



## Cognitive-behavioral therapy for externalizing disorders: A meta-analysis of treatment effectiveness

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### ABSTRACT

Externalizing disorders are the most common and persistent forms of maladjustment in childhood. The aim of this study was to conduct a meta-analysis evaluating the effectiveness of Cognitive Behavioral Therapy (CBT) to reduce externalizing symptoms in two disorders: Attention Deficit Hyperactivity Disorder (ADHD) and Oppositional Defiant Disorder (ODD). The efficacy of CBT to improve social competence and positive parenting and reduce internalizing behaviors, parent stress and maternal depression was also explored. The database PsycInfo, PsycARTICLES, Medline and PubMed were searched to identify relevant studies. Twenty-one trials met the inclusion criteria.

Results showed that the biggest improvement, after CBT, was in ODD symptoms (−0.879) followed by parental stress (−0.607), externalizing symptoms (−0.52), parenting skills (−0.381), social competence (−0.390) and ADHD symptoms (−0.343). CBT was also associated with improved attention (−0.378), aggressive behaviors (−0.284), internalizing symptoms (−0.272) and maternal depressive symptoms (−0.231).

Overall, CBT is an effective treatment option for externalizing disorders and is also associated with reduced parental distress and maternal depressive symptoms. Multimodal treatments targeting both children and caregivers' symptoms (e.g. maternal depressive symptoms) appear important to produce sustained and generalized benefits.

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### 1. Introduction

The estimated prevalence of psychiatric disorders in youth ranges between 10% and 20% (Belfer, 2008; Jaffee, Harrington, Cohen, & Moffitt, 2005). Quality of life in children with mental health issues is poorer than quality of life in healthy children and children suffering from chronic physical illness (Bastiaansen, Koot, Ferdinand, & Verhulst, 2004; Sawyer et al., 2002). If not treated early and effectively, these conditions produce significant adverse outcomes in adulthood, including detrimental, longer-term effects on social relationships, health, and economic success (Karantanos, 2012; Loth, Drabick, Leibenluft, & Hulvershorn, 2014).

Externalizing disorders are common disorders in children (American Psychiatric Association, 2000) and include the diagnoses of Attention Deficit Hyperactivity Disorder (ADHD), Conduct Disorder (CD) and Oppositional Defiant Disorder (ODD). The genetic risk for developing these conditions seems to be greater in the context of impaired parent–child relationships (Samek et al., 2014). After illness onset, externalizing symptoms continue disrupting interpersonal relationships. Parents can show controlling and punitive behaviors, are often less responsive to their children's needs (Hechtman et al., 2004) and can develop psychopathological symptoms themselves (Shin & Stein, 2008).

Results from a 24-year longitudinal study showed that externalizing symptoms in childhood predict disruptive behaviors in adulthood, as well as anxiety, mood and substance use disorders (Reef, Diamantopoulou, van Meurs, Verhulst, & van der Ende, 2011) and a recent meta-analysis found that externalizing disorders are associated with the later development of unipolar depression (Loth

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et al., 2014). Due to the detrimental and long term effects of externalizing disorders on the individual and their families, timely and effective treatments appear to be crucial.

A range of psychological strategies are currently employed to target externalizing symptoms. Multimodal and extensive treatments are recommended, including psychoeducation, behavioral and cognitive behavioral therapy (CBT), interpersonal psychotherapy, family therapy, school-based interventions, social skills training and parent management training (PT), (Lochman, Powell, Boxmeyer, & Jimenez-Camargo, 2011; Masi et al., 2014; NICE, 2013). These treatments can involve individual and family psychotherapy, medication and sociotherapy (Steiner & Remsing, 2007). Cognitive and emotional strategies such as emotion awareness, perspective taking, anger management and problem solving are usually employed and homework are used to enhance motivation and generalization of skills to everyday life (Lochman et al., 2011).

Despite the large availability of data showing the efficacy of CBT techniques to reduce externalizing symptoms (Lochman et al., 2011; Steiner & Remsing, 2007), no quantitative syntheses of findings have been published so far. Thus, the aim of this paper was to conduct a meta-analysis of studies investigating the effectiveness of CBT in reducing externalizing symptoms in children and adolescents. Externalizing, ADHD and ODD symptoms were considered as primary outcomes. Secondary outcomes included social competence, internalizing behavior, parent stress, positive parenting and maternal depression.

