

A meta-analysis of long-term outpatient treatment effects for children and adolescents
with conduct problems

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Running Head: Lasting treatment effects

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Abstract

The present meta-analytic review explored long-term treatment effects in children and adolescents, age ranging from 2-17 years, treated because of conduct problems. The presumed mediators were examined. Various treatments, in all 56 studies including 2589 participants, were included. 32 studies involved an untreated control condition, whereas 24 studies did not. The overall weighted effect size (ES) in conduct problems after termination of treatment was a reduction of $ES = 0.08$ for a mean follow-up period of 8.9 months. Long-term changes on the presumed mediator showed a small deterioration of $ES = -0.06$. The moderator analysis confirmed that treatment effects in conduct problems and mediators were related. Changes in conduct problems from post-treatment to follow-up were larger in studies with CBT or a combination of BT/CBT compared to BT and FT. Individual treatments resulted in larger changes in aggressive behaviour as compared to group treatments or a combination of these. Treatment effects for both conduct problems and the presumed mediators seem to last, but changes were small. Few studies included teenagers and knowledge of lasting treatment effects is limited for older children including CBT treatments. More knowledge of the mediators involved in treatment is needed, in particular for cognitive and family therapeutic interventions.

Key-words: long-term, conduct problems, mediators, meta-analysis

Introduction

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2 Conduct problems, characterized by opposition, delinquency, temper tantrums, and acting-out behaviors give
3
4 cause for concern due to the nature *and* the stability of these problems. A longitudinal study found that 57% of
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6 children that were considered oppositional met the diagnostic criteria for oppositional defiant disorder (ODD) at
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8 least once during a four-year period (August, Realmuto, Joyce, & Hektner, 1999). Similarly, 88% of clinic-
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10 referred boys with conduct disorder (CD) met diagnostic criteria at least once more during a three-year follow-up
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12 period (Lahey et al., 1995), whereas the persistence of CD after seven years was 50% (Lahey, Loeber, Burke,
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14 Rathouz, & McBurnett, 2002). The estimated lifetime prevalences of childhood-onset CD and ODD were 9.5%
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16 and 10.2%, respectively (Nock, Kazdin, Hiripi, & Kessler, 2006, 2007). Among those with lifelong ODD, more
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18 than 90% of the participants suffered from at least one other lifetime diagnostic condition such as a mood
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20 disorder, an anxiety disorder, an impulse-control disorder or a substance-abuse disorder (Nock et al., 2007).
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22 Understanding the long-term effectiveness of various treatments is important in order to optimize the
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24 maintenance of positive child behavior change, with the view to alter children's pathways to aggressive and
25
26 delinquent behaviors. Moreover, we need valid knowledge about the long-term effects of treatment for conduct
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28 problems (McMahon, 1994).
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31 Several reviews and meta-analyses relevant to the treatment of conduct problems have been published
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33 (see e.g. Bennett & Gibbons, 2000; Eyberg, Nelson & Boggs, 2008; Fossum, Handegard, Martinussen, & Morch,
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35 2008; Kaminski, Valle, Filene, & Boyle, 2008; McCart, Priester, Davies, & Azen, 2006; Menting, de Castro &
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37 Matthys, 2013; Serketich & Dumas, 1996; Sukhodolsky, Kassinove, & Gorman, 2004; Weisz, Weiss, Alicka, &
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39 Klotz, 1987; Weisz, Weiss, Han, Granger, & Morton, 1995). However, our knowledge of long-term treatment
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41 outcomes is still rather limited. A few meta-analyses report the long-term results of individual studies (Serketich
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43 & Dumas, 1996; Bennett & Gibbons, 2000). One review focusing on two specific treatment programs (Parent
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45 Child Interaction Therapy [PCIT] and Positive Parenting Program [Triple-p]) reported treatment effects from
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47 pre-treatment to post-treatment and from pre-treatment until follow-up for these programs, (Thomas & Zimmer-
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49 Gembeck, 2007) and one review reported lasting positive effects for evidence-based treatments (Eyberg et al.,
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51 2008). One review that focused on parent training presented the results of moderator effects and follow-up
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53 effects, but long-term treatment effects were not assessed (Lundahl, Risser & Lovejoy, 2006). To the best of our
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55 knowledge, no systematic review has focused on the long-term effects of treatment (e.g. changes in conduct
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57 problems from pre-treatment to post-treatment *and* from post-treatment until follow-up) in reducing conduct
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59 problems in children and adolescents, in studies that included a range of psychosocial treatments.
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Besides reduction in conduct problems, it is important to explore the magnitude of the change on the mediators, both immediately at the termination of treatment and in terms of lasting changes. Mediation effects refer to the feasible underlying processes of change in treatment, or the mechanisms of change. The need for more knowledge about mediators has been addressed in research (Jensen, Weersing, Hoagwood, & Goldman, 2005; Kazdin & Nock, 2003; Kraemer, Wilson, Fairburn, & Agras 2002). As noted by Weersing and Weisz (2002), many studies do explore and report the results of possible mediators, but actual mediator analyses are rarely done. As a consequence, we named these variables presumed mediators. When considering the effects of the presumed mediators, we base our analyses on the suggestions of Kraemer and colleagues (Kraemer et al., 2002), who argued that the mediator is an event or change during treatment that has either a main effect or interactive effect on the outcome of treatment. They also argued that there should be a theoretical basis for the choice of the measure. The presumed variables were chosen on the basis of core qualities of the treatment programs whenever formal tests of the associations between the mediator and reductions in conduct problems were not performed. The presumed mediator in parenting programs was therefore *altered parenting* (most often altered negative parenting), while in cognitive treatments the presumed mediator was *altered cognitions* that result in, for instance, anger management skills, and in family therapy mediation refers to alterations in family functioning, for instance family cohesion. A review of six clinical trials of the parent-training program “The incredible years,” identified harsh and inconsistent parenting as mediators (Beauchaine, Webster-Stratton, & Reid, 2005). Apart from this study, we are unaware of any review that systematically estimated the effects of the mediators in different treatments. Our review may provide important information of both clinical and scientific interest.

