents; Disruptive Behaviour

### **Funding**

The present study did not receive any funding.

**Systematic Review and Meta-Analysis: Psychosocial Treatments for Disruptive  
Behavior Symptoms and Disorders in Adolescence**

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## Abstract 249

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3 **Objectives.** Disruptive behaviour disorders (DBDs) are common reason for referral among  
4 children/adolescents. The present meta-analysis aims to estimate the efficacy of psychosocial  
5 treatments for adolescents with DBDs. **Method.** PRISMA-compliant systematic review,  
6 MEDLINE/PubMED/PsycINFO/Cochrane Central Register of Controlled Trials, last search April  
7 5th, 2020. Eligible were randomized controlled trials (RCTs) administering psychosocial  
8 interventions to adolescents with symptoms of/full-blown DBDs. Out of 6,006 initial hits, random-  
9 effect meta-analysis (with sensitivity, subgroup and meta-regression analyses) was conducted on 18  
10 cohorts, in 17 RCTs from 16 publications. Primary outcome: externalizing behaviors at RCT  
11 endpoint (standardized mean difference [SMD]). Secondary outcome: acceptability (drop-out odds  
12 ratio [OR]). Risk of bias was assessed with Risk of Bias Tool 2. **Results.** Seventeen RCTs,  
13 including 1,954 adolescents, were included. Mean age was 14.09 (DS 1.33), 61% were male. Mean  
14 duration of RCT was 12 weeks, and of follow-up eight (DS 3.98) months. Some concern on risk of  
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16 effect size at RCT endpoint (SMD=0.98, 95%CI -0.55 to -1.38, k=18), and were acceptable (drop-  
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18 (SMD=-0.36, 95%CI 0.06 to -0.78, k=10). Family format was the most effective. No clinically  
19 significant moderator was found. **Conclusion.** In conclusion, psychosocial interventions involving  
20 family of adolescents with DBDs symptoms/disorders are effective, and acceptable in the short  
21 term, but not effective at follow-up. Future studies should focus on strategies to maintain short-term  
22 efficacy of psychosocial interventions in DBDs.

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Keywords: Meta-Analysis; Psychosocial Treatment; Adolescents; Disruptive Behaviour

## 1. Introduction

International Classification of Diseases (ICD-) 11 clusters Oppositional Defiant Disorder (ODD) and Conduct-dissocial Disorder (CD) under “06 Disruptive Behaviour Disorders (DBDs)”.<sup>1</sup> These disorders share impulsivity as well as disrupted emotional and behavioural regulation with onset typically in childhood,<sup>2</sup> with common underlying neurobiological alterations.<sup>3</sup> Specifically, ODD refers to emotional dysregulation expressed through angry mood and outburst, as well as hostility and irritability.<sup>4,5</sup> CD presents a severe behavioural pattern characterized by the repetitive violation of others rights and major violation of social norms and rules.<sup>2,4</sup> DBDs have a mean prevalence of 6% (range 5% to 14 %),<sup>6</sup> which is higher in males (ODD: males 11.2%, females 9.2%; CD: males 12.0%, females 7.1%),<sup>7,8</sup> and represents a considerable social cost<sup>6</sup> being responsible for 50% of children and adolescents medical referral.<sup>9</sup>

In DBDs aggressive behaviours are heterogeneous and differentiated between “overt” (e.g. physical violence, disobedience, excessive quarrelling, etc.) and “covert” (e.g. theft, use of substances and alcohol, skipping school) antisocial behaviour.<sup>10,11</sup> Aggressive behaviours assume a relational connotation being directed primarily towards peers,<sup>11</sup> and often under the shape of relational aggression (i.e. manipulation and damaging of someone’s social status by spreading rumours, indirect threats and/or gossiping).<sup>12</sup> Relational aggression in adolescents with DBDs is associated to callousness, physical aggression, cognitive rather than affective empathy, and relational victimization (i.e. bullying).<sup>13</sup> In addition, adolescents with DBD can commit crimes and be convicted, in particular when these adolescents associate with deviant-peers<sup>11,14</sup> Once in justice system, individuals with DBD are highly problematic, compared to others in the justice system.<sup>15</sup>

In recent years, an increasing number of studies reported on efficacy of psychosocial treatments for DBD.<sup>16-19</sup> Psychosocial treatments, and parent-training in particular, are currently considered as the best practice for treating DBD in children and adolescents.<sup>9,20,21</sup> However, pharmacological interventions still remain the most administered for youths with DBD,<sup>22</sup> and

1 specifically second- or third-line treatments such as second Generation Anti-psychotics (SGAs)<sup>23</sup>  
2 are frequently used (in a Canadian epidemiologic study, 14% of prescribed SGAs were for CD).  
3

4 According to Weisz and colleagues,<sup>19,24,25</sup> psychosocial treatments have been defined as any  
5 psychological treatment aimed at alleviating psychological distress, reducing dysfunctional  
6 behaviors or enhancing adaptive behaviors through psychotherapy, counselling and training.  
7 Previous systematic reviews and meta-analyses investigating treatments and interventions for DBDs  
8 have primarily focused on parent-therapy for children<sup>17,21,26,27</sup> and family, behavioural and  
9 cognitive treatments for adolescents.<sup>15</sup> Overall, although an elective psychosocial treatment has still  
10 not been identified,<sup>21,28,29</sup> current meta-analytic evidence has recognised parental, familial and  
11 integrated psychosocial approaches as effective, for inpatients and outpatients adolescents, either in  
12 individual or group setting.<sup>15,21,28,30</sup> Nevertheless, previous meta-analyses suffer for several  
13 limitations. First, to the best of our knowledge, no meta-analysis to date has specifically focused on  
14 DBDs in adolescence separately from childhood, despite the specificity of this developmental stage  
15 and the phenotypic differences between DBDs in childhood and adolescents.<sup>11,17</sup> Second, promising  
16 novel manualized interventions have been recently developed,(e.g., Regulation Focused  
17 Psychotherapy for Children)<sup>31</sup> going beyond the dominant cognitive-behavioural  
18 approach.<sup>11,15,18,21,26,28,30,32-36</sup> Finally, methodological limitations of previous meta-analyses (e.g.,  
19 including other-than-RCT studies,<sup>17</sup> reduction of aggressive behaviours as unique outcome and  
20 neglecting acceptability of interventions<sup>17,26</sup>) hinder the generalizability of the result failing to  
21 inform best clinical practices and guide clinical decision-making.  
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48 The present meta-analysis aims to estimate the efficacy and acceptability of i) psychosocial  
49 interventions (collectively considered), ii) treatments of different therapeutics approaches (i.e.,  
50 psychotherapy, counselling, training), and iii) psychotherapies of various theoretical orientations  
51 (i.e., cognitive-behaviour therapy, psychodynamic psychotherapy, transactional psychotherapy, and  
52 systemic psychotherapy) in reducing externalizing behaviours (i.e., primary outcome) as well as  
53 their acceptability among adolescents with DBDs.  
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## 2. Methods

### 2.1. Search strategy

Authors followed an a-priori protocol, available at [www.osf.io](http://www.osf.io) (DOI: 10.17605/OSF.IO/ZY3VG). The present systematic review and meta-analysis was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines,<sup>37</sup> as reported in eTable 1. MEDLINE, PubMed, PsycINFO and Cochrane Central Register of Controlled Trials (CENTRAL) were searched by database inception until April 5th, 2020. Search key was *((disruptive behavior disorder OR externalizing disorder OR conduct disorder OR oppositional defiant disorder OR aggress\* OR aggressive behavior) AND (psychosocial intervention OR psychosocial treatment OR psychological treatment OR psychological intervention OR psychotherapy OR counseling OR training) AND (adoles\* OR youth\*) NOT (prevent\* OR predict\*)) AND (randomized controlled trial OR randomized OR clinical OR trial OR experimental)*. Search was supplemented with manual search of reference list of included studies and relevant reviews on the same subject. Language restriction was applied to English language. We excluded unpublished articles. Screening and data extraction were performed by two independent authors (TB, VG), and any conflict was resolved by a third authors (SS).

### 2.2. Inclusion criteria

Inclusion criteria were i) randomized controlled trials (RCT), ii) on any psychosocial intervention as defined above,<sup>25,38,39</sup> compared with any active other-than-psychosocial interventions, or with inactive control group (i.e. no intervention, waiting list, treatment as usual, pharmacological intervention), iii) on adolescents aged 11 to 19 years old<sup>40</sup>; iv) affected by DBDs,<sup>2</sup> namely CD or ODD defined according to structured interview or ICD/Diagnostic and Statistical manual (DSM) any version,<sup>1,2,41</sup> or showing externalizing symptoms according to validated scales with thresholds (i.e. State-Trait Anger Expression Inventory [STAXI]<sup>42</sup>; Aggression Scale<sup>43</sup>) v) that provided

1 specific statistical information to calculate the effect sizes needed for meta-analysis. Excluded were  
2 studies with design other-than-RCTs.  
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### 7 *2.3. Data extraction*

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9 The following variables were extracted by two independent authors (TB, VG). Author, year,  
10 country, specific DBD, diagnostic criteria, experimental and control interventions, sample size of  
11 each arm, outcome definition, severity of externalizing symptoms at baseline, functioning at  
12 baseline, effect size with dispersion estimates (standard deviation), number of completers, whether  
13 the effect size was estimated with intention-to-treat analysis or per-protocol.  
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### 25 *2.4 Primary and secondary outcomes*

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27 Primary outcome was change in externalizing symptoms at RCT endpoint (standardized mean  
28 difference [SMD]). Secondary outcome was acceptability measured as drop-out (Odds Ratio [OR]).  
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30 When more than one instrument was used to measure externalizing symptoms, measuring tools  
31 were selected following the “decision rule” which aims at selecting the most relevant outcome  
32 measure, based on hierarchical rules. If primary or secondary outcomes were measured with more  
33 than one tool, the tool having the following two characteristics was selected: (i) *Clinical relevance*  
34 (i.e. the outcome most representative of the outcome domain and its coherence with the symptoms  
35 targeted by the intervention); (ii) *Frequency of use* (i.e. the frequency with which an instrument is  
36 used on the literature to assess comparable symptoms and disorders).  
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### 54 *2.5. Quality assessment*

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57 Quality of included RCTs was assessed with Risk of Bias tool version 2 (RoB 2.0).<sup>44</sup> The  
58 evaluation of risk of bias was also performed by two independent authors (EM, VG), and any  
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1 conflict was resolved by a third author (TB). Studies' risk of bias was assessed based on the  
2 following domains: Randomization process, Deviations from the intended interventions (effect of  
3 assignment to intervention; effect of adhering to intervention), Missing outcome data, Measurement  
4 outcome data and Selection of reported results. The RoB 2.0. ultimately provides an overall  
5 judgment as a synthesis of the domains' risk of bias assessment.  
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## 11 12 13 14 15 16 *2.6. Statistical analysis*

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18 Random-effect meta-analysis<sup>45,46,45</sup> was performed using Comprehensive meta-analysis.<sup>47</sup> Primary,  
19 secondary outcomes were meta-analyzed when at least two studies provided data for a given  
20 outcome. For primary and secondary outcomes, we calculated standardized mean difference (SMD)  
21 and OR with its 95% confidence interval for continuous outcomes. Study heterogeneity was  
22 measured using  $I^2$ , with values higher than 50% indicating high heterogeneity.<sup>48</sup> Presence of  
23 publication bias was investigated by visual inspection of funnel plots, and by means of Egger's  
24 regression test.<sup>49,50</sup> When publication bias was present, trim and fill procedure was performed, as  
25 well as fail-safe-number<sup>51</sup> was calculated in order to test whether results remained the same after  
26 accounting for publication bias.  
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41 Finally, meta-regression was performed when the moderator was provided by at least ten studies.