## 2. Method

### 2.1. Search procedure

MC and OIL conducted the literature research independently and screened titles and abstracts to check studies' eligibility; GB and VC examined the full texts of the identified studies and extracted the data for descriptive and statistical purposes.

The electronic databases PUBMED, MEDLINE, PsycINFO and PsycArticles were searched to identify relevant research articles. Date limits were set from January 1980 (i.e. date of publication of the DSM III) to December 2012. The search terms used were: "Cognitive behavioral therapy" OR "CBT" linked to "externalizing" OR "ADHD" OR "ODD" OR "CD" OR "anger control" OR "anger management" OR "anger treatment".

The reference lists of the papers selected were inspected to identify further eligible studies. Data from unpublished studies were not included.

### 2.2. Selection criteria

Six inclusion criteria were used: 1) the study investigated the effects of CBT in externalizing disorders using a randomized controlled trial (RCT) design; 2) study participants were younger than 18 years old, 3) the treatment tested was cognitive or behavioral or cognitive-behavioral therapy; 4) the study included a control group (participants on a waiting list or a different treatment group); 5) the diagnostic criteria for an externalizing disorder (ADHD, ODD, CD) were met and 6) the outcome measures were evaluated pre- and post-treatment.

Data were obtained through clinical observations, interviews or questionnaires and reported by parents, teachers and children/adolescents.

### 2.3. Data extraction

Information about: (1) study's authors and year of publication);

(2) sample size and demographics (i.e. age, gender, nationality); (3) treatment target (i.e. parents, teachers, children or combined); (4) measures used; (5) participants reporting on outcome measures (i.e. mothers, fathers or both, teachers, children); (6) participants' diagnoses; (7) type of intervention used and control groups; (8) time of follow-up assessments, (9) study design and quality analysis. Means and standard deviations (SDs) of the outcome measures were also extracted. The primary outcome measures considered were: externalizing behaviors and ADHD and ODD symptoms measured using validated standardized questionnaires (see Table 1). Secondary outcomes were: attention, aggressive behavior, social competence, internalizing behavior, parent stress, positive parenting and maternal depression as measured through validated standardized questionnaires (see Table 1 for details).

Conduct disorder's symptoms were not included amongst the outcome measures as a sufficient number of studies to conduct the analyses were not available.

### 2.4. Meta-analysis

All meta-analytic computations were performed using the software Comprehensive Meta-analysis (version 2; Borenstein, Hedges, Higgins, & Rothstein, 2011). Pre- and post-treatment means and SDs were entered for each outcome measure and the pre-post change was calculated. A separate meta-analysis was performed for each outcome variable. Effect sizes were calculated (Cohen's *d*). Effect sizes ranging between 0.56 and 1.2 were considered large, effect sizes ranging between 0.33 and 0.55 were considered as moderate and effect sizes ranging from 0 to 0.32 were considered negligible (Lipsey & Wilson, 1993).

The treatment effect was considered to be significant (effect size of 0.5) when the mean of the trained group was half standard deviation larger than the mean of the control group. Final effect sizes  $\pm 3$  SDs above or below the weighted mean effect size estimate in each data set were identified as outliers and the corresponding studies were excluded from the analyses (Hedges, 1985).

A random effects model was used for the meta-analysis due to the differences identified between studies (Higgins, Thompson, Deeks, & Altman, 2003). The Q-statistic was calculated as indicator of homogeneity. A significant Q rejects the null hypothesis of homogeneity and indicates that the variability among the effect sizes is greater than what is likely to result from subject-level sampling error alone.

The  $I^2$ -statistic was calculated as an indicator of heterogeneity in percentages. A value of 0% stands for a no observed heterogeneity and larger values indicate increasing heterogeneity (i.e. 25% considered as low, 50% as moderate and 75% as high heterogeneity).

Specific subgroup analyses were conducted to investigate the variability between studies. These analyses included the different diagnostic groups (ADHD, ODD, CD), responders (mother, father, both parents, teachers) and intervention targets (children, parents, teachers).