This study presents data on the lasting effects of outpatient treatment of children and adolescents with conduct problems, previously not systematically reviewed. The goals of the study are to examine: (i) lasting treatment effects for changes in conduct problems, (ii) long-term changes of presumed mediators, and (iii) the overall treatment effects on changes in conduct problems and the presumed mediators (which we examine by calculating the immediate treatment effects) are calculated.

Method

Inclusion and exclusion criteria

Inclusion criteria in the study were: (a) conduct problems within the clinical range before treatment; (b) mean age below 18 at study intake; (c) the study reported at least one parent-reported quantitative measure

(rating scale or method of observation) of change in conduct problems from pre-treatment until post-treatment and from post-treatment to at least a three months follow-up. The exclusion criteria were: (a) studies of psychosocial interventions not identified or described by the authors; (b) single-case studies; (c) studies that did not maintain psychopharmacological treatment throughout the treatment phase; (d) children suffering from a debilitating mental handicap (such as autism); (e) studies of prevention, inpatient treatments and foster-care treatments; (f) unpublished studies.

Psychosocial treatment was defined as any psychological intervention aimed at reducing conduct problems, aggressive, oppositional and maladaptive behaviors, or enhancing prosocial behavior through counselling, training programs or predetermined treatment plans. This definition is in line with the definition used by Weisz and his colleagues (1987; 1995). Studies that included only reading interventions (“bibliotherapy”) were excluded if not accompanied by other interventions (such as counselling or “video-based” interventions).

Search for studies

Studies from a recent review (Fossum et al., 2008) presenting data from pre-treatment to post-treatment and until a follow-up were included. In addition, we searched for other relevant studies by the authors of these studies, resulting in 36 studies. A search for studies presenting long-term treatment results in previously published meta-analyses (Kaminski et al., 2008; McCart et al., 2006; Sukhodolsky et al., 2004) was made, and resulted in another five publications. Systematic and comprehensive searches for studies using the psychINFO, MEDLINE, and ERIC databases from 1980 until February 2010 were carried out, adding another 15 studies. For details in the literature search and the search phrases see Figure 1.

<insert Figure 1 about here>

As expected, we identified few studies that conducted either a formal mediation analysis or explored if the changes in conduct problems and the mediator were related. In order to improve our knowledge of the role of the mediators we therefore made additional searches of psychINFO on the surname of the first author of the included studies and the search phrases (*treat** or *psychother** or *therap** or *cbt**) **and** (*child** or *adoles** or *youth**) **and** (*antisoc** or *aggress** or *defiant** or *opposition** or *conduct* or *disrupti** or *delinq**) **and** (*mediator* or *mechanism of change*). This process identified 76 studies, of which three explored the role of the mediator in an included study, marked ^a in the column ‘Presumed mediator’ in Table 2, and ^b in the references.

Study coding

Studies were grouped into two main types, those studies who had an untreated (i.e. waiting-list) control condition (design-1) and those who had either a treated control or no control (design-2).

Some variables were included due to their possible importance for long-term treatment outcomes in the moderator analysis. The length of the follow-up period was incorporated as a variable of particular interest for both conduct problems and the mediator. Attrition from the study (i.e. the percentage of the participants not available at follow-up) was also coded as a variable of possible relevance for the long-term outcome of treatment. Attrition rates were calculated using information from the studies of participants after inclusion or randomization, when available.

Lists of potential variables of interest for change in aggressive and mediating behaviors in the moderator analysis were also coded for each study. The moderator variables included the following: Treatments fell into the categories of Behavioral Therapy (BT), Cognitive Behavioral Therapy (CBT), BT and CBT in combination, or Family Therapy (FT). The BT interventions were various formats of parent training which typically focus on reducing negative parenting and increasing positive parenting thereby altering the children's behavior. CBT included interventions focusing on children's anger management, social-skills and/or problem-solving skills. In FT, the focus was on family communication, improving parenting and empowering the parents. The mean number of treatment sessions and the duration of the treatment curricula were coded as potential moderators. The moderator variables also included mean age of the children, number of participants, percentage of attrition and allocation of subjects. The presumed mediators were coded as changes in parenting (with the exception of one study that reported positive parenting as being the mediator [Gardner et al, 2006], the mediator was negative parenting), change in family functioning (family cohesion) or altered cognitions (resulting in improved anger management). The coding manual involved a total of 13 coding variables, of which the eight most relevant were included in the moderator analysis – see Table 4. Some variables were omitted. We were interested, for instance, in more knowledge of the role of “booster sessions” and “treatment dosages during the booster sessions” for long-term treatment results, but we ended up with only one study that presented such information. In a few cases where the published studies did not include all the relevant data, we were able to obtain this data directly from the authors (see acknowledgement).

Procedure and statistical analysis

In order to ensure independent ESs, a single ES was calculated for changes in conduct problems and the presumed mediator for each study. Non-independent ESs are problematic, as these tend to give more weight to studies with multiple ESs compared to studies with only one effect size when the data are merged, as well as violating the assumptions underlying estimation and statistical tests of variance across studies. Some of the studies involved several interventions or several modifications of interventions. A pooled total effect was computed for such studies, weighted by the number of participants in each condition. These procedures eliminated possible differences in treatment effects between the conditions. Studies were categorized as BT, BT/CBT, CBT or FT based on considerations of the core purpose of the interventions. Parent training interventions that also included other interventions (for instance some studies of the Incredible Years included several treatment formats – see Webster-Stratton et al., 1997) were categorized as BT, whereas a study of older children with multiple interventions (Dishion & Andrews, 1995) but with a main focus on the teenagers' anger management was categorized as CBT. Data from each relevant comparison in each study were used to estimate the ESs. If a study reported several measures of conduct problems, a pooled ES of the measures was reported. Since mothers generally outnumbered fathers as respondents and relatively few studies reported father measures, only data from mothers were included. The characteristics of the studies are reported in Table 2. Five of the studies with either a treated control or no control (design-2) involved a “treatment as usual” or a treatment control condition not suited for merging the data, marked with † in Table 2. The pre-post differences in the “treatment as usual” condition were not included in order to ensure the independence of the data when the studies were merged.