42 Moderators of interest were age, gender, race/ethnicity and duration of intervention.

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44 Subgroup analyses were conducted according to type of intervention (psychotherapy, counselling,  
45 or training), format of intervention (group, family, individual), control group (no  
46 intervention/waitlist, active), and theoretical background (cognitive-behaviour therapy,  
47 psychodynamic psychotherapy, transactional psychotherapy, and systemic psychotherapy).  
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57 Sensitivity analyses were performed excluding RCTs with high risk of bias, and focusing only on  
58 studies including subjects with full-blown disorders according to structured ICD/DSM criteria.  
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### 3. RESULTS

#### 3.1. Search results

The identification, selection, screening and inclusion or exclusion of studies is described in Figure 1. Out of 6,006 initial records, the full text of 250 studies was assessed, and after exclusion of 234 with specific reasons (supplementary material, SD1) 16 studies, reporting on 17 RCTs, were finally included in the meta-analysis. The list of studies excluded after full-text assessment, with reason for exclusion is available in eTable 3.

[INSERT FIGURE 1 HERE]

#### 3.2. Study Characteristic

Descriptive characteristics of the 17<sup>46-61</sup> included RCTs are reported in Table 1. All studies were published in English between 1996 and 2017, with a total of 1,954 subjects, of which 1,016 received psychosocial intervention, and 938 control intervention. Subjects were 61% male (N = 1192), and mean age was 14.09 (standard deviation (SD) 1.33) years old. Only 6<sup>57,58,61-64</sup> included RCTs reported data on race/ethnicity of enrolled patients, with great variability between Solo 6 RCT inclusi hanno riportato dati sulla razza/etnia dei pazienti arruolati, con una grande variabilità tra gli studi. Psychosocial interventions were psychotherapy (k=9, n= 642),<sup>53-56,58,65-67</sup> training (k=5, n=208),<sup>52,57,61,63,64</sup> counselling (k=1, n=60)<sup>60</sup> and combined (k=2, n=106)<sup>59,62</sup> interventions. Combined interventions included a combination of multiple therapeutic modalities such as psychotherapy, training, counselling and school-based interventions (see also Table 2). A group setting was employed in 11 studies (n=596),<sup>46,47,50,51,54-60,</sup> a family approach in 3 studies (n=57),<sup>48,49,61</sup> an individual approach in one study (n=279)<sup>58</sup> and a multiple approach including group, family and individual settings in one study (n=84).<sup>59</sup> As regards psychotherapy theoretical background, behavioural approaches were the most commonly adopted (k=10, n=436),<sup>52,53,56,57,61-65</sup> while other theoretical approaches are systemic (k=1, n=84),<sup>59</sup> transactional (k=1, n=100)<sup>66</sup> and

1 mixed approaches (k=5, n=396)<sup>54,55,58,60,67</sup> in which different technical and theoretical features were  
2 combined together. Control groups provided different conditions, such as “no treatment/waitlist”  
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4 (k=10, n=513),<sup>52,53,57,60,62,63,65-67</sup> “active control group” (other than psychosocial) (k=7, n=503).<sup>54-  
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7 56,58,59,61,64</sup>

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12 [INSERT TABLE 1 HERE]

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14 [INSERT TABLE 2 HERE]

### 15 16 17 18 19 *3.3. Quality assessment*

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21 Risk of bias of included RCTs is described in Figure 2. Overall, six RCTs had high risk of bias, 12  
22 had suspected (i.e. some concern) risk of bias, and none had low risk of bias. Main source of  
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24 suspected bias was the Selection of reported results domain due to the impossibility of retrieving  
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26 suspected bias was the Selection of reported results domain due to the impossibility of retrieving  
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28 any of the studies’ protocol and statistical analysis plan. Other relevant source of bias were the  
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30 Randomization process (some concern 89%; high risk 5.5%) and Measurement of outcome data  
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32 (some concern 89%; high risk 5.5%) domains (see also eFigure 1).  
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39 [INSERT FIGURE 2 HERE]

### 40 41 42 43 *3.4. Meta-analysis and meta-regression*

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45 Results of random-effect meta-analysis (main analyses, sensitivity analyses, subgroup analyses) and  
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47 meta-regression are reported in Table 3. In main analyses, psychosocial interventions had a large  
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49 effect size on improving externalizing symptoms compared with control interventions in subjects  
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51 with DBDs symptoms/disorders at RCT endpoint (SMD=0.978, 95%CI - 0.55 to - 1.38, k=18), and  
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53 were acceptable (drop-out OR=1.29, 95%CI 0.62 to 2.70, k=13). Such beneficial effect did not  
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56 persist at follow-up (SMD=-0.36, 95%CI 0.06 to -0.78, k=10).  
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1 Sensitivity analyses focusing only on subjects with DBDs full-blown disorder confirmed results at  
2 RCT endpoint (primary outcome SMD=-0.80, 95%CI -1.11 to -0.5, acceptability/drop-out  
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4 OR=1.03, 95%CI 0.48 to 2.20), as did sensitivity analyses without RCTs without high risk of bias  
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6 (primary outcome SMD=-0.83, 95%CI -0.45 to -1.22, acceptability/drop-out OR=1.43, 95%CI 0.62  
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8 - 3.30).  
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11 In subgroup meta-analyses, type of analyses (ITT, per protocol), type of intervention (counselling,  
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13 mixed, psychotherapy, training) and type of control group (active, inactive) did not yield  
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15 significantly different effect sizes for either primary or secondary outcomes. When focusing on  
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17 format of interventions (family, individual, group, mixed), family format showed the largest effect  
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19 size on the primary outcome (SMD=-1.46, 95%CI -1.05 to -1.88), while individual format showed  
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21 the worst acceptability (OR=47.19, 95%CI 2.86 to 779.53, yet with data coming from just one  
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23 RCT). Regarding theoretical background, transactional background had the largest effect size on  
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25 primary outcome (SMD=3.18, 95%CI 3.26 to -4.18, yet based on data from one RCT only), and no  
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27 subgroup difference emerged for acceptability.  
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33 Meta-regression showed that duration of RCTs moderated the effect size, yet with a small and  
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35 marginally significant effect ( $p=0.04$ ). No other significant moderator emerged. It was not possible  
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37 to include race/ethnicity as moderator, since data were provided in less than ten studies.  
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43 [INSERT TABLE 3 HERE]  
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#### 48 **4. Discussion**

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51 Pooling data from 17 RCTs and almost 2,000 adolescents, the present random-effect meta-analysis  
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53 shows that psychosocial interventions for subjects with symptoms of, or with diagnosed DBDs are  
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55 effective, and acceptable. Involving family seems to be the most effective format of psychosocial  
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57 intervention. However, the beneficial effects of psychosocial interventions for DBDs  
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59 symptoms/disorders are lost at follow-up.  
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1 Results are relevant for several reasons. First, this is the largest meta-analysis to date on  
2 psychosocial interventions for DBDs encompassing N = 1,474 adolescents more and N = 13 RCTs  
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4 more compared with the most recent meta-analysis previously published.<sup>26</sup> Moreover, it is the first  
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6 specifically focused on adolescents, rather than adolescents and children together considered.<sup>26,68,69</sup>  
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9 Second, results clearly show that psychosocial interventions should be the first-line treatment for  
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11 adolescents with DBDs. Coherently, NICE guidelines<sup>9</sup> recommend psychosocial intervention for  
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13 both children and adolescents as compared to pharmacological (e.g. anti-psychotics) and physical  
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15 (e.g. dieting) interventions. Importantly, according to our results, psychosocial treatment should  
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17 have an explicit focus on families.<sup>9</sup> The general aim of familiar interventions is to decrease  
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19 proximal risk factors while enhancing the protective one in favour of behaviour change and its  
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21 maintenance.<sup>9,15,70</sup> Specifically, the rationale of familiar interventions considers mis-conduct and  
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23 maladaptive behaviour as resulting from the family relational system,<sup>70</sup> and it aims at obtaining  
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25 behaviour-change as well as at deepening understating of maladaptive behaviour and related  
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27 emotions by operating on internal family dynamics.<sup>15,70</sup> This strategy is (albeit partially) addressed  
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29 by international guidelines, which recommend multi-model intervention for DBD adolescents aged  
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31 11-17 years,<sup>9</sup> comprising additional aspects related to school and other relevant context.<sup>9,15</sup>  
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39 Despite promising evidence on psychosocial interventions at RCT endpoint, serious concerns are  
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41 raised but the complete loss of efficacy at follow-up. Several reasons might explain such a dramatic  
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43 drop of efficacy from RCT endpoint to follow-up. A lack in the generalization of the improvements  
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45 attributed to interventions could lead to recidivism<sup>15</sup>. Generalizability is crucial for the long-term  
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47 effect of intervention as it imply broadening the behaviour change to multiple areas of  
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49 functioning.<sup>9,15</sup> The distinction between efficacy and effectiveness is also relevant. Efficacy refers  
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51 to the effect obtained in a controlled, thus more artificial, environment such as that of RCTs,  
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53 accounting for generalization across population while being less subject-specific.<sup>71</sup> On the other  
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55 hand, the effectiveness describes intervention effect referred to a more ecological context, favouring  
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57 cross-context generalizability for the sole individual.<sup>71</sup> Consequently, the study design and the  
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1 degree of its “real- world” application might further account for the loss of intervention effects at  
2 follow-up. Moreover, additional factors could, solely or jointly, contribute to the reestablishment of  
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4 pre-intervention maladaptive behaviors, including contact with deviant peers,<sup>72</sup> impaired cognitive  
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6 functioning (e.g., low verbal IQ<sup>73,74</sup>) and reduced learning abilities,<sup>74</sup> and psychological problems in  
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8 parents associated to a reduced monitoring of DBD adolescents.<sup>75</sup>  
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12 The present meta-analysis has several limitations, which match limitations affecting the field of  
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14 psychotherapy in general. More in detail, no study was blinded, due to the nature of interventions.  
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16 Also, in an umbrella review encompassing 247 meta-analyses, reporting on 5,157 RCTs, it has been  
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18 shown that 199 reported significant effect sizes (80.5%), and that 196 (98.5%) of these significant  
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20 results favoured experimental arms.<sup>76</sup> The same umbrella review also showed that the majority of  
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22 significant findings had large and very large heterogeneity (as the present work), and that small-  
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24 study effect (small studies inflating pooled estimates), and excess of significance bias frequently  
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26 affect estimates in the field of psychotherapy.<sup>76</sup> Ultimately it was shown that out of 247 meta-  
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28 analyses only 7% were significant, being most of them on CBT.<sup>76</sup>  
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35 In conclusion, psychosocial interventions involving family of adolescents with DBDs  
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37 symptoms/disorders are effective, and acceptable in the short term, but not effective at follow-up.  
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39 Future studies should focus on strategies to maintain short-term efficacy of psychosocial  
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41 interventions in DBDs, and real-world data on large collaborative cohorts of adolescents with DBDs  
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43 treated with psychotherapies or other interventions are also needed.  
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## 48 **Funding**