A meta-analytic calculation was conducted when at least three studies included the variables considered.

### 2.5. Assessment of quality

The methodological quality of the studies selected for the meta-analysis was assessed independently by the authors using the Critical Appraisal Skills Programme (CASP) for RCTs (Bradley & Hill, 2001). Data from the qualitative assessment are reported in a previous manuscript (Baglioni et al., 2009). Only studies that reached a cut-off quality score of 60% were included in the meta-analysis.

**Table 1**

Summary table of the characteristics of the sample and description of treatment conditions.

Authors (year)	Sample characteristics N/mean age of children/percentage of female/ethnic composition	Disorder of children	Treatment	Control condition	Measures	Responders	Receivers of the intervention	Outcome
Barkley, Edwards, Laneri, Fletcher, and Metevia (2001)	N = 39/58 Mean age: 14.2/15 %F: 13/10 Ethnic composition: 86% Caucasian, 9% Hispanic, 2% African American, 3% Asian	ADHD/ODD	Problem Solving Communication Training (PSCT)	Behavioral Management Training (PSCT + BMT)	Rating of ADHD/ODD Symptoms	Mother/Father/Children	Children and Parents	ADHD/ODD/Aggressive Behavior
Drugli, Larsson, Fossum, and Mørch (2010)	N = 54/45 Mean age: nr/nr %F: 17/25 Ethnic composition: 100% native caucasian	CD/ODD	Parent Training (PT) PT + Child Therapy (CT)	Waiting List Waiting List	PPI-Positive Parenting Index CBCL-Aggressive PSI-Parent Stress Index BDI	Mothers	Parents Children and Parents	Positive Parenting Aggressive Behavior Parent Stress Mother Depression
Drugli and Larsson (2006)	N = 52/28 Mean age: 6.6/6.6 %F: 20/20 N = 47/28 Mean age: 6.6/6.6 %F: 20/20 Ethnic composition: 99% native caucasian	CD/ODD	Parent Training (PT) PT + Child Therapy (CT)	Waiting List Waiting List	CBCL	Parents	Parents Children and Parents	Attention Aggressive Behavior Social Competence Internalizing Behavior
Fehlings, Roberts, Humphries, and Dawe (1991)	N = 13/13 Mean age: 9.3/9.6 %F: 0/0 Ethnic composition: n.r.	ADHD	CBT	Supportive Therapy	Werry Weiss Activity Scale Behavior Problem Checklist-Attention Problems Self Control Rating Scale Conners Scale Aggression Scale FBB Oppositional-Aggression Scale FBB	Parents Teachers	Children	ADHD Attention Externalizing Behavior
Grasmann and Stadler (2011)	N = 18/18 Mean age: 11/10.5 %F: 0/0 Ethnic composition: nr	CD	PT + Child Therapy (CT)	Waiting List	CBCL TRF	Parents	Children and Parents	ADHD Aggressive Behavior ODD
Hemphill and Littlefield (2001)	N = 102/37 Mean age: 8.88/8.54 %F: 22.26/3.9 Ethnic composition: n.r.	Externalizing problems	PT + Child Therapy (CT)	Waiting List	CBCL TRF	Parents Teachers	Children and Parents	Externalizing Behavior Internalizing Behavior Social Competence
Jones, Daley, Hutchings, Bywater, and Eames (2007)	N = 50/29 Mean age: 46.50/45.90 %F: 32/32 Ethnic composition: 100% native caucasian	ADHD	Parent Training (PT)	Waiting List	Conners Scale	Parents	Parents	ADHD
Kratochwill, Elliott, Loitz, Sladeczek, and Carlson (2003)	N = 68/21 Mean age: 4.4/4.4 %F: 30/30 Ethnic composition: 54% minorities (African Americans, Hispanics, Southeast Asians); 46% native USA	Externalizing and Internalizing problems	Child Therapy (CT)	no treatment	SSRS	Parents Teachers	Children	Social Competence
Larsson et al. (2009)	N = 45/28 Mean age: 6.40/6.90 %F: 28/28 Mean age: 6.70/6.90 %F: 21.2/21.4 Ethnic composition: 100% native caucasian	CD-ODD	Parent Training (PT) Parent Training (PT) + Child Therapy (CT)	Waiting List Waiting List	PPI PSI CBCL ECBI	Mother Father	Parents Parents Teachers	Externalizing Behavior Attention Aggressive Behavior Internalizing Behavior Parent Stress Positive Parenting
Lipman et al. (2006)	N = 52/47 Mean age: 9.3/9 %F: 19.4/14.8 Ethnic composition: n.r.	Externalizing problems	Family/child/home psychoeducational program	Self Help	BCFPI Children's Inventory of Anger Children's Hostility	Children Parents	Children and Parents	Externalizing Behavior Aggressive Behavior Parent Stress