The average total effect is a weighed mean of the individual effects and was calculated using the following formula:

$$\overline{ES} = \frac{\sum_{i=1}^k \frac{1}{v_i + \tau^2} \cdot (ES)_i}{\sum_{i=1}^k \frac{1}{v_i + \tau^2}},$$

k being the number of studies, v_i is the within-study variance for the i^{th} study, and τ^2 is the between-studies variance (Borenstein & Rothstein, 1999). The 95% confidence interval for the population effect size in the random effects model was computed in the following manner:

$$(\overline{ES} - 1.96 \cdot S; \overline{ES} + 1.96 \cdot S)$$

with \overline{ES} being the average effect size, and S the standard error for this effect. S was computed as:

$$\sqrt{\frac{1}{\sum_{i=1}^k \frac{1}{v_i + \tau^2}}},$$

The random effects model was chosen in this meta-analysis. We expected true variation in the population parameters, and the random effects model was more appropriate under these assumptions. The studies varied in a number of ways such as including various types and formats of the interventions, treatment length, the number of participants, and time from ended treatment until follow-up. This led to the expectation of varying effect sizes. Furthermore, as noted by Weisz et al. (2006), random-effects models are appropriate for analyses that involve a heterogeneous set of ESs from which we want to draw inferences about a population of studies that extend beyond the observed sample. Another argument in support of the use of a random effects model was the relatively small number of studies in this area, which results in a low statistical power for the chi-square test used to test variation between studies (Martinussen & Bjørnstad, 1999). The test may, under these circumstances, fail to reject the homogeneity hypothesis even with substantial differences between studies.

In the design-1 studies, the pre-to-post ESs of both conduct problems and presumed mediators were calculated using the following formula:

$$ES_1 = \frac{m_I - m_C}{SD_{(pooled)}}$$

ES₁ was calculated as the difference between the mean changes in the treatment intervention condition(s) (m_I) and the untreated control condition (m_C) divided by the pooled standard deviation of the pretest score in the two conditions ($SD_{(pooled)}$). For design-2 studies, a within-group effect size was calculated for pre-to-post-treatment changes, using the following formula suggested by Becker (1988), for both conduct problems and presumed mediators:

$$ES_2 = \frac{m_{t1} - m_{t2}}{SD_{t1}}$$

ES₂ was calculated subtracting the mean score at time 1 (m_{t1}) with the mean score at time 2 (m_{t2}) divided by the standard deviation of the pretest score (SD_{t1}).

In 50 of the included 56 studies there were either a waitlist control condition or no control group. The waitlist families were treated after the post measure, and the long-term treatment effects concerning both aggressive behaviors and presumed mediators were therefore calculated as a within-group effect (for those in the treatment group condition):

$$ES_{fu} = \frac{m_{t2} - m_{t3}}{SD_{t1}}$$

The pre-test standard deviation was chosen as denominator because it had not been influenced by the experimental manipulations (i.e. differential treatment effects) and was therefore more likely to be consistent across studies, further allowing us to analyse long-term treatment effects applying the same metric on several occasions. All ESs were calculated using the Comprehensive Meta-Analysis Program (Borenstein & Rothstein, 1999). Each ES was weighted by the inverse of its variance, in order to give more weight to studies with larger sample sizes. A positive ES indicated a preferable treatment result in aggressive and mediating behaviors. According to Cohen's descriptions, an ES of $d = 0.2$ typically denotes a "small" effect, $d = 0.5$ denotes a "medium" effect, and $d = 0.8$ denotes a "large" effect (Cohen, 1977).

The analyses of potential moderator variables were performed using SPSS. A weighted, inverse variance least squares regression analysis was conducted in order to assess the relationship between the ESs and the moderator variables in accordance with the recommendations by Lipsey and Wilson (2001). The value of inverse variance of the effect was used in these analyses as weight of the study in aggressive or mediating behaviors. Within meta-analysis, moderator analyses are conducted in cases when heterogeneity is significant, because the variation in the obtained ESs is beyond what can be explained by sampling variation (Hunter & Schmidt, 2004). But since the focus in this study is on long-term effects after treatment termination, most likely resulting in less heterogeneity, a moderator analysis will nevertheless be conducted.

Results

Sample characteristics. We identified 56 studies from eight countries published between 1984 and 2010 that fulfilled the inclusion criteria. Eight studies presented treatment outcomes on a second follow-up. 40 studies presented treatment effects on a presumed mediator from pre-treatment to post-treatment, while 37 presented these outcomes at the first follow-up. The mean length from post-treatment until the first follow-up was 8.9 months ($SD = 6.5$) (mode = 12, range 3-48) and the mean follow-up period from the first to the second follow-up was 20.3 months ($SD = 7.8$) (mode = 18, range 12-36). The mean total percentage of boys in these studies was 70.8 ($SD = 20.9$). The mean age of the participants in the 33 studies with complete data using BT interventions was 5.5 years ($SD = 1.7$). In the 11 studies combining BT/CBT studies the mean age was 8.4 years ($SD = 2.2$). In the 6 studies that employed a CBT intervention the mean age was 9.9 years ($SD = 4.4$), while in the two studies with FT intervention the mean age was 14.9 years. The mean age differed significantly between the various

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modes of treatment, $F(3, 51) = 21.5, p < .001$. The studies that provided information about the development in aggression from a first to a second follow-up were BT or a combination of BT/CBT. Table 1 shows demographic information about the included studies related to the included treatments.

<Insert Table 1 about here>

The sample characteristics of the 56 studies included in the meta-analysis are shown in Table 2. A total of 2821 individual participants were included 32 design-1 studies, with mean ages ranging from 3.4 – 14.5 years. 24 design-2 studies were included with a total of 1184 participants. The mean age ranged from 3.7 – 16.0 years.

<insert Table 2 about here>

Changes from pre-treatment to post-treatment. The overall mean weighted ES concerning conduct problems in the design-1 studies from pre-treatment to post-treatment was 0.64. All but one of the ESs in conduct problems were positive in direction from pre-treatment to post-treatment in the design-1 studies, indicating larger treatment effects in the treatment conditions compared with the untreated control condition. The overall weighted ES of the presumed mediators in the design-1 studies was 0.65. When considering treatment effects on the presumed mediators, none of the design-1 studies reported deterioration from pre-treatment to post-treatment, but one study reported an ES close to zero. The overall weighted ES in the 24 studies included in the design-2 studies was 1.05. Thirteen design-2 studies reported changes in the presumed mediator, and the overall ES was 0.83.