49  
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51 The present study did not receive any funding.  
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54 **Manuscripts word count:** 2592  
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## Figure captions

**Figure 1. PRISMA Flowchart (see Moher et al., 2009)**

1 **Figure 2. Risk of bias summary: review author's judgments about each risk of bias item for each**  
2 **included study according to Risk of Bias Tool, version 2.0**  
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Manuscript Title: Systematic Review and Meta-Analysis: Psychosocial Treatments for Disruptive Behavior Symptoms

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**Section 3: On an attached page, please list the funding, acknowledgments, and financial disclosures of all authors.**

**Section 4: Acknowledgments.** By signing below, I acknowledge my acceptance to and/or certification of the following information.

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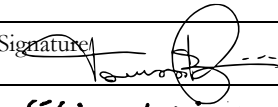
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**Financial and Material Support.** All sources of grant or other financial support, as well as any material support, are listed on the page attached to this form and on the title page of the submitted manuscript. If no funding was received, please state this.

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**Table1. Characteristics of randomized controlled trials administering psychosocial interventions to adolescents with disruptive behaviour disorders.**

Study	Country	Race/Ethnicity N	Recruitment	Mean Age	Definition of CD and ODD	Interventions	Psychosocial N	Control N	Treatment Format	Measures
Avci et al., 2016 <sup>52</sup>	Turkey	N/A	High school	14,5	Aggression Scale scores $\geq 100$ ; Trait Anger, Anger Out and Anger In (STAXI) scores higher than the school average	1. Anger Coping Programme 2. Waitlist	32	30	Group	State-Trait Anger Expression Inv. (STAXI); Aggression Scale; BSI
Currie et al., 2012 (a) <sup>53</sup>	Australia	N/A	Referrals from school staff (Deputy Principal or Head of Welfare)	13,8	Trait-Anger (STAXI) scores $\geq 70^{\text{th}}$ percentile	1. Doing Anger Differently 2. Waitlist	28	22	Group	Trait Anger Sc. (TAS); Anger-Out Sc. (AX-OUT); Beck Depression Inv. (BDI); CSEI
Currie et al., 2012 (b) <sup>53</sup>	Australia	N/A	Referrals from school staff	13,8	Trait-Anger (STAXI) scores $\geq 70^{\text{th}}$ percentile	1. Doing Anger Differently 2. Waitlist	32	29	Group	Trait Anger Sc. (TAS); Anger-Out Sc. (AX-OUT); Beck Depression Inv. (BDI); CSEI
Deffenbacher et al., 1996 (a) <sup>63</sup>	USA	94 White 23 Hispanic 2 Asian Americans 1 American Indian	Middle school	13,3	Trait-Anger Scale (STAXI) scores in the upper quartile ( $>23$ )	1.Cognitive Relaxation Coping Skills 2.No treatment	39	41	Group	Trait Anger Sc. (TAS); Anger Rating Sc.; Anger Situation Rat.; Anger Expression Inv.; Trait Anxiety Inv.; Anxiety Rating Sc.; Depression Rating Sc.; Self- Esteem Rating Sc.; Shyness Rating Sc.; Deviant Behavior Rat.
Deffenbacher et al., 1996 (b) <sup>63</sup>	USA	94 White 23 Hispanic 2 Asian Americans 1 American Indian	Middle school	13,3	Trait-Anger Scale (STAXI) scores in the upper quartile ( $>23$ )	1. Social skills training 2.No treatment	40	41	Group	Trait Anger Sc. (TAS); Anger Rating Sc.; Anger Situation Rat.; Anger Expression Inv.; Trait Anxiety Inv.; Anxiety Rating Sc.; Depression Rating Sc.; Self- Esteem Rating Sc.; Shyness Rating Sc.; Deviant Behavior Rat.
Kendall et al., 2017 <sup>64</sup>	USA	<i>Experimental Group</i> 26 Black or African American 3 Hispanic <i>Control Group</i>	Community- based alternatives to detection	15,8	Youth Self-Report scores $\geq 67$	1. Preventing HIV/AIDS among Teens 2.Active control group (teaching/ tutoring)	28	43	Group	Youth Self Report

		34 Black or African American 4 Hispanic								
Kulashekara et al., 2015 <sup>66</sup>	India	N/A	Middle and High schools	NR	Aggression Scale scores $\geq$ 100	1. Transactional Analysis 2. No treatment	100	100	Group	Aggression Sc.; Beck Depression Inv. (BDI)
Kumar et al., 2009 <sup>65</sup>	India	N/A	Schools and colleges	11-18	CD diagnosis based on DSM-Oriented scales	1. Rational Emotive Behavioural Therapy 2. No treatment	100	100	Group	Youth Self Report DSM-Oriented Scale
Nickel et al., 2005 (a) <sup>54</sup>	Germany	N/A	Polyclinic	14,9	State-Anger, Trait-Anger and Anger-Out (STAXI) scores $\geq$ 70 <sup>th</sup> percentile	1. Family Therapy 2. No treatment	13	12	Family	State-Trait Anger Expression Inv. (STAXI)
Nickel et al., 2005 (b) <sup>67</sup>	Germany	N/A	Clinic for Psychosomatic Medicine	15	STAXI screening and bullying behaviour of at least 6 months	1. Integrative Family Therapy 2. Active control group (interviews)	22	22	Family	State-Trait Anger Expression Inv. (STAXI); ARBS; IIP-D; SF-36(Health Survey)
Nickel et al., 2006 <sup>55</sup>	Germany	N/A	High school	15	STAXI screening and verbal and/or physical bullying behaviour for at least 6 months	1. Brief Strategic Family Therapy 2. Active control group (interviews)	20	20	Family	State-Trait Anger Expression Inv. (STAXI); ARBS.; IIP-D; SF-36(Health Survey)
Rohde et al., 2004 <sup>56</sup>	USA	N/A	Juvenile Justice Department	15,1	CD diagnosis based on DMS-IV	1. Adolescent Coping with Depression 2. Active control group (life-skills/tutoring)	44	47	Group	Hamilton Depression Rating Sc (HDRS); Beck Depression Inv.-II (BDI-II); Child Behavior Checklist (CBCL); Children's Global Adjustment Sc.(CGAS); SAS-SR
Shechtman et al. 2009 <sup>60</sup>	Israel	N/A	Middle school	11,9	PNI (Peer Nomination Instrument)	1. Integrative counselling intervention 2. No treatment	60	51	Group	Teacher Report Form (TRF); Aggression Quest.; Illinois Aggression Sc.; Classroom Environment Sc.
Snyder et al., 1999 <sup>61</sup>	USA	<i>Experimental Group</i> 13 African American 6 White 4 Hispanic 2 Mixed <i>Control Group</i> 12 African American 5 White 4 Hispanic 3 Mixed	Psychiatric Hospital	NR	Trait-Anger (STAXI) scores $\geq$ 75 <sup>th</sup> percentile	1. Anger Management Control Training 2. Active control group (teaching/tutoring)	25	25	Group	MMPI-Anger Content sc.; SSBS and HSCBS-Antisocial Behavior sc.
Splett et al., 2014 <sup>62</sup>	USA	5 African American 19 White 3 Mixed	Middle school	13	Children's Social Behaviour Scale-Teacher Report	1. GIRLSS (growing interpersonal relationships through learning and systemic support) 2. Waitlist	22	12	Group	Children's Social Behavior Scale (CSBS-Self-report) (CSBS-Teacher-report)

van Manen et al., 2004 <sup>57</sup>	Netherlands	77 White 10 Moroccan 6 Turkish 4 Sruinarnese-Caribbean	Outpatient mental health clinics	11,2	CD and ODD diagnosis based on DSM-IV	1. Social Cognitive Intervention Program 2. Waitlist	42	15	Group	Child Behavior Checklist (CBCL); Teacher Report Form (TRF); TOPS; TRA; SCRS; MFFT; MESSY; SCST
Wagner et al., 2014 <sup>58</sup>	USA	118 African American 32 White 291 Hispanic 73 Other	County Public School System	16,2	Relational and Proactive Violence Scale (at least one act of relational or predatory violence in the last 90 days)	1. Guided Self Change 2. Active control group (teaching/ tutoring)	279	235	Ind.	Timeline Follow-Back (TLFB)
Weiss et al., 2013 <sup>59</sup>	USA	N/A	Self-contained behaviour intervention classroom	14,5	CBCL Externalizing scale's scores in the clinical range for 96% of the sample	1. Multi-systemic Therapy 2. Active control group (classroom management)	84	80	Family/Group/ Ind.	Child Behavior Checklist (CBCL); Youth Self Report (YSR); Teacher Report Form (TRF); SRDS; FACES; PAQ; PAI