(continued on next page)

Table 1 (continued)

Authors (year)	Sample characteristics N/mean age of children/percentage of female/ethnic composition	Disorder of children	Treatment	Control condition	Measures	Responders	Receivers of the intervention	Outcome
Matos, Bauermeister, and Bernal (2009)	N = 20/12 Mean age: 4.6/3.5 %F:nr Ethnic composition: 100% native Hispanic	ADHD	Parent–Child Interaction Therapy	Waiting List	Index PSI- Parent Stress Index ECBI - Intensity DBRS - Inattention BASC - Aggression FEI - Familiar Experience Index PPI- Positive Parenting Index BASC -Hyperactivity DPRS-ODD BDI	Parents Mother	Children and Parents	Externalizing Behavior Attention Aggressive Behavior Parent Stress Positive Parenting ADHD ODD Mother Depression
McGilloway et al. (2012)	N = 103/46 Mean age:4.11/4.7 %F:42.6/33 Ethnic composition: nr	CD	Incredible Years Basic PT	Waiting List	ECBI Social Competence Scale PSI PPI Conners Scale BDI	Parents Mothers	Parents	Externalizing Behavior Social Competence Parent Stress Positive Parenting ADHD Mother Depression Externalizing Behavior Attention Aggressive Behavior Social Competence
Nitkowski, Petermann, Büttner, Krause-Leipoldt, and Petermann (2009)	N = 12/12 Mean age:10.2/10 %F:0/25 Ethnic composition: n.r.	CD/ODD	Training for Aggressive Children (TAC)	Waiting List	CBCL TRF SDQ	Parents Teacher	Children	Externalizing Behavior Attention Aggressive Behavior Social Competence
Nixon, Sweeney, Erickson, and Touyz (2003)	N = 17/17 Mean age:46.75/46.75 %F: 17.64/35.29 N = 20/17 Mean age:/46.75 %F:33.33/35.29 Ethnic composition: 100% native Australian	ODD	Standard treatment (PCIT) Abbreviated Treatment (PCIT videotape)	Waiting List Waiting List	CBCL ODD Sx PSI	Parents	Children and Parents	Externalizing Behavior Parent Stress ODD
Pfiffner et al. (2007)	N = 36/33 Mean age:8.7/8.7 %F:33.33 Ethnic composition: white 51%; Asian 16%; Hispanic 10%; African American 6%; Mixed 17%	ADHD	Child Life and Attention Skills Program	No treatment	DSM-IV inattention symptom count SSRS	Parents	Children	Attention Social Competence
Scott et al. (2010)	N = 51/45 Mean age:5.18/5.24 %F:32/27 Ethnic composition:37.5% minorities; 62.5% caucasian	CD/ODD/ADHD	Incredible Years	Self-help	CBCL	Parents	Children and Parents	Externalizing Behavior
Webster-Stratton (1984)	N = 11/11 Mean age:5.20/4.92 %F:45.45/27.27 Ethnic composition: n.r.	CD	Videotape Individual Therapy	Waiting List Waiting List	CBCL Prosocial Behavior	Parents		Externalizing Behavior Social Competence
Webster-Stratton (1994)	N = 64/39 Mean age:4.89/nr %F: 25.5/0 Ethnic composition: n.r.	ODD	Parent Training advance	Parent Training	CBCL PSI BDI	Mother Father	Children and Parents	Social Competence Parent Stress Mother Depression
Webster-Stratton and Hammond (1997)	N = 27/22 Mean age:5.33/5.64 %F:19.2/31.8 Ethnic composition: 84.6% caucasian	CD/ODD	Parent Training (PT)	Waiting List	ECBI PSI	Mother Father	Parents	Externalizing Behavior Parent Stress