The moderator analysis showed a significant association between mean age and the treatment effect, implying larger reductions in conduct problems in younger than in older children. Larger doses of treatment resulted in significantly larger treatment effects on the presumed mediator but not on conduct problems. There was a significant association between the magnitude of change in the mediator behavior and the magnitude of change in aggression from pre-treatment to post-treatment. There was also a significant association between treatment format and change in aggression in that individual treatment formats resulted in larger changes in aggressive behavior. None of the other variables, e.g. the mode of treatment or the mechanism of change in treatment, indicated any significant trends concerning aggressive or mediating behaviors from pre-treatment to post-treatment.

Changes from post-treatment to follow-up. The reported changes in conduct problems from post-treatment until the first follow-up were small, but 17 studies did report slight increases in conduct problems. The ESs ranged from greater conduct problems equivalent to an ES of -0.71 to a reduction of 0.54. The overall weighted mean change was a non-significant reduction in conduct problems of ES = 0.08. The test of heterogeneity was non-significant. Stem-and-leaf plots of weighted effect sizes for aggressive behavior and the presumed mediators from post-treatment until the first follow-up are shown in Figure 2. The distributions of effect sizes showed no extreme deviations from the normal distribution and the ESs were close to zero or small deteriorations or improvements. The changes in the presumed mediator from post-treatment until follow-up were small and not significant. Twenty studies reported deteriorations in the presumed mediator, but the test of heterogeneity was not significant, with an overall not significant ESs suggesting a deterioration equal to -0.06.

<insert Figure 2 about here>

In the eight studies that reported changes in conduct problems from a first to a second follow-up, the changes were negative in five of the studies, but tended to be close to zero. The overall weighted ES was 0.04. In the two studies that presented the results of the presumed mediators, the changes were small.

There were no significant associations between the size of the ESs, mode of treatment, and the length of the follow-up period, $F(3, 55) = .38, ns$. There was no tendency for longer follow-up periods to result in smaller ESs in conduct problems ($r = -0.11, ns$) or the presumed mediator ($r = -0.07, ns$). In the 50 studies with complete data, there was a small and non-significant correlation between the percentage lost from pre-treatment until follow-up and the size of the ES during this period in conduct problems ($r = -0.13, ns$) and in the 33 studies of presumed mediators ($r = 0.22, ns$). The correlations between the changes in conduct problems from pre-treatment to post-treatment and from post-treatment to follow-up was significantly negative ($r = -0.30, p < .05$), indicating that studies with larger ESs from pre-treatment to post-treatment did report deteriorations in conduct problems to a larger extent than studies producing somewhat smaller ESs from pre-treatment to post-treatment. The same tendencies were true for the presumed mediators at follow-up ($r = -0.39, p < .05$). Table 3 presents detailed information on overall weighted changes in conduct problems and on the presumed mediators from pre-treatment to post-treatment, from post-treatment to the first follow-up and from the first to the second follow-up.

<Insert Table 3 about here>

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4 Table 4 presents the findings of the moderator analysis of changes from pre-treatment to post-treatment
5 and from post-treatment until the 1st follow-up in conduct problems and the presumed mediators.
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10 <Insert Table 4 about here>

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13 In the CBT and the BT/CBT studies the changes in conduct problems were larger than in the studies of BT and
14 FT. Further, in the studies in which the mediators were altered cognitions and family functioning, there was a
15 tendency for larger changes to appear in conduct problems from post-treatment to follow-up than in the studies
16 that employed altered parenting as the mediator. None of the other variables were significant.
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22 Discussion

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25 The main purpose of this study was to explore whether treatment effects for children and adolescents
26 with conduct problems last. We identified 56 studies published from 1980 until February 2010 that offered
27 information from pre-treatment until a follow-up. In all, 34 studies were BT interventions and various parent-
28 training interventions, 12 studies were combined BT and CBT interventions, seven were CBT interventions and
29 three were FT interventions. Evidently, the BT interventions are most often subject to long-term evaluation,
30 sometimes in combination with CBT, and typically with younger children. CBT and FT interventions are more
31 rarely evaluated, and when they are evaluated they typically include older children and adolescents. When
32 interpreting the results, two perspectives are of importance. It is somewhat promising that the overall changes in
33 conduct problems were small from post-treatment until follow-up (see Figure 2), and that there was a small
34 reduction in conduct problems after treatment ($ES = 0.08$), also when the length of the follow-up period was
35 controlled for. It is of interest to notice that no studies reported of significant increases in conduct problems
36 during the follow-up period, but it is obviously important to bear in mind that the statistical power in many of
37 these tests was limited. Furthermore, the test of heterogeneity was non-significant, which indicates that
38 variations in the ESs were limited. Eight studies presented information from a first to a second follow-up. The
39 impression remained the same when these studies were merged, six of the eight displayed a slight increase in
40 conduct problems. The changes in conduct problems seem to come to a stop after treatment has ended though,
41 which is of both clinical and scientific interest. It is unwise to expect changes in conduct problems after ended
42 treatment. This should be addressed clinically in particular for non-responders, and also scientifically, to ensure a
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1 positive development even though treatment has ended. With regard to which variables that predict positive
2 changes after treatment has ended, in the studies with treatments classified as BT in combination with CBT or in
3 the studies with CBT, the changes in conduct problems were significantly larger compared to the studies of BT
4 or FT. The same was seen in conduct problems regarding the mediator cognition. This mediator was
5 significantly larger than changes in parenting or family functioning. Finally, older children seem to experience
6 larger ESs in the follow-up period than the younger children, most likely related to the fact that the CBT
7 receivers were older. Even though attrition was high in some of the studies, it seems as attrition did not cause
8 these findings. There were non-significant correlations between attrition and the ESs in conduct problems and
9 the presumed mediator from post-treatment until the first follow-up, suggesting that attrition did not explain why
10 the treatment results usually seemed to persist after termination of treatment.
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20 We were also interested in learning more about changes in the presumed mediators in these studies.
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22 Thirty-seven studies reported changes on a presumed mediator from post-treatment until follow-up. As for
23 conduct problems, the overall changes in the mediators were small during this period ($ES = -0.06$) and the test of
24 heterogeneity was not significant. The small changes in the presumed mediators after treatment (see Table 2 and
25 Figure 2) are further indications of lasting treatment effects. But as for changes in conduct problems, the same
26 caution should be taken regarding the changes in mediators – after treatment termination the changes are small
27 and steps to improve aftercare are essential. Understanding the changes in the mediators are somewhat
28 complicated. For example the changes in the mediators from pretreatment to posttreatment were in the moderate
29 range in our study, this was the case both for overall mediators (Table 2) and for the presumed mediator
30 “parenting” (Table 4). This effect is larger than the behavioral change in parenting reported by Kaminski et al.
31 (2008). The differences in findings could be due to the present study only including studies with clinical
32 samples, resulting in the potential for change being larger in sum, as opposed to Kaminski and colleagues
33 (2008), who included both non-clinical and clinical samples. Further, there was a strong association between the
34 changes in conduct problems and the mediators from pre-treatment until post-treatment in the moderator analysis
35 (Table 4), which demonstrated the relevance of taking both of these variables into account when considering the
36 treatment effects of an intervention. Still, the correlation was far from one, indicating that more factors than one
37 mediator alone caused the changes in conduct problems. Jensen and colleagues (2005) suggest several factors of
38 potential relevance in treatment, i.e. therapeutic effects of attention, beliefs, expectancies, and values. In this
39 study, we considered only the outcome of one presumed mediator in each study. Obviously, several mediators
40 may be involved in treatment and should be tested for (Eyberg et al., 2008; Kazdin & Nock, 2002), and future
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1 studies should be planned and designed with this in mind, as suggested by Eyberg et al. (2008) and Kraemer et
2 al. (2002).