Legend: ARBS= Adolescents' Risky-Behavior Scale; BSI= Brief Symptom Inventory; CSEI= Coopersmith Self Esteem Inventory; FACES= Family Adaptability and Cohesion Evaluation; HCSBS= Home and Community Social Behavior Scale; IIP-D= Inventory of Interpersonal Problems; MESSY= Matson Evaluation of Social Skills with Youngsters; MFFT= Matching Familiar Figures; MMPI= Minnesota Multiphasic Personality Inventory; NR, not reported; PAI= personality Assessment Inventory; PAQ= Parental Authority Questionnaire; SAS-SR = Social Adjustment Scale–Self-Report; SBSS= School Social Behavior Scale; SCRS= Self Control Rating Scale; SCST= Social Cognitive Skills Test; SRDS= Self-Report Delinquency Scale; TOPS= Taxonomy of Problematic Social Situations; TRA= Teacher Rating Scale for Reactive and Proactive Aggression;

**Table 2. Description of psychosocial intervention and control interventions in randomized controlled trials treating disruptive behaviour disorders in adolescents**

	<b>Psychosocial intervention</b>	<b>Control intervention</b>
Avci, 2016 <sup>52</sup>	The Anger Coping Programme is based on cognitive behavioural theories. Session topics are as follows: (1) creating the groups, recognizing emotions and identifying events triggering anger; (2) recognizing the components and negative consequences of anger, and understanding the relationship between emotions, thoughts and behaviours; (3) identifying the thoughts and beliefs that trigger anger, and learning record-keeping; (4) learning how to question and how to stop thoughts from coming into mind when the thoughts have been identified as triggers that intensify anger; (5) finding alternative ideas to change negative thoughts and references and record-keeping; (6) relaxation training; (7) assertiveness training; (8–9) ensuring anger control by finding alternative ideas from real-life events and by using relaxation and assertiveness skills; The programme has a group setting, one day a week for one hour and half.	The Anger Coping Programme was administered to the students of the control group after the study was over.
Currie, 2012 (a) <sup>53</sup>	Doing Anger Differently is a program which uses structured Latin American percussion exercise to explicate and treat reactive aggression in adolescent males. It develops in seven focus areas and two core group therapy techniques. Each focus area ran for two or three sessions and contained a series of structured percussion exercises, guided psychoeducation and discussion, and an anger diary. These focus areas and their content were based on well researched and validated areas of cognitive anger management. Weekly supervision is used to assess the progress of each individual within the group in an ongoing cycle of assessment and proposed interventions. The programme was administered in twenty sessions over ten weeks, in a group setting.	Doing Anger Differently was administered to the control participants after the treatment was over.
Currie, 2012 (b) <sup>53</sup>	Doing Anger Differently	Doing Anger Differently was administered to the control participants after the follow-up measures were over.
Deffenbacher, 1996 (a) <sup>63</sup>	Cognitive-relaxation coping skills is a cognitive behavioural intervention targeting emotional and physiological arousal and anger-engendering cognitions and focusing on increasing skills for emotional control. Students are taught applied relaxation and cognitive-attitude change skills with which to alter cognitive, emotional, and physiological elements of anger. The treatment develops in six sessions and entails homework involving self-monitoring and application of cognitive and relaxation coping skills to anger and other distressing emotions. Group meets weekly for one hour and fifty minutes.	Untreated control group
Deffenbacher, 1996 (b) <sup>63</sup>	Social skills training is a cognitive behavioural intervention addressing skill deficiencies and dysfunctional expression styles by focusing on increasing positive social skills with which to handle social disagreement and conflict. As SST participants employ these skills, anger is reduced through improved communication, and the consequences of uncontrolled anger are therefore reduced. The treatment develops in six session and entails homework involving self-monitoring and application of communication skills to anger and other distressing interactions. Group meets weekly for one hour and fifty minutes.	Untreated control group
Kendall, 2017 <sup>64</sup>	Preventing HIV/AIDS among Teens is a two-week psychosocial intervention for juvenile offenders serving probation, on future aggression and incarceration. The interactive, group-based intervention involves activities specifically relevant to decreasing aggression, identifying and anticipating personal risk-related triggers and developing plans to address people, places, situations and moods that prompt risk taking. Activities relevant to aggression include, moreover, evaluating the impact of “hot” feelings on behaviour and learning to regulate “hot” emotions. Groups spanned 8 sessions lasting 90-120 minutes each.	The control group focuses on health promotion and is matched for number of sessions, session length and facilitator training. It takes the same interactive approach but primarily provides information about nutrition, substance use, violence, and HIV/AIDS. Incarceration is not specifically addressed. Regarding violence, controls review tips for preventing interpersonal conflicts from becoming violent and are teach definitions and statistics related to violence. A main distinction between arms is that the control curriculum is informative in nature, emphasizing generalized knowledge.
Kulashekara, 2015 <sup>66</sup>	Transactional Analysis Psychotherapy is based on the parent, adult, child Ego states model. It is a theory of personality and a model of communication through which repetitive patterns of behaviour can be studied. It is mainly based on two notions: first, the personality has three parts or ‘ego-states’. Parental transactions, images and cultural aspects play an important role in making of a personality. Personality traits are manifested in the behaviour through these ego states. The other assumption is that these ego states converse with one another in	Untreated control group

	<p>transactions. The flow of communication between individuals is known as transactions. Transactions are analysed to find out which ego state the individuals are operating from. This same model also helps to understand how people function and express themselves in their behaviour.</p> <p>The treatment has a group setting, develop in 24 sessions, lasting for 50-60 minutes each.</p>	
Kumar, 2009 <sup>65</sup>	<p>Rational-Emotive Behavior Therapy is an active-directive, solution-oriented therapy which focuses on resolving emotional, cognitive and behavioural problems in clients, originally developed by the American psychotherapist Albert Ellis. REBT views that emotional suffering result primarily, though not completely, from our evaluations of a negative event, not solely by the events per se. Therapy is administered in seven sessions over ten weeks, in a group setting.</p>	Untreated control group
Nickel, 2005 (a) <sup>54</sup>	<p>Integrative Family Therapy may be defined as coherent clinical synthesis of the more individually oriented behaviour therapy and psychodynamic therapy with a broader family system orientation, which maintains the integrity of all three theoretical approaches, while addressing the treatment needs of youth and their families. Family therapy is the treatment component of the philosophy that extends to concepts of illness, defining it to include a person's nodal involvement in his or her kinship network. Developers of family therapy were typically psychoanalysts who came to see pathology as a function of family dynamics and treatment as being to do with seeing the whole family rather than the individual and their internalized 'family experiences'. The focus is on communication, the rules that the family have, and the behavioural latitude of each individual member. The aggressive youth are seen as bearer of a symptom and one goal of the therapy is to ascertain the family's 'game' that contributes to maintenance of the symptoms. The aim is to bring the tried and tested connections out of balance, to change them and adopt new rules. Elements from systematic therapy, psychodynamic-oriented therapy, behavioral therapy, gestalt therapy and psychodrama are included. In the first 2 months, a 60 min session took place once a week. Between the third and sixth month, therapy was carried out every 2 weeks in a family setting.</p>	Untreated control group
Nickel, 2005 (b) <sup>67</sup>	<p>Integrative family therapy may be defined as a coherent clinical synthesis of the more individually oriented behavior therapy and psychodynamic therapy with a broader family-systems orientation that maintains the integrity of all 3 theoretical approaches while addressing the treatment needs of youths and their families. It is a form of psychotherapy and it is the treatment component of the philosophy that expands the concept of illness to include a person's involvement in his or her family network. By working with families, the therapist gains better insight into the transactional nature of aggressive behaviours and thus can address directly the interactions among family members. The aggressive youths are seen as symptom bearers, eg, for the communication problems in the entire family's network of "playing rules" and another goal is to ascertain any family "games" that contributed to maintenance of the symptoms. The aim is to knock the tried and tested connections off balance, to change them, and to have families adopt new rules. During the first 2 months, a 90-minute session took place once a week. Between the third and sixth months, therapy was conducted every 2 weeks, in a family setting.</p>	The control group was treated during the same period and with the same frequency as the experimental group, but with a placebo intervention. This intervention consisted of a structured and detailed survey of the psychological state of health, daily routine, and events. Authors rigorously checked that none of the family therapeutic interventions took place.
Nickel, 2006 <sup>55</sup>	<p>Brief strategic family therapy focuses on assessing the family's conflict resolution style and developing specific interventions to help families negotiate and resolve their differences more effectively. Therapy targets children and adolescents between the ages of eight and seventeen who are currently displaying behavioural problems or are at risk for developing them. The goal is to improve youth behaviour by improving family relationships that are presumed to be directly related to the youth behaviour problems, and to improve relationships between the family and other important systems which influence youth. Therapy fosters family communication, parenteral leadership, appropriate parenteral involvement, problem solving, clear rules and consequences, mutual support among parenting figures. The short-term, problem-focused intervention included twelve 100-min sessions once a week over a period of 12 weeks, in a family setting.</p>	The control group was treated simultaneously and just as frequently as the experimental group, but with a placebo intervention. This consisted of structural, detailed question sessions on how family felt, their daily activities and events. Rigorous attention was paid to their not receiving any of the family therapeutic interventions.
Rohde, 2004 <sup>56</sup>	<p>Adolescent Coping with Depression is a cognitive behavioural group intervention for adolescent depression. Many of the therapeutic techniques in the intervention (e.g. cognitive restructuring, problem solving) are components of cognitive-behavioural interventions previously shown to be efficacious in the treatment of Conduct Disorder and delinquency. Participants in the therapy course are taught mood monitoring; how to improve social skills, increase pleasant activities, decrease anxiety, reduce depressogenic cognitions, improve communication; conflict resolution; and relapse prevention. The CWD-A was modified slightly for use with a comorbid population based on pilot work and clinical recommendations. Modifications included the use of two interventionists to better monitor in-session behaviour and assist with reading and writing, shortened writing assignments, and a point system to reward attendance and participation. Mixed-gender groups of approximately 10 adolescents were treated in 16 2-hour sessions conducted over an 8-week period.</p>	Life-skills/tutoring intervention consisted of current events review, life skills training (filling out a job application, renting an apartment), and academic tutoring.
Shechtman, 2009 <sup>60</sup>	<p>An integrative counselling intervention is used in this study, combining humanistic principles, psychodynamic approach's elements to increase awareness, and cognitive-behavioural principles to improve social information processing and behaviour. The counselling intervention aims to help the aggressive children become aware of their aggression, understand what triggers it, and learn how to control it. This intervention also involves two stages. First, a therapeutic alliance is established between the counsellor, the group and the individual members through therapeutic activities and the creation of group norms. In the second stage, adolescents discuss four issues that are</p>	Untreated control group