Table 1 (continued)

Authors (year)	Sample characteristics N/mean age of children/percentage of female/ethnic composition	Disorder of children	Treatment	Control condition	Measures	Responders	Receivers of the intervention	Outcome
Webster-Stratton, Reid and Hammond (2004)	N = 26/22 Mean age: 5.95/5.64 %F: 25.9/31.8 Ethnic composition: 88.9% caucasian	ODD	Child Therapy (CT)	Waiting List			Children	
	N = 22/22 Mean age: 6.06/5.64 %F: 27.3/31.8 Ethnic composition: 81.8% caucasian		Parent Training (PT) + Child Therapy (CT)	Waiting List			Children and Parents	
	N = 31/26 Mean age: 5.85/5.86 %F: 9.70/11.5 Ethnic composition: 71.1%/84.6% Euro-American		Parent Training	Waiting List	Conduct Problems Child Social Competence with Peers	Mother Father Teacher	Parents	Externalizing Behavior Social Competence Positive Parenting
	N = 24/26 Mean age: 5.63/5.86 %F: 8.33/11.5 Ethnic composition: 83.33%/84.6% Euro-American		Parent Training + Teacher Training	Waiting List	Positive Parenting		Parents and Teacher	
	N = 30/26 Mean age: 6.12/5.86 %F: 6.7/11.5 Ethnic composition: 83.3%/84.6% Euro-American		Child Therapy	Waiting List			Children	
	N = 23/26 Mean age: 6.21/5.86 %F: 8.7/11.5 Ethnic composition: 78.3%/84.6% Euro-American		Child Therapy + Teacher Training	Waiting List			Children and Teacher	
	N = 25/26 Mean age: 5.82/5.86 %F: 16/11.5 Ethnic composition: 72%/84.6% Euro-American		Child Therapy + Parent Training + Teacher Training	Waiting List			Parents, Children and Teacher	
	N = 49/50 Mean age: 5.34/5.37 %F: 27/22 Ethnic composition: n.r.		Incredible Years (Parent Training + Child Therapy)	Waiting List	CBCL TRF CTRS-R PPI Conners Scale Mother Report Social Competence	Mother Father Teacher	Parents, Children	Externalizing Behavior Attention Aggressive Behavior Social Competence Internalizing Behavior Positive Parenting ADHD ODD
Webster-Stratton, Reid, and Beauchaine (2011)		ADHD						

Abbreviations: ADHD = Attention Deficit Hyperactivity Disorder; ODD = Opposition Defiant Disorder; CD = Conduct Disorder; PCIT = Parent–Child Interaction Therapy; PPI = Positive Parenting Index; CBCL = Child Behavior Checklist; PSI = Parent Stress Index; BDI = Beck Depression Inventory; TRF = Teacher Report Form; SSRS = Social Skills Rating System; ECBI = Eyberg Child Behavior Inventory; BCFPI = Brief Child and Family Phone Interview; DBRS = Disruptive Behavior Scale for Children; BASC = Behavior Assessment System for Children Observation; FEI = Familiar Experience Index; SDQ = Strengths Difficulties Questionnaire; CCTRS = Conners' Rating Scales Revised; nr = non reported.

### 3. Results

#### 3.1. Study characteristics

The search flow is shown in Fig. 1. A total of 108 abstracts were identified. Titles and abstracts' screening led to select 79 studies. Twenty-four studies were included after reading the full text. It was not possible to calculate the effect size for three studies, thus the final number of studies included in the meta-analysis was 21. Table 1 shows the studies' characteristics in relation to: a) participants' sample; b) participants' diagnosis; c) type of interventions used in experimental and control conditions; d) intervention recipients; e) outcome measures used; f) participants providing the outcome measures.