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4 Of the 56 studies, 40 reported changes in a presumed mediator. It is somewhat surprising that only nine
5 of these studies actually controlled for the role of the mediator on the development of the conduct problems,
6 even after additional searches had been performed. Twenty-nine of the 40 studies exploring the role of the
7 presumed mediator were published in 1999 or later. Consequently, the need for more knowledge of actual
8 mediators in psychosocial treatments of conduct problems is obvious, in particular in interventions that employ
9 family-based and cognitively-based therapies. Eight studies were classified applying “cognitions” as the
10 presumed mediator, as against 28 studies using altered parenting. In the moderator analysis of changes from
11 *post-treatment to follow-up* in conduct problems, in the CBT interventions either alone or in combination with
12 the BT interventions, the changes in conduct problems were larger than in the studies of the BT and the FT
13 treatments. The same was true for the mediator “cognition” as compared to “parenting” and “family
14 functioning”. There is a possibility that the delayed treatment effects in the studies with CBT or “cognitions”, as
15 seen in the moderator analysis (Table 4), is a chance finding, given the limited information base. We found that
16 eight of nine studies that tested the role of the mediator were parenting programmes with altered parenting being
17 the mediator, while one study of CBT reported testing this (i.e. altered cognitions resulting in improved anger
18 management skills - see Cavell & Hughes, 2000). As such, our finding concerning the outcomes of mediators
19 and treatment on conduct problems is another confirmation of the scarcity of the empirical knowledge
20 concerning evidence-based treatments, as noted by Jensen and colleagues (2005).

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22 The moderator analysis of pre-to-post changes showed that studies conducting randomization or
23 matching procedures resulted in smaller effect sizes compared to studies with a pre-post design. The same was
24 true for the variables mean age and sample size as well for change in conduct problems. Individual treatment
25 resulted in larger changes in aggressive behavior compared to treatments with a group or combination of both
26 group and individual treatment. Eyberg et al. (2008) highlighted the need to focus on the individual needs of the
27 children and families in treatment. Intuitively, individual treatments would seem more likely to ensure this.
28 Further, Lundahl et al. (2006) suggested that individual PT is more suited for families with a low socio-economic
29 status. Both issues may influence outcomes of the moderator analysis. Still, there was no difference between
30 treatment formats and the presumed mediators in treatment, which might be expected. This might be influenced
31 by the role of multiple mediators and factors in treatment, not included here.

1 Findings may be influenced by studies with smaller sample sizes, often on younger children and with no
2 control group and poorer experimental control, and may result in an overestimation of reductions in conduct
3 problems. Further, studies with an untreated control group (design-1) produced smaller treatment effects in both
4 conduct problems and in the presumed mediator than did studies with no untreated control group (design-2). The
5 control-group design has a higher internal validity than a pretest-posttest design has, where factors such as test-
6 retest effects, history and maturation may contribute to observed differences in pre-test and post-test scores, in
7 addition to the treatment effects. These threats to internal validity and regression toward the mean may explain
8 why the mean estimated effect size is larger for a pretest-posttest design than for a control-group design
9 (Shadish, Cook, & Campbell, 2002). It is also of some importance to notice that there was a significant effect
10 indicating a worsening in conduct problems at follow-up among children in studies that reported larger ESs from
11 pre-treatment to post-treatment. The same trend was present for the mediating behaviors too. Although these
12 deteriorations were not significant in any single study, the magnitude of the deteriorations was close to the
13 moderate range in some studies.

14 In discussing treatment dosages and treatment outcome, Beauchaine et al. (2005) suggested that more
15 treatment is better than less, whereas Nixon et al. (2004) reported few differences between children treated with
16 standard or abbreviated parent-child interaction therapy (PCIT). In our study, treatment dosages were
17 significantly correlated with the presumed mediators at post-treatment, indicating that more treatment did in fact
18 result in larger changes in the mediator. Since obtaining change on the mediator behavior is often one of the
19 main areas of focus in these treatments, this makes sense. The same trend was also evident for treatment dosages
20 and conduct problems, although the associations were not significant. Unfortunately, relatively few of the studies
21 described treatment dosages. For this reason, we do not know enough about the relevance of treatment dosages
22 in the treatment of children and adolescents with conduct problems.

23 *Limitations*

24 The inclusion of studies was not in accordance with the standards of MARS (APA, 2008). We did not
25 exclusively include RCT studies, due to the low number of studies fulfilling these criteria (see Table 2). Due to
26 the focus on long-term treatment effects, a decision of calculating within-group changes for the studies from
27 post-treatment until follow-up was made for all studies. We conducted a moderator analysis for changes from
28 post-treatment to follow-up due to the focus on this time of period, although the test of heterogeneity was non-

1 significant, as such violating the premise for doing such an analysis. Caution in interpreting these results is
2 imperative.