	pertinent to aggressive behaviour: anger, what triggers it and ways to control it; the need for power and force; empathy towards victims of aggression; and self-control. This school-based intervention was comprised of 12 sessions over a period of 4 months, in a group setting.	
Snyder, 1999 <sup>61</sup>	Anger Management Group Training is a brief, cognitive-behavioural, manual-based group therapy. The cognitive view promotes the interpretation and verbal labelling of internal arousal levels, angry feeling states, self-statements, attending to social cues, and other cognitive strategies for regulating affect and subsequent behaviours. Behavioural contingencies and the social context support these new skills and enhance their transfer to natural, social situations. The intervention is administered in 4-session anger management series that could be completed within a 2-week time periods. Groups include 4 to 6 patients and each of the group sessions was 45 to 50 minutes long.	The control condition consists of a series of psychoeducational videotapes on topics relevant to adolescents, including 4 sessions.
Splett, 2014 <sup>62</sup>	Growing Interpersonal Relationships through Learning and Systemic Supports is a school based, multisystemic intervention to reduce relational aggression (RA) among adolescent girls. The intervention consists of group counselling, parent training and caregiver phone consultation intervention within a cognitive-behavioural framework. Students participated in one 70 min group session per week for 10 weeks. Each group session focused on a specific topic taught through the use of interactive discussions, media-based examples, role-plays, journaling, and weekly goal setting. Self-talk strategies were taught to help participants reframe hostile thoughts and negative statements, and assertiveness skills were practiced helping participants increase the number of appropriate behavioural response options identified. To increase participants' awareness of relationally aggressive behaviours and immediate negative outcomes is used psychoeducational strategies to share databased and anecdotal stories of negative outcomes. The caregiver component of the intervention included two workshops and biweekly phone consultations. Topics of the workshops included (1) prevalence of RA and negative outcomes; (2) appropriate disciplinary responses to instances of RA; (3) positive and appropriate communication, monitoring and supervision strategies; and (4) generalization strategies to help caregivers support their child participant's learning at home.	Growing Interpersonal Relationships through Learning and Systemic Supports was administered to the control participants after the treatment was over.
Van Manen, 2004 <sup>57</sup>	Social Cognitive Intervention Program is a cognitive-behavioural group therapy combining skills training with interventions that target the social cognitive deficits and distortions underlying social information processes in aggressive adolescents. The social cognitive deficits and distortions are addressed with treatment components such as problem-solving abilities, social cognitive skills, and self-control technique. Moreover, the role of emotions in social information processing is particularly addressed. Groups of 4 adolescents were chosen to provide opportunities for role-playing and peer feedback. The therapists used prompts, cognitive modelling (verbalizing the problem-solving steps), role-play positive reinforcement, time-out procedure, and coaching using video feedback. The program consisted of 11 session, once a week, of 70 minutes each.	After the first round of treatment, the waitlist control group adolescents were offered the Social Cognitive Intervention Program.
Wagner, 2014 <sup>58</sup>	Guided Self Change employs a motivational client-therapist interaction style, a cognitive-behavioural approach to planning, implementing and maintaining changes and a harm-reduction perspective for the treatment of addictive and aggressive behaviours. Major treatment components include (a) weekly self-monitoring of behaviours targeted for change; (b) treatment goal advice, with clients selecting their own goal; (c) brief readings and homework assignments exploring high-risk situations, options, and action plans; (d) motivational strategies to increase clients' commitment to change; and (e) cognitive relapse prevention procedures. Guided Self Change employs a school-based format, one-on-one, within 5-weekly-session.	School personnel provided a variety of educational lessons intended to prevent the onset of alcohol and drug use and violence. School counsellors were available to provide brief alcohol and drug disorder and/or violence assessments, as well as referral to outside treatment providers. Thus, control group consisted of education/brief assessment/referral-only, which is the standard of care in schools without a formal substance abuse or violence early intervention program.
Weiss, 2013 <sup>59</sup>	Multisystemic Therapy is a family-focused, home-based treatment for adolescents with serious antisocial behaviour and emotional disturbance. It derives from theory of social ecology and views individuals' behaviour as embedded in a complex network of interconnected social systems. Treatment is multifaceted, targeting the behaviour of individuals, family, peer, and other key systems such as the school. MST treatment does not involve application of a unique set of techniques, but rather interventions for each family are integrated from problem-focused, empirically validated treatment models that target etiological factors. 96% of the families received family therapy, 82% received parent training sessions, 95% received individual parent sessions, 95% received individual adolescent sessions, and 94% of adolescents received school-based interventions from the project that included individualized behaviour management plans, during a period of 6 months.	A services-as-usual control group was used. Usual services consisted primarily of a behaviourally focused classroom management plan provided by the school, with educational instructions.

**Table 3. Comparative random-effect meta-analysis of randomized controlled trials on psychosocial interventions in adolescents with disruptive behaviour disorders. Main, sensitivity, subgroup and meta-regression analyses.**

Main analyses						
Outcome	k	SMD/OR	95%CI	p	I <sup>2</sup>	Egger's test for publication bias / Subgroup comparison p value
Primary outcome endpoint	18	-0,968	- 0.55 - - 1.385	<0.001	94,161	0,035*
Drop out	13	1,295	0.620 - 2.705	0,491	23,741	0,227#
Primary outcome follow-up	10	-0,358	0.063 - - 0.779	0,096	92,97	NA
Sensitivity analyses with disorders according to structured criteria						
Primary outcome endpoint	12	-0,803	-1,107 - - 0,5	<0,001	80,411	
Drop out		1,026	0,478 - 2,204	0,947	0	
Sensitivity analyses without high risk of bias						
Primary outcome endpoint	12	-0,831	- 0.447 - - 1.216	<0.001	89,047	
Drop out	10	1,432	0.621 - 3.303	0,4	18,947	
Subgroup meta-analyses						
<i>Type of analysis</i>						
Primary outcome endpoint						
Not reported	7	-1,08	- 0.173 - - 1.988	0,002	96,088	0,598
ITT	9	-0,759	- 0.372 - -1.147	<0.001	87,798	
Per-protocol	2	-1,383	- 0.003 - - 2.762	0,049	90,685	
Drop-out						
Not reported	3	1,141	0.398 - 3.269	0,806	0,578	0,669
ITT	9	1,235	0.437 - 3.491	0,69	37,89	
Per-protocol	1	5	0.230 - 108.257	0,305	NA	
<i>Type of intervention</i>						
Primary outcome endpoint						
Counseling	1	-0,726	- 0.340 - - 1.111	<0.001	NA	0,146
Mixed	2	-0,412	- 0.128 - - 0.695	0,004	0	
Psychotherapy	9	-1	- 0.408 - - 1.945	0,003	96,867	
Training	6	-0,881	- 0.369 - - 1.393	0,001	82,545	
Drop-out						
Mixed	2	7,37	0.895 - 60.697	0,063	0	0,224
Psychotherapy	7	0,877	0.272 - 2.831	0,826	45,874	
Training	4	1,401	0.499 - 3.936	0,523	0	



<b>Format of intervention</b>						
<b>Primary outcome endpoint</b>						
Family	3	-1,464	- 1.051 - - 1.878	<0.001	0	<0.001
Group	13	-0,991	- 0.466 - - 1.516	<0.001	93,805	
Individual	1	-0,012	0.161 - - 0.186	0,89	NA	
Mixed	1	-0,398	- 0.089 - - 0.707	0,012	NA	
<b>Drop-out</b>						
Family	3	0,746	0.256 - 2.176	0,591	0	0,032
Group	8	1,04	0.457 - 2.369	0,926	0	
Individual	1	47,193	2.857 - 779.53	0,007	NA	
Mixed	1	6,914	0.351 - 136.008	0,203	NA	
<b>Control group</b>						
<b>Primary outcome endpoint</b>						
Active	7	-0,616	-0.213 - - 1.018	0,001	85,753	0,134
No treatment	11	-1,162	-0.572 - - 1.751	<0.001	93,798	
<b>Drop-out</b>						
Active	6	1,789	0.596 - 5.371	0,3	38,469	0,406
No treatment	7	0,938	0.327 - 2.692	0,905	14,825	
<b>Theoretical background</b>						
<b>Primary outcome endpoint</b>						
Cognitive-behavioral	11	-0,761	-0.446 - -1.077	<0.001	78,198	<0.001
Mixed	5	-0,964	- 0.271 - - 1.658	0,006	91,392	
Systemic	1	-0,397	-0.089 - - 0.707	0,012	NA	
Transactional	1	-3,719	- 3.261 - -4.177	<0.001	NA	
<b>Drop-out</b>						
Cognitive-behavioral	8	1,04	0.457 - 2.369	0,926	0	0,458
Mixed	4	1,637	0.323 - 8.298	0,552	59,737	
Systemic	1	6,914	0.351 - 136.008	0,203	NA	
<b>Metaregression (primary outcome only)</b>						
<b>Moderator</b>	k	slope	SE	p value		
Age	15	-0,042	0,115	0,716		
Male gender	15	0.613	0.748	0,412		
Duration	18	-0,056	0,027	0,043		

Legend. \*Egger's test for publication bias, p value=0.035; trim and fill analysis: 5 studies trimmed to the left, -1.289, 95%CI -0.810 - - 1.769; fail safe number 1,179; # Egger's test for publication bias, p value=0.227; SE, standard error; MD, standardized mean difference; OR, odds ratio.