Six studies evaluated more than one experimental condition. A

total of 1960 participants were recruited in the studies. The following variables were calculated for the total sample: mean age of children; percentage of females included; mean age of mothers (data available for 8 studies) and children's mean IQ (data available for 7 studies). Children had a mean age of 7 (SD = 2.7) and a mean IQ of 104.6 (SD = 6.2). The 22.8% of participants included in the study were females. The mean age of mothers was 34.5 (SD = 3.7).

#### 3.2. Meta-analytic calculation

Ten meta-analyses were conducted on: externalizing behavior, ADHD symptoms, ODD symptoms, internalizing behavior, attention, aggressive behavior, social competence, parental stress, positive parenting and maternal depression. Subgroup analyses were conducted for each outcome to investigate heterogeneous results.

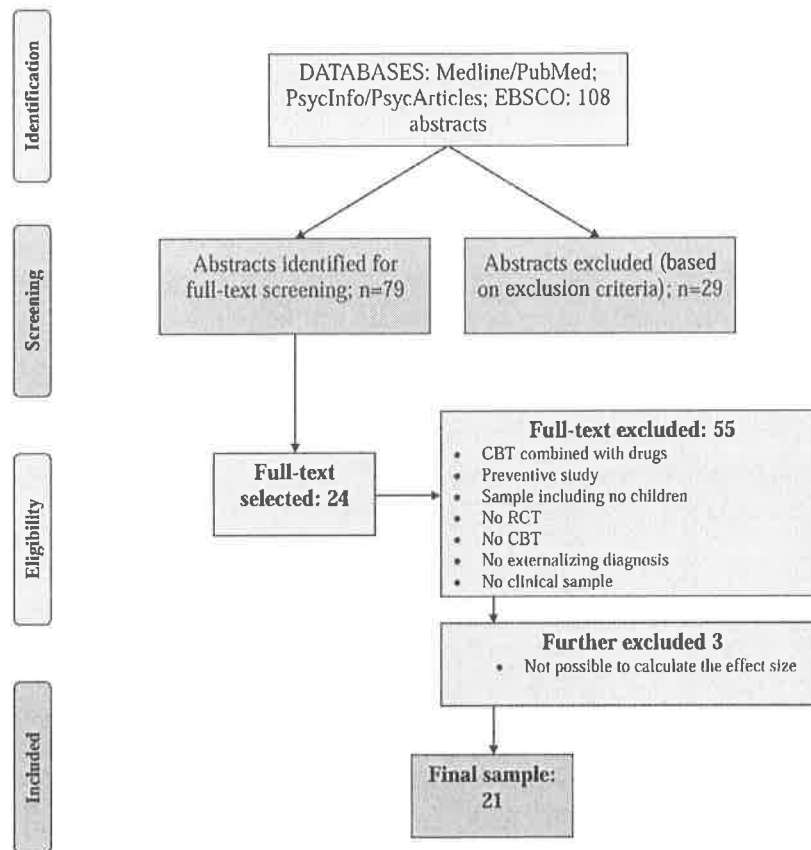


Fig. 1. Flow chart of the literature search and identification of randomized-controlled trials (RCTs) included in this systematic review.

Sources of variability which were evaluated when a sufficient amount of data was available are: diagnoses (including ADHD; ODD and CD); responders (mother, father, both parents, teachers) and intervention targets (children, parents, teachers). Outliers were identified and are listed in the Supplementary Table 1 (S1).

### 3.3. Efficacy of CBT on primary outcomes

#### 3.3.1. Externalizing symptoms measured through validated standardized questionnaires

Overall, a moderate benefit of CBT on externalizing symptoms was found ( $d = -0.52$ ; 95% CI  $[-0.68, -0.36]$ ;  $z = -6.31$ ;  $N = 19$ ;  $p < 0.001$ ;  $Q\text{-value} = 26.91$ ;  $df(Q) = 18$ ;  $p = 0.08$ ; and  $I^2 = 33.10$ ) compared to other treatment/control conditions.

The forest plot is shown in Fig. 2.