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4 In total, we were able to identify 56 studies that described lasting treatment effects. This is a fairly low
5 figure. Further, it is unfortunate that we were able to identify only seven studies that reported lasting treatment
6 effects for older children and adolescents with a mean age of 12 or older. Our knowledge of lasting treatment
7 effects for adolescents is thus very limited, and caution in interpreting lasting treatment effects for adolescents is
8 essential. Due to the limited number of studies, caution is needed in evaluating the effects in the moderator
9 analysis.
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18 ***Conclusions***

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20 In general, treatment effects in aggressive as well as mediating behaviors seem to last, but changes after
21 treatment tend to be small. Although the correlation between change in the mediators and conduct problems was
22 pronounced, better knowledge of the presumed mediators and the significance of this variable in treatment is
23 needed. In the controlled studies, the overall treatment results at post-treatment were moderate as far as reduced
24 aggression and the presumed mediators were concerned, indicating that there still is a need to further develop
25 more effective interventions, particularly interventions for older children and adolescents. We would emphasize
26 the importance of performing follow-up studies in both clinical and scientific practice. It is very probable that
27 some of the children with positive treatment results may in fact experience deteriorations in conduct problems,
28 even into the clinical range, although the setback in conduct problems in the total population remains non-
29 significant.
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Table 1. Information about treatment interventions

Treatment	<i>k</i>	<i>n</i>	Age		Dose	Months to	%	med	WLC/ no con	Treatment format		
			mean (sd)	age range	mean (SD)	FU	mean (SD)	test		ind	group	comb
BT	34	2739	5.5 (1.7)	2-17	12.3 (4.3)	9.4 (7.9)	26.3 (14.8)	8	21/ 12	13	15	6
BT/ CBT	12	698	8.4 (2.2)	4-14	9.0 (-)	6.0 (3.2)	26.2 (13.9)	0	6/ 5	3	7	2
CBT	7	452	10.9 (4.1)	4-18	20.0 (2.8)	8.6 (3.6)	31.9 (26.2)	1	3/ 2	1	5	1
FT	3	116	14.9 (.5)	7-17	30 (-)	11.0 (1.7)	20.7 (15.7)	0	1/ -	2	1	-

Note.

BT = behavior therapy, CBT = cognitive behavioral therapy, BT/ CBT = combined PT and CBT treatment, FT = family therapy, *k* = number of included studies,

n = number of participants in each treatment, Age range = range of participants age. Dose/ Max dose = Treatment dose and maximum treatment dose.

Month to FU = Number of months from post-treatment to follow-up. % = percentage attrition for pre-treatment until follow-up. Med test = test of mediator

is related to reduced aggression. WLC/ no con = studies with either waiting list controls or no control. Treatment format = individual (ind), group or combined

individual and group treatments.

Table 2. Immediate and long-term effects on aggressive behavior and mediators

Authors	<i>n</i>	age	Tx	dose	FU	%	D	conduct problems		mediator	
								ES ₁	ES _{fu}	ES ₁	ES _{fu}
Behan et al., 2001	40	7.6 (3-12)	BT	- / 8	5,5	20.0%	r	0.56	-0.24	-	-
Blair Irvine et al., 1999	255	12.2 (-)	BT	6.3/ 12	6	55.0%	r	0.29	0.14	0.21 ^{ap}	0.14 ^p
Bor et al., 2002	63	3.5 (3-4)	BT	15.0/ -	12	27.6%	r	0.65	-0.13	0.59 ^p	0.06 ^p
Bradley et al., 2003	174	3.8 (3-4)	BT	- / 4	12	9.9%	r	0.25	0.31	0.60 ^{ap}	-0.45 ^p
Connell et al., 1997	23	4.3 (2-6)	BT	-/ 10	4	40.0%	r	2.45	0.31	1.88 ^p	-0.32 ^p
Connolly et al., 2001	103	6.7 (2-10)	BT	- /10	6	32.9%	m	0.17	0.09	-	-
Cunningham et al., 1995	113	4.4 (-)	BT	- / 12	6	23.7%	r	0.21	0.23	0.02 ^f	0.23 ^f
Dishion & Andrews, 1995	141	12.0 (11-14)	CBT	8.4/ 12	12	10.4%	r	0.17	-0.05	0.63 ^p	-
Feinfeld & Baker, 2004	47	6.6 (4-8)	BT/FT	- / 12	5	30.3%	r	0.67	0.28	0.82 ^{ap}	-
Gardner et al., 2006	71	6.0 (2-9)	BT	9.0/ 12	18	14.0%	r	0.39	-0.08	0.47 ^{ap}	0.04 ^p
Hemphill & Littlefield, 2001	139	8.9 (5-14)	BT/CBT	9.0/ 10	12	55.0%	m	0.55	0.04	-	-
Jones et al., 2008	79	3.9 (3-4)	BT	9.5/ 12	12	12.0%	r	0.72	0.20	-	-
Larsson et al., 2009	127	6.6 (4-8)	BT	11.0/14	12	11.1%	r	0.60	0.06	0.43 ^{bp}	0.11 ^p
Leung et al., 2009	110	5.3 (2-8)	BT	15.7/ 27	3	29.0%	m	1.61	-0.01	1.22 ^p	0.16 ^p
Magen & Rose, 1994	37	7.0 (5-11)	BT/CBT	- / 8	3	-	r	-0.04	0.24	0.10 ^f	-0.23 ^f
Martin & Sanders, 2003	30	5.8 (2-9)	BT	- / 8	4	65.2%	r	0.65	0.02	0.80 ^p	1.03 ^p
Moretti & Obsuth, 2009	17	14.5 (12-16)	Attach	- / 10	12	15.0%	n	0.37	0.32	0.53 ^f	0.32 ^f