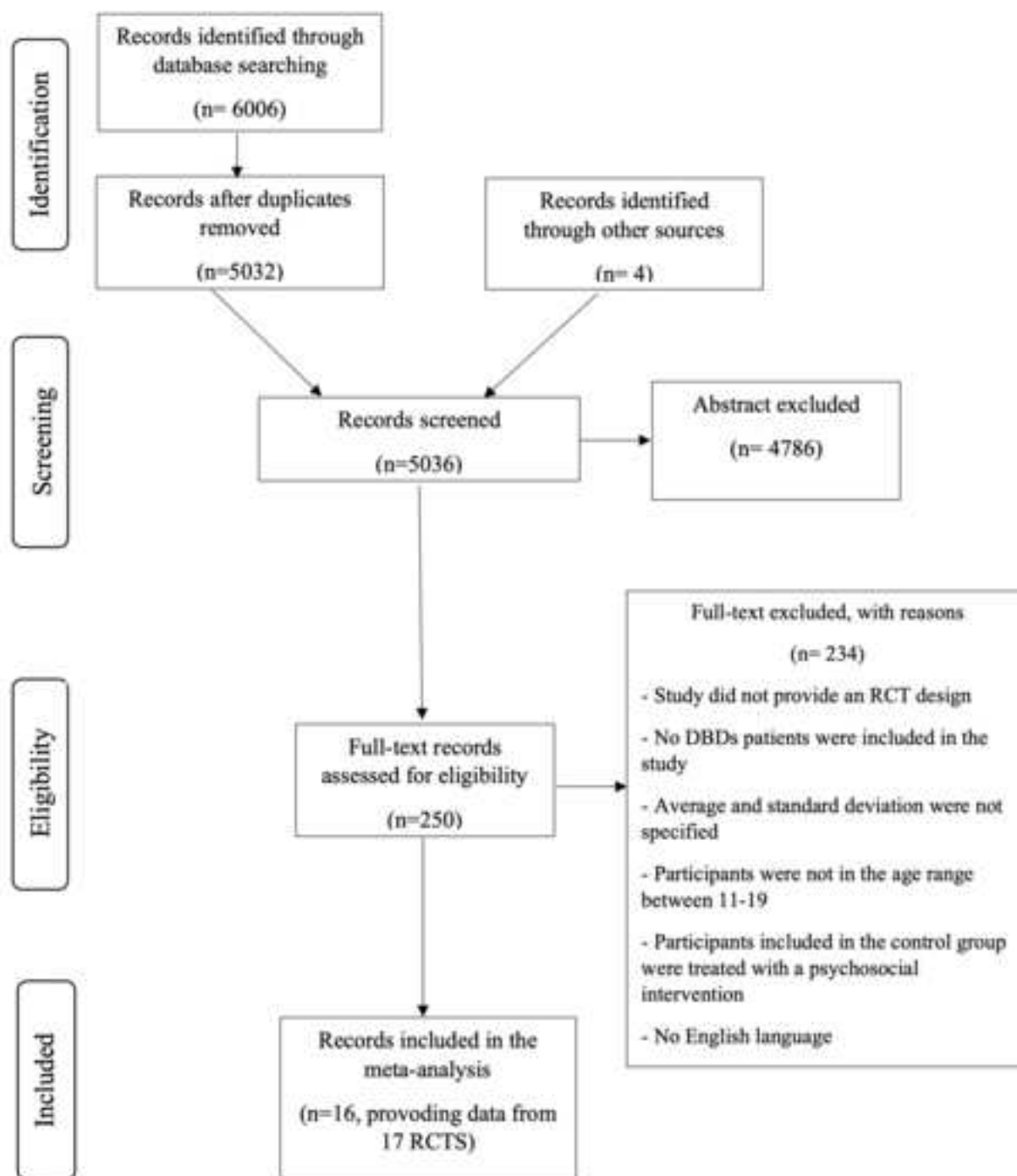
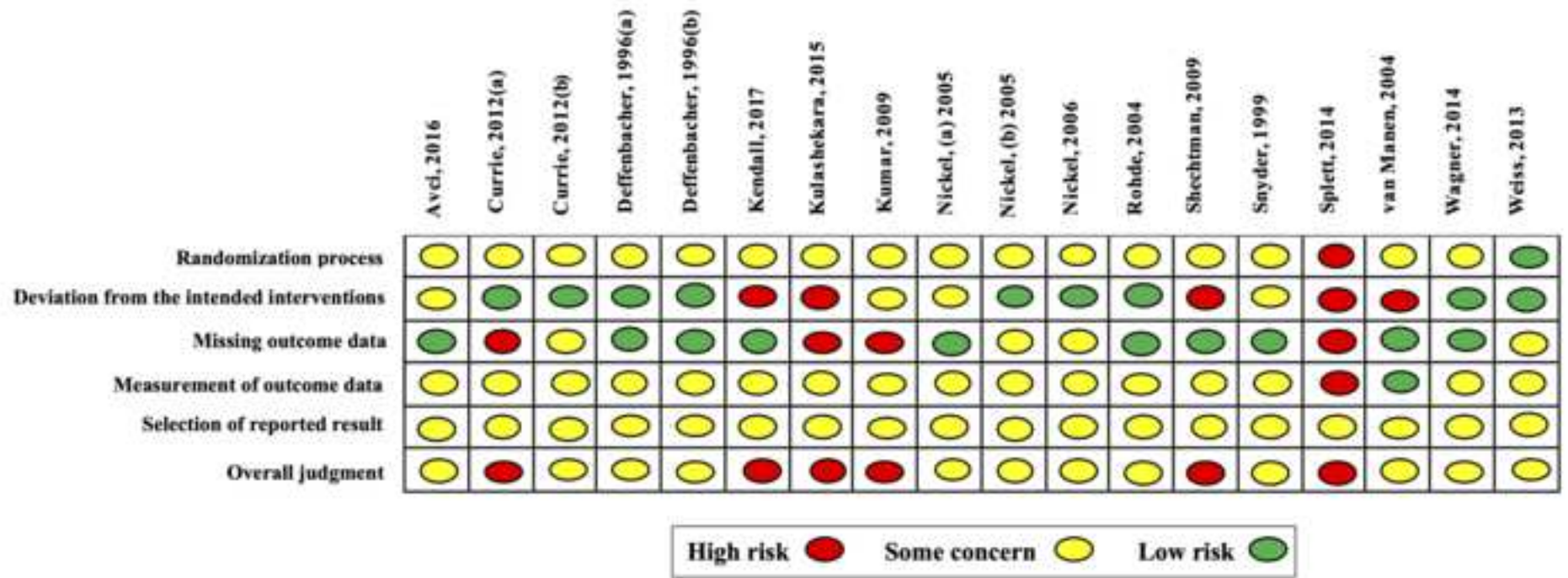


Figure 2



## Supplementary material

### Systematic Review and Meta-Analysis: Psychosocial Treatments for Disruptive Behavior Symptoms and Disorders in Adolescence

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eTable 1. PRISMA check-list<sup>1</sup>

Section/topic	#	Checklist item	Reported on page #
<b>TITLE</b>			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
<b>ABSTRACT</b>			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	2
<b>INTRODUCTION</b>			
Rationale	3	Describe the rationale for the review in the context of what is already known.	4,5
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	5, 7
<b>METHODS</b>			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	6
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	6, 7
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	6
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	6
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	6-8
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	6,7
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	6-8
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	7,8

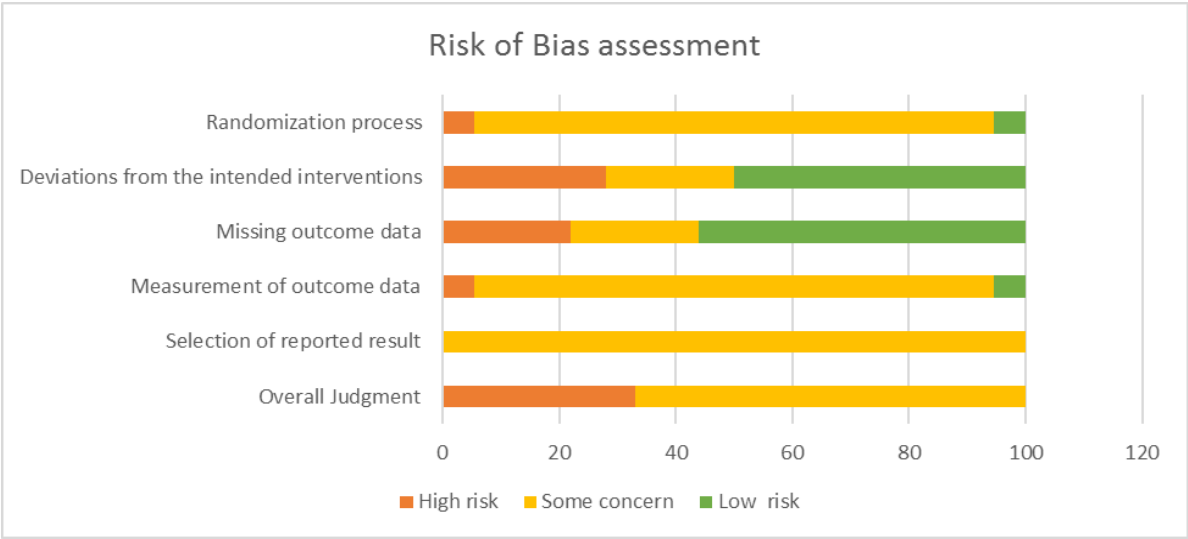
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	8
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., $I^2$ ) for each meta-analysis.	6-8
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	7,8
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	8
<b>RESULTS</b>			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	8,9
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	9
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	9
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	9
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	10
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	9
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	10
<b>DISCUSSION</b>			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	10-12
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	12
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	12,13
<b>FUNDING</b>			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	13