Nixon et al., 2004	54	3.9 (3-5)	BT	12.3/ 12	6	21.6%	r	0.64	0.29	1.29 ^p	-0.11 ^p
Pepler et al., 2010	77	8.6 (5-11)	BT/CBT	- / 12	6	24.1%	r	0.42	0.15	0.43 ^c	0.12 ^c
Pfiffner & McBurnett, 1997	27	-(8-10)	BT/CBT	- / 8	3	-	r	0.42	-0.23	-	-
Prinz et al., 1994	80	-(6-9)	CBT	22.0/ 24	6	18.8%	r	0.58	0.40	0.74 ^c	0.01 ^c
Sanders et al., 2000	194	3.4 (3-4)	BT	-/ 10	12	27.5%	r	0.83	-0.26	1.17 ^p	-0.32 ^p
Sayger et al., 1988	37	-(7-10)	FT/BT	- / 10	9	29.0 %	r	1.27	-0.01	0.70 ^f	-0.14 ^f
Scott, 2005	110	4.5 (3-8)	BT	9.1/ 16	12	19,2	r	0.90	0.01	0.76 ^{bp}	-
Spaccarelli et al., 1992	53	6.1 (-)	BT/CBT	- / 16	3	15.1%	r	0.85	0.10	1.09 ^p	-0.38 ^p
Turner et al., 2007	38	5.9 (1-13)	BT	- / 8	6	25.5%	r	0.73	0.18	0.12 ^p	-0.05 ^p
van Manen et al., 2004	97	11.2 (9-13)	CBT	- /11	12	-	r	0.15	0.42	0.24 ^c	0.19 ^c
Webster-Stratton, 1984	35	4.9 (3-8)	BT	8.8 /10	12	11.4%	r	0.91	0.03	0.96 ^p	-0.01 ^p
Webster-Stratton, 1992	100	5.0 (3-8)	BT	9.6/ 10	12	15.3%	r	0.67	0.22	0.21 ^p	0.06 ^p
Webster-Stratton & Hammond,1997	95	5.6 (4-7)	BT	19.6/ 24	12	-	r	1.14	0.04	0.67 ^p	-0.04 ^p
Webster-Stratton et al., 2001	97	6.0 (4-8)	CBT	18.0/ 24	12	10.2%	r	0.35	0.30	0.56 ^c	0.11 ^c
Webster-Statton et al., 2004	158	5.9 (4-8)	BT	22.0/ 24	12	8.4%	r	0.93	0.13	1.13 ^{bp}	-0.12 ^p

Part B: Study characteristics and effect sizes in studies without an untreated control (ES₂):

	n	age	Tx	dose	FU	%	D	ES ₂	ES _{fu}	ES ₂	ES _{fu}
Augimeri et al., 2007†	30	8.7 (?-12)	BT/CBT	- / 12	6	-	m	0.33	0.27	-	-
Azrin et al., 2001	56	15.4 (12-17)	CBT	- / 15	6	37.2%	r	1.06	0.54	0.59 ^c	-0.06 ^c

Webster-Stratton, 1994	39	4.9 (3-8)	BT		3,5	10.6%	r	0.73	0.22	0.52 ^P	0.01 ^P
Webster-Stratton, 1996	193	5.0 (3-7)	BT	- / 12	12	13.1%	n	1.03	0.09	-	-

Note.

ES₁: between group change from pre- to post-treatment, ES₂: Within group change from pre-treatment to post-treatment, ES_{fu}: changes for post-treatment to

1st follow-up. Dose = Treatment dose/ maximum treatment dose. FU = Number of months from post-treatment to follow-up. % = percentage attrition for

pre-treatment until follow-up. D = Design: r = randomization, m = matching procedures, n = no randomization or matching. Tx = Treatment,

BT = behavior therapy, FT = family therapy, CBT = cognitive behavioral therapy, Attach = parent-teen attachment.

^aFormal test of the mediator is related to reduced aggression. ^bStudies identified by additional searches on psychINFO.

Mediators: ^PMechanism of change is parenting ^cMechanism of change is cognition. ^fMechanism of change is family functioning.

Table 3. Overall weighted ESs in conduct problems and the presumed mediators.

	pre-treatment to post-treatment					post-treatment to-first follow-up					first-to-second follow-up				
	<i>k</i>	<i>n</i>	ES	95% CI	Q	<i>k</i>	<i>n</i>	ES	95% CI	Q	<i>k</i>	<i>n</i>	ES	95% CI	Q
Conduct problems - ES ₁	32	2821	0.61***	0.47-0.75	79.5***										
Conduct problems - ES ₂	24	1184	1.05***	0.81-1.30	80.9***	56	2589	0.08	-0.00-0.15	33.3	8	245	0.04	-0.20-0.29	1.2
Presumed mediators - ES ₁	27	2322	0.65***	0.49-0.80	72.1***										
Presumed mediators - ES ₂	13	483	0.83***	0.56-1.14	35.8***	37	1552	-0.06	-0.16-0.04	14.5	2	60	0.11	-0.41-0.62	0.3

Note. CI = Confidence Interval, *k* = number of studies, ES₁ = studies with an untreated control condition, ES₂ = studies with no untreated control

p* < .05, *p* < .01, ****p* < .001

Table 4. Moderator analysis of conduct problems and presumed mediators from pre-treatment to post-treatment.

			pre-post		post - FU ^c	
			<i>k</i>	ES _{w1}	<i>k</i>	ES _{w2}
Categorical variables:						
Treatment ^a	BT	conduct problems	34	0.70	34	0.02*
	CBT	conduct problems	7	0.52	7	0.28*
	BT/CBT	conduct problems	12	0.51	12	0.11*
	FT	conduct problems	3	0.80	3	0.06*
Allocation of subjects ^a	random	conduct problems	45	0.67*	45	0.09
	matched	conduct problems	4	0.70*	4	0.06
	none	conduct problems	7	1.11*	7	-0.01
Presumed mediators ^a	parenting	conduct problems	28	0.61	28	0.04**
		mediator	28	0.60	25	-0.11
	cognition	conduct problems	8	0.41	8	0.33**
		mediator	8	0.47	8	0.07
	family functioning	conduct problems	4	0.34	4	0.20**
		mediator	4	0.19	4	0.12
Treatment format ^a	individual	conduct problems	19	0.90*	19	-0.01
		mediator	12	0.51	12	-0.06
	group	conduct problems	28	0.59*	28	0.13
		mediator	21	0.52	20	-0.03
	combined	conduct problems	9	0.41*	9	0.02
		mediator	7	0.81	5	-0.19
Continuous variables:						
			<i>k</i>	(<i>r</i> _{w1})	<i>k</i>	(<i>r</i> _{w2})
ES mediator ^b		conduct problems	40	(0.58**)	37	(-0.09)
<i>n</i> ^b		conduct problems	56	(-0.29*)	56	(0.15)
		mediator	40	(-0.26)	37	(0.32)
Mean age ^b		conduct problems	52	(-0.32*)	52	(0.29*)
		mediator	37	(-0.27)	34	(0.21)
Number of sessions (dose) ^b		conduct problems	21	(0.35)	21	(0.15)

mediator	16	(0.64**)	14	(0.21)
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Note. k = number of studies.

^aWeighted Effect size (ES) for the categorical variables mode of treatment, allocation of subjects, presumed mediators and treatment format.

^bWeighted (inverse variance) correlations are based on weighted regression analysis, for both r_{w1} and r_{w2} , on the effect size and the continuous variables "ES₁ mediator", " n ", "mean age", and "number of sessions".

^cTests of significance were performed although the heterogeneity from post-treatment until first follow-up was non-significant.

Variables marked with * $p < .05$, ** $p < .01$ (two-tailed) in overall F -tests.

Figure 1.

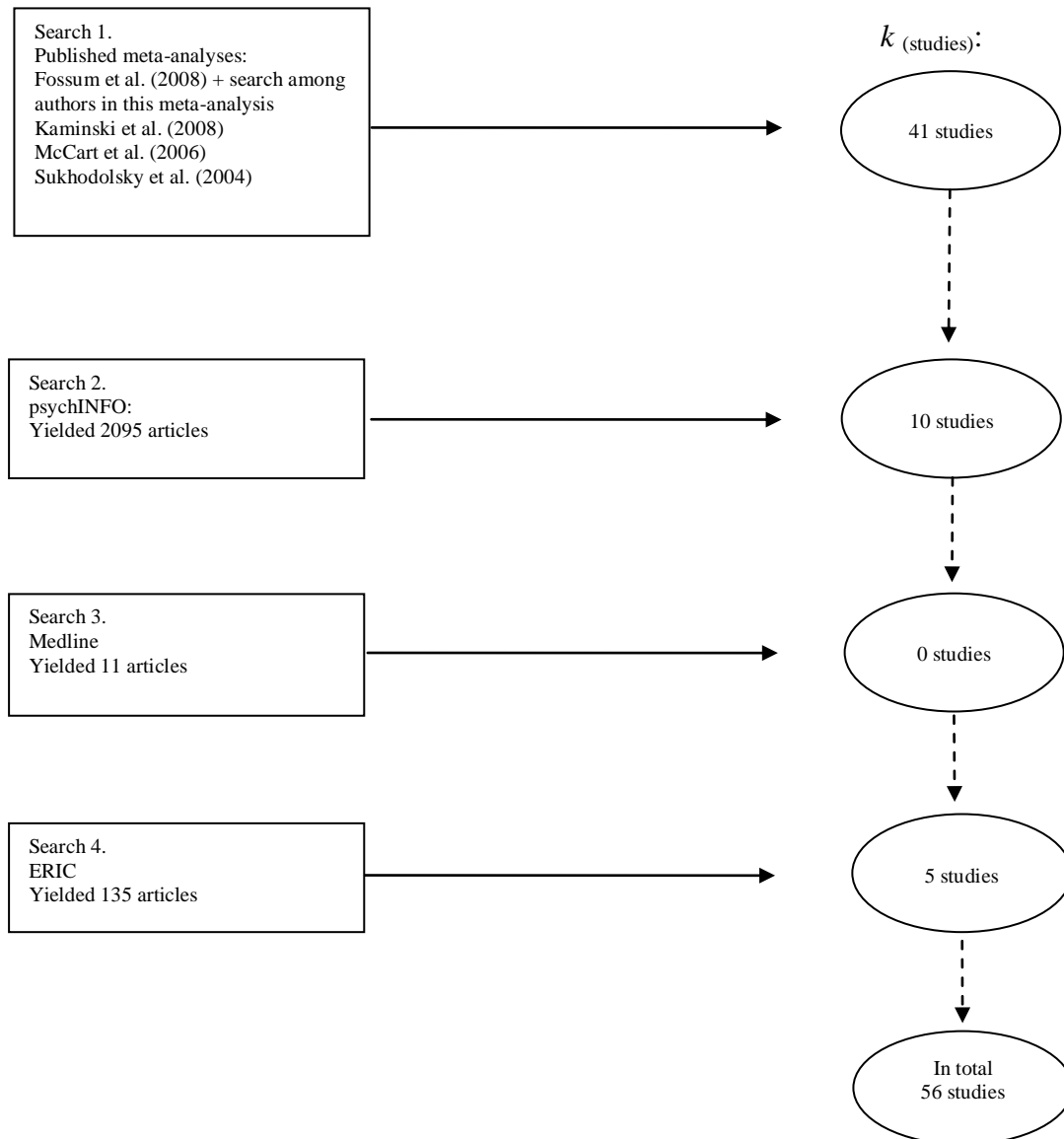


Figure caption.

k = number of studies.

Search phrases in databases were (*treat** or *psychother** or *therap** or *cbt**) and (*child** or *adoles** or *youth**) and (*antisoc** or *aggress** or *defiant** or *opposition** or *conduct* or *disrupti** or *delinq**) and (*long-term* or *follow**) not (*music** or *art** or *longitude** or *methylphen** or *epidemiol** or *inpatient* or *residential* or *autis**).

Figure 2. Stem- and leaf- plots for conduct problems and presumed mediators at the first follow-up

conduct problems		presumed mediator	
stem	leaf	stem	leaf
-8		-8	
-7	1	-7	
-6		-6	
-5		-5	
-4	0	-4	34
-3	45	-3	247
-2	2236	-2	277
-1	1235	-1	1112346
-0	11588	-0	444469
.0	112234446799	.0	0111269
.1	23345889	.1	129
.2	222336789	.2	339
.3	0223368	.3	29
.4	02	.4	
.5	4	.5	
.6		.6	
.7		.7	
.8		.8	
.9		.9	
1.0		1.0	3

Fig 2. Stem- and leaf- plots for conduct problems and the presumed mediators at the first follow-up.