**eTable 2. Categorization of experimental and control interventions.**

<b>Study</b>	<b>Type of analysis</b>	<b>Type of intervention</b>	<b>Format of intervention</b>	<b>Theoretical background</b>	<b>Control intervention</b>
Avci et al., 2016 <sup>2</sup>	Per-protocol	Training	Group	Cognitive-behavioural	No treatment
Currie et al., 2012 (a) <sup>3</sup>	Intention to treat (ITT)	Psychotherapy	Group	Cognitive-behavioural	No treatment
Currie et al., 2012 (b) <sup>3</sup>	Intention to treat (ITT)	Psychotherapy	Group	Cognitive-behavioural	No treatment
Deffenbacher et al., 1996 (a) <sup>4</sup>	Intention to treat (ITT)	Training	Group	Cognitive-behavioural	No treatment
Deffenbacher et al., 1996 (b) <sup>4</sup>	Intention to treat (ITT)	Training	Group	Cognitive-behavioural	No treatment
Kendall et al., 2017 <sup>5</sup>	Not reported	Training	Group	Cognitive-behavioural	Active
Kulashekara et al., 2015 <sup>6</sup>	Not reported	Psychotherapy	Group	Transactional	No treatment
Kumar et al., 2009 <sup>7</sup>	Not reported	Psychotherapy	Group	Cognitive-behavioural	No treatment
Nickel et al., 2005 (a) <sup>8</sup>	Not reported	Psychotherapy	Family	Mixed	No treatment
Nickel et al., 2005 (b) <sup>9</sup>	Intention to treat (ITT)	Psychotherapy	Family	Mixed	Active
Nickel et al., 2006 <sup>10</sup>	Intention to treat (ITT)	Psychotherapy	Family	Mixed	Active
Rohde et al., 2004 <sup>11</sup>	Intention to treat (ITT)	Psychotherapy	Group	Cognitive-behavioural	Active
Shechtman et al. 2009 <sup>12</sup>	Not reported	Counselling	Group	Mixed	No treatment
Snyder et al., 1999 <sup>13</sup>	Per protocol	Training	Group	Cognitive-behavioural	Active
Splett et al., 2014 <sup>14</sup>	Not reported	Mixed	Group	Cognitive-behavioural	No treatment
van Manen et al., 2004 <sup>15</sup>	Not reported	Training	Group	Cognitive-behavioural	No treatment
Wagner et al., 2014 <sup>16</sup>	Intention to treat (ITT)	Psychotherapy	Individual	Mixed	Active
Weiss et al., 2013 <sup>17</sup>	Intention to treat (ITT)	Mixed	Mixed	Systemic	Active



**eFigure 1 Risk of bias graph for RCTs: review authors' judgments about each risk of bias item presented as percentages across all included studies.**



eTable 2. List of studies excluded after full-text assessment

<b>Authors, Year</b>	<b>Exclusion reasons at full-text level</b>
Abebe et al., 2017	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Abrahams et al., 2018	No DBDs patients were included in the study (attention-related problems)
Arbuthnot et al., 1986	Average and standard deviation were not specified
Asscher et al., 2013	Participants included in the control group were treated with a psychosocial intervention (counselling and family therapy)
August et al., 2016	Protocol
Avery-Leaf et al., 1997	Study did not provide an RCT design; No DBDs patients were included in the study (preventive study)
Barker et al., 2010	Participants were not in the age range between 11-19 (longitudinal study)
Barkley et al., 2001	No DBDs patients were included in the study (ADHD patients); Participants included in the control group were treated with a psychosocial intervention (training)
Bell et al., 1983	No DBDs patients were included in the study (mental retardation)
Bienert et al., 1995	Participants included in the control group were treated with a psychosocial intervention (training)
Bierman et al., 2000	Study did not provide an RCT design
Bjørknes et al., 2012	Participants were not in the age range between 11-19 (mean age 5)
Blader et al., 2016	Study did not provide an RCT design; Participants were not in the age range between 11-19 (age range 6-13)
Boege et al., 2015	No English language (German); Participants were not in the age range between 11-19 (age range 5-17)
Boisjoli et al., 2007	Participants were not in the age range between 11-19 (longitudinal study)
Bonell et al., 2015	No DBDs patients were included in the study (preventive study)
Bonell et al., 2017	Updated protocol; No DBDs patients were included in the study (preventive study)
Bonell et al., 2018	No DBDs patients were included in the study (preventive study)
Bonell et al., 2018	No DBDs patients were included in the study (preventive study)
Borduin et al., 2009	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation); Participants included in the control group were treated with a psychosocial intervention (cognitive behavioural therapy)

Bornmann et al., 2011	No DBDs patients were included in the study (preventive study)
Borowsky et al., 2004	Participants were not in the age range between 11-19 (age range 7-15)
Bosworth et al., 1996	No DBDs patients were included in the study (preventive study)
Botvin et al., 2006	No DBDs patients were included in the study (preventive study)
Boucher et al., 2012	Study did not provide an RCT design
Bowling et al., 2017	No DBDs patients were included in the study (other disorders); Participants were not in the age range between 11-19
Brody et al., 2008	No DBDs patients were included in the study (preventive study)
Burdsal et al., 1980	Study did not provide an RCT design
Burke et al., 2012	No DBDs patients were included in the study (preventive study)
Burt et al., 2011	Protocol
Butler et al., 2011	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation); Participants included in the control group were treated with a psychosocial intervention (training)
Bywater et al., 2011	Participants were not in the age range between 11-19 (age range 2-8)
Caprara et al., 2015	Study did not provide an RCT design; No DBDs patients were included in the study (preventive study)
Castillo et al., 2013	Study did not provide an RCT design; No DBDs patients were included in the study (preventive study)
Cervenka et al., 1996	Study did not provide an RCT design; No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Chan et al., 2005	No DBDs patients were included in the study (other disorders); Participants were not in the age range between 11-19
Chase et al., 2019	Participants were not in the age range between 11-19 (age range 2-5)
Chen et al., 2014	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Clair-Michaud et al., 2016	Average and standard deviation were not specified
Clingempeel et al., 2008	Study did not provide an RCT design; No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Cohen et al., 2015	No DBDs patients were included in the study (PTSD)
Colyer et al., 1996	Study did not provide an RCT design; No DBDs patients were included in the study (preventive study); Average and standard deviation were not specified

Costantino et al., 1994	No DBDs patients were included in the study (mixed disorders); Average and standard deviation were not specified; Participants included in the control group were treated with a psychosocial intervention (psychoeducation)
Cogle et al., 2017	Participants were not in the age range between 11-19 (mean age 40)
Coulton et al., 2017	Protocol
Cropp et al., 2016	Study did not provide an RCT design
Cunningham et al., 2011	Not found
Cunningham et al., 2012	Average and standard deviation were not specified
Cunningham et al., 2013	Average and standard deviation were not specified
Dakof et al., 2015	Participants included in the control group were treated with a psychosocial intervention (adolescent group therapy)
Davison et al., 2016	No DBDs patients were included in the study (mixed disorders)
Deighton et al., 2016	Participants were not in the age range between 11-19 (mean age 7)
DeLay et al., 2016	No DBDs patients were included in the study (preventive study)
Derbyshire et al., 2018	Study did not provide an RCT design; No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Derella et al., 2019	Participants were not in the age range between 11-19 (age range 6-11)
Devries et al., 2013	No DBDs patients were included in the study (preventive study); Participants were not in the age range between 11-19 (primary school)
Dodge et al., 2013	Participants were not in the age range between 11-19 (longitudinal study)
Dodge et al., 2010	Protocol
Dong et al., 1979	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Donohue et al., 1999	No DBDs patients were included in the study (half of the sample with CD)
D'Oosterlinck et al., 2008	Study did not provide an RCT design
Dousti et al., 2014	Study did not provide an RCT design
Down et al., 2011	Study did not provide an RCT design; Average and standard deviation were not specified
Dray et al., 2014	Protocol
Drugli et al., 2010	Participants were not in the age range between 11-19 (longitudinal study)

Dumas et al.,1999	Average and standard deviation were not specified
Ehrensaft et al., 2018	Participants were not in the age range between 11-19 (longitudinal study)
Eiraldi et al., 2018	Participants included in the control group were treated with a psychosocial intervention (training)
Eiraldi et al., 2016	Study did not provide an RCT design; Average and standard deviation were not specified
Ellenbogen et al., 2015	Protocol
Ercan et al., 2005	Participants were not in the age range between 11-19 (mean age 9)
Espelage et al., 2013	No DBDs patients were included in the study (preventive study)
Feindler et al., 1984	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Feinfield et al., 2004	Participants were not in the age range between 11-19 (age range 4-8)
Fonagy et al., 2013	Protocol; Participants included in the control group were treated with a psychosocial intervention (training)
Foster, 2010	Participants were not in the age range between 11-19 (longitudinal study)
Franco et al., 2016	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Frankel et al., 1997	No DBDs patients were included in the study (ADHD); Participants were not in the age range between 11-19 (age range 9-10)
Fraser et al., 2004	Participants were not in the age range between 11-19 (mean age 8)
Friman et al., 1997	Study did not provide an RCT design; Average and standard deviation were not specified
Fullchange et al., 2018	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Fung et al., 2012	Study did not provide an RCT design
Gillespie et al., 2017	Study did not provide an RCT design
Goldstein et al., 1984	No English language (Spanish)
Goldstein et al., 2018	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Gonzales et al., 2012	No DBDs patients were included in the study (preventive study)
Granic et al., 2007	Study did not provide an RCT design; Participants were not in the age range between 11-19 (age range 7-11)
Guo et al., 2015	No DBDs patients were included in the study (preventive study); Average and standard deviation were not specified

Hafner et al.,1983	No DBDs patients were included in the study (mixed disorders)
Hagen et al., 2019	Protocol
Hatziergati et al., 2016	No DBDs patients were included in the study (mixed disorders)
Havighurst et al., 2015	No DBDs patients were included in the study (preventive study)
Hendriks et al., 2012	Study did not provide an RCT design; Participants included in the control group were treated with a psychosocial intervention (psychotherapy); No DBDs patients were included in the study (cannabis use disorder)
Henggeler et al., 1992	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Henggeler et al., 1997	No DBDs patients were included in the study (other disorders); Participants included in the control group were treated with a psychosocial intervention (psychotherapy; psychoeducation)
Henggeler et al., 2009	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Henggeler et al., 2002	No DBDs patients were included in the study (other disorders); Participants included in the control group were treated with a psychosocial intervention (psychotherapy; psychoeducation)
Henry et al., 2013	Average and standard deviation were not specified
Henry et al., 2012	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation); Average and standard deviation were not specified
Hermenau et al., 2013	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Hilton et al., 2013	No DBDs patients were included in the study (mixed disorders); Average and standard deviation were not specified
Hinsberger et al., 2019	Participants were not in the age range between 11-19 (mean age 23)
Hinsberger et al., 2017	Participants were not in the age range between 11-19 (mean age 22)
Hogue et al., 2013	No DBDs patients were included in the study (CD and/or SUD); Participants included in the control group were treated with a psychosocial intervention
Hogue et al., 2015	No DBDs patients were included in the study (CD and/or SUD); Participants included in the control group were treated with a psychosocial intervention
Hogue et al., 2015	No DBDs patients were included in the study (CD and/or SUD); Participants included in the control group were treated with a psychosocial intervention
Hoogsteder et al., 2014	Study did not provide an RCT design; Participants included in the control group were treated with a psychosocial intervention (CBT)
Hoogsteder et al., 2018	Study did not provide an RCT design; Participants included in the control group were treated with a psychosocial intervention (CBT); No DBDs patients were

	included in the study (no standardized instruments were used for DBDs evaluation)
Humayun et al., 2017	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Irvine et al., 2015	Participants were not in the age range between 11-19 (mean age 40)
Jackson et al., 1992	Participants included in the control group were treated with a psychosocial intervention (group therapy)
Jacobs et al., 2010	Average and standard deviation were not specified; No DBDs patients were included in the study (depression and/or ODD)
Jansen et al., 2013	Protocol
Jensen et al., 2014	Average and standard deviation were not specified; No DBDs patients were included in the study (preventive)
Jones et al., 2010	Participants were not in the age range between 11-19 (longitudinal); Average and standard deviation were not specified
Jordans et al., 2010	No DBDs patients were included in the study (preventive)
Kastner et al., 1998	Study did not provide an RCT design
Katzmann et al., 2017	Participants were not in the age range between 11-19 (mean age 7)
Kaufman et al., 2005	No DBDs patients were included in the study
Kazdin et al., 2018	Study did not provide an RCT design; Average and standard deviation were not specified
Kazdin et al., 2005	Study did not provide an RCT design; Average and standard deviation were not specified
Kazdin et al., 1996	Study did not provide an RCT design; Average and standard deviation were not specified
Kellam et al., 1998	No DBDs patients were included in the study (preventive)
Kellam et al., 1998	No DBDs patients were included in the study (preventive)
Kellam et al., 2008	No DBDs patients were included in the study (preventive)
Kellner et al., 1999	Study did not provide an RCT design
Kendall et al., 1990	Participants included in the control group were treated with a psychosocial intervention (psychodynamic therapy); Participants were not in the age range between 11-19 (mean age 10)
Kersten et al., 2015	Study did not provide an RCT design; Average and standard deviation were not specified
Kersten et al., 2016	Protocol

Kim et al., 2011	No DBDs patients were included in the study (preventive); Participants included in the control group were treated with a psychosocial intervention (counselling, family therapy)
Kim et al., 2018	Study did not provide an RCT design
Kirkpatrick et al., 1985	Study did not provide an RCT design
Kliwer et al., 2011	No DBDs patients were included in the study (preventive)
Klingsporn et al., 1990	Study did not provide an RCT design
Kolko et al., 2014	No DBDs patients were included in the study (mixed disorders)
Larson et al., 1998	No DBDs patients were included in the study (CD/ODD and/or ADHD); Study did not provide an RCT design
Law et al., 2014	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation); Participants were not in the age range between 11-19 (age range 18-40)
Letourneau et al., 2009	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Lewis et al., 2013	No DBDs patients were included in the study (preventive); Participants were not in the age range between 11-19 (longitudinal study); Average and standard deviation were not specified
Li et al., 2014	No DBDs patients were included in the study (preventive); Study did not provide an RCT design
Liu et al., 2009	No English language
Lochman et al., 2015	No DBDs patients were included in the study (preventive); Participants included in the control group were treated with a psychosocial intervention (individual or group training)
Lochman et al., 2004	Study did not provide an RCT design
Lucassen et al., 2015	Protocol
Manders et al., 2013	Participants included in the control group were treated with a psychosocial intervention (counselling, family therapy)
Marlowe et al., 1978	Average and standard deviation were not specified; No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Martinez et al., 2005	No DBDs patients were included in the study (preventive)
Masi et al., 2014	Participants included in the control group were treated with a psychosocial intervention (psychoeducation, psychotherapy)
Mason et al., 1997	Study did not provide an RCT design; No DBDs patients were included in the study (preventive)



Mason et al., 2016	No DBDs patients were included in the study (preventive)
McGrath et al., 2011	Participants were not in the age range between 11-19 (mean age 4); Average and standard deviation were not specified
Mertens et al., 2018	Protocol
Monahan et al., 2013	Study did not provide an RCT design; No DBDs patients were included in the study (preventive)
Moore et al., 2018	No DBDs patients were included in the study (preventive study)
Morris et al., 2014	Participants were not in the age range between 11-19 (mean age 8)
Morrison et al., 2014	No DBDs patients were included in the study (other disorders); Participants were not in the age range between 11-19 (age range 18-41)
Muntz et al., 2004	Participants were not in the age range between 11-19 (age range 2-10); Participants included in the control group were treated with a psychosocial intervention
Mytton et al., 2006	Study did not provide an RCT design
Nickel et al., 2005	No DBDs patients were included in the study (other disorders)
Nickerson et al., 2004	No DBDs patients were included in the study (preventive study)
Nock et al., 2005	Participants were not in the age range between 11-19 (age range 20-66); Participants included in the control group were treated with a psychosocial intervention
Ogden et al., 2009	Study did not provide an RCT design
O'Leary-Barrett et al., 2013	No DBDs patients were included in the study (mixed disorders); Average and standard deviation were not specified
Ollendick et al., 2016	Participants were not in the age range between 11-19 (mean age 9)
Ong et al., 2019	Participants were not in the age range between 11-19 (age range 6-12); Study did not provide an RCT design
Orpinas et al., 2000	No DBDs patients were included in the study (preventive study)
Oruche et al., 2017	Protocol
Osman et al., 2017	No DBDs patients were included in the study (preventive study)
Pantin et al., 2009	Average and standard deviation were not specified
Pasalich et al., 2016	Participants were not in the age range between 11-19 (longitudinal study)
Pecukonis et al., 1990	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Raider et al., 2008	Average and standard deviation were not specified

Raine et al., 2019	No DBDs patients were included in the study (mixed disorders); Average and standard deviation were not specified; Participants were not in the age range between 11-19 (mean age 10)
Raine et al., 2016	Average and standard deviation were not specified;
Rees-Jones et al., 2012	Participants were not in the age range between 11-19 (age range 18-65); Study did not provide an RCT design
Rhew et al., 2013	No DBDs patients were included in the study
Rhiner et al., 2011	Study did not provide an RCT design; No English language (German)
Rickson et al., 2003	No DBDs patients were included in the study (mixed disorders)
Ryan et al., 2013	No DBDs patients were included in the study (mixed disorders); Participants included in the control group were treated with a psychosocial intervention (counselling)
Salekin et al., 2012	Study did not provide an RCT design; No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Salzer et al., 2015	No English language (German)
Salzer et al., 2014	Participants included in the control group were treated with a psychosocial intervention (psychotherapy)
Santisteban et al., 2003	Participants included in the control group were treated with a psychosocial intervention (therapy)
Santisteban et al., 2017	No DBDs patients were included in the study (mixed disorders)
Santos et al., 2011	No DBDs patients were included in the study (preventive study)
Schaub et al., 2014	No DBDs patients were included in the study (other disorders); Participants included in the control group were treated with a psychosocial intervention (individual therapy)
Schijven et al., 2015	Protocol
Scott et al., 2001	Average and standard deviation were not specified
Shechtman et al., 2006	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Shechtman et al., 2000	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Shelton et al., 2009	Participants were not in the age range between 11-19 (mean age 28);
Sheridan et al., 2017	Participants were not in the age range between 11-19 (mean age 6);
Shore et al., 1967	Study did not provide an RCT design; No DBDs patients were included in the study

Sieving et al., 2014	Average and standard deviation were not specified
Simon et al., 2009	No DBDs patients were included in the study (preventive study)
Sinclair et al., 2016	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Smith et al., 2010	Study did not provide an RCT design
Smith et al., 2014	No DBDs patients were included in the study (preventive study)
Spilt et al., 2012	Participants were not in the age range between 11-19 (mean age 40); Participants included in the control group were treated with a psychosocial intervention (training)
Spoth et al., 2000	No DBDs patients were included in the study (preventive study)
Spoth et al., 2015	No DBDs patients were included in the study (preventive study)
Stadler et al., 2016	Average and standard deviation were not specified
Stadler et al., 2016	Average and standard deviation were not specified
Stevens et al., 2017	Study did not provide an RCT design
Stevens et al., 2000	No DBDs patients were included in the study (preventive study)
Streeck-Fischer et al., 2012	Average and standard deviation were not specified
Sundell et al., 2008	Participants included in the control group were treated with a psychosocial intervention (training, counselling, family therapy)
Swanson et al., 2001	No DBDs patients were included in the study (other disorders); Average and standard deviation were not specified
Taylor et al., 2013	No DBDs patients were included in the study (preventive study)
Te Brinke et al., 2018	Protocol
Tyrer et al., 2017	Participants were not in the age range between 11-19 (age range 17-70); No DBDs patients were included in the study (mixed disorders)
Van De Wiel et al., 2003	Participants included in the control group were treated with a psychosocial intervention (training, psychotherapy)
Van Ryzin et al., 2012	Average and standard deviation were not specified
Vaudreuil et al., 2017	Study did not provide an RCT design; Participants were not in the age range between 11-19 (mean age 10)
Vaziri et al., 2012	No English language
Wachlarowicz et al., 2012	Participants were not in the age range between 11-19 (mean age 30); Average and standard deviation were not specified

Walton et al., 2010	No DBDs patients were included in the study (mixed disorders)
Weeland et al., 2015	Protocol
Weichold et al., 2004	No English language (German)
Weis et al., 2005	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Weiss et al., 2015	Average and standard deviation were not specified
Weisz et al., 2012	Participants were not in the age range between 11-19 (age range 7-13); Participants included in the control group were treated with a psychosocial intervention
Weitkamp et al., 2017	Study did not provide an RCT design; Participants included in the control group were treated with a psychosocial intervention
Wettach et al., 2016	No English language (German)
Whitfield et al., 1999	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)
Wilmshurst et al., 2002	Participants included in the control group were treated with a psychosocial intervention; Participants were not in the age range between 11-19 (mean age 10)
Woolfenden et al., 2001	Study did not provide an RCT design
Zadeh et al., 2012	No DBDs patients were included in the study (preventive study)
Zatzick et al., 2014	No DBDs patients were included in the study (other disorders)
Zhang et al., 2015	No DBDs patients were included in the study (no standardized instruments were used for DBDs evaluation)

## Supplementary references

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