The subgroup analysis on responders (parents and teachers) showed that parents reported a large improvement in externalizing symptoms following CBT ( $d = -0.603$ ; 95% CI  $[-0.865, -0.341]$ ,  $N = 10$ ,  $p < 0.001$ ;  $Q\text{-value} = 16.35$ ;  $df(Q) = 9$ ;  $p = 0.06$ ; and  $I^2 = 44.97$ ), whereas teachers reported only a moderate improvement ( $d = -0.430$ ; 95% CI  $[-0.619, -0.240]$ ,  $N = 9$ ,  $p < 0.001$ ;  $Q\text{-value} = 9.135$ ;  $df(Q) = 8$ ;  $p = 0.331$ ; and  $I^2 = 12.43$ ).

Subgroup analysis evaluating externalizing symptoms separately depending on the diagnosis (ADHD, ODD, CD) showed the following results. Children with a diagnosis of ADHD showed a moderate symptomatic improvement ( $d = -0.404$ ; 95% CI  $[-0.710, -0.097]$ ,  $N = 6$ ,  $p < 0.01$ ;  $Q\text{-value} = 10.28$ ;  $df(Q) = 5$ ;  $p = 0.06$ ; and  $I^2 = 51.38$ ), whereas greater therapeutic effects were found in children with a diagnosis of ODD ( $d = -0.785$ ; 95% CI

$[-0.932, -0.638]$ ,  $N = 17$ ,  $p < 0.001$ ;  $Q\text{-value} = 15.64$ ;  $df(Q) = 16$ ;  $p = 0.478$ ; and  $I^2 = 0$ ) and CD ( $d = -1$ ; 95% CI  $[-1.680, -0.320]$ ,  $N = 3$ ,  $p = 0.004$ ;  $Q\text{-value} = 5.30$ ;  $df(Q) = 2$ ;  $p = 0.07$ ; and  $I^2 = 62.28$ ).

Subgroup analysis on intervention targets showed that treatments directed to children only ( $d = -0.452$ ; 95% CI  $[-0.696, -0.209]$ ,  $N = 9$ ,  $p < 0.001$ ;  $Q\text{-value} = 10.24$ ;  $df(Q) = 8$ ;  $p = 0.25$ ; and  $I^2 = 21.86$ ) or delivered to children and parents together produced a moderate effect on symptoms ( $d = -0.549$ ; 95% CI  $[-0.738, -0.359]$ ,  $N = 15$ ,  $p < 0.001$ ;  $Q\text{-value} = 25.76$ ;  $df(Q) = 14$ ;  $p = 0.028$ ; and  $I^2 = 45.65$ ). CBT delivered exclusively to parents ( $d = -0.917$ ; 95% CI  $[-1.226, -0.609]$ ,  $N = 8$ ,  $p < 0.001$ ;  $Q\text{-value} = 15.24$ ;  $df(Q) = 7$ ;  $p = 0.016$ ; and  $I^2 = 59.39$ ), or to children and teachers ( $d = -0.871$ ; 95% CI  $[-1.226, -0.517]$ ,  $N = 3$ ,  $p < 0.001$ ;  $Q\text{-value} = 0.64$ ;  $df(Q) = 2$ ;  $p = 0.726$ ; and  $I^2 = 0$ ) produced greater symptomatic improvement (i.e. large effect sizes).

#### 3.3.2. ADHD symptoms measured through validated standardized questionnaires

Overall, a moderate benefit of CBT on ADHD symptoms was found ( $d = -0.343$ ; 95% CI  $[-0.638, -0.049]$ ;  $z = -2.286$ ;  $N = 11$ ;  $p = 0.022$ ;  $Q\text{-value} = 40.00$ ;  $df(Q) = 10$ ;  $p < 0.001$ ; and  $I^2 = 75.00\%$ ) compared to other treatment/control conditions.

The forest plot is shown in Fig. 3.

Parents reported a large improvement in children's ADHD symptoms ( $d = -0.677$ ; 95% CI  $[-0.912, -0.441]$ ,  $N = 5$ ,  $p < 0.001$ ;  $Q\text{-value} = 2.35$ ;  $df(Q) = 4$ ;  $p = 0.671$ ; and  $I^2 = 0$ ). The small numbers of studies reporting teachers ( $N = 1$ ), children ( $N = 1$ ), mother ( $N = 2$ ) or father ( $N = 2$ ) ratings only did not allow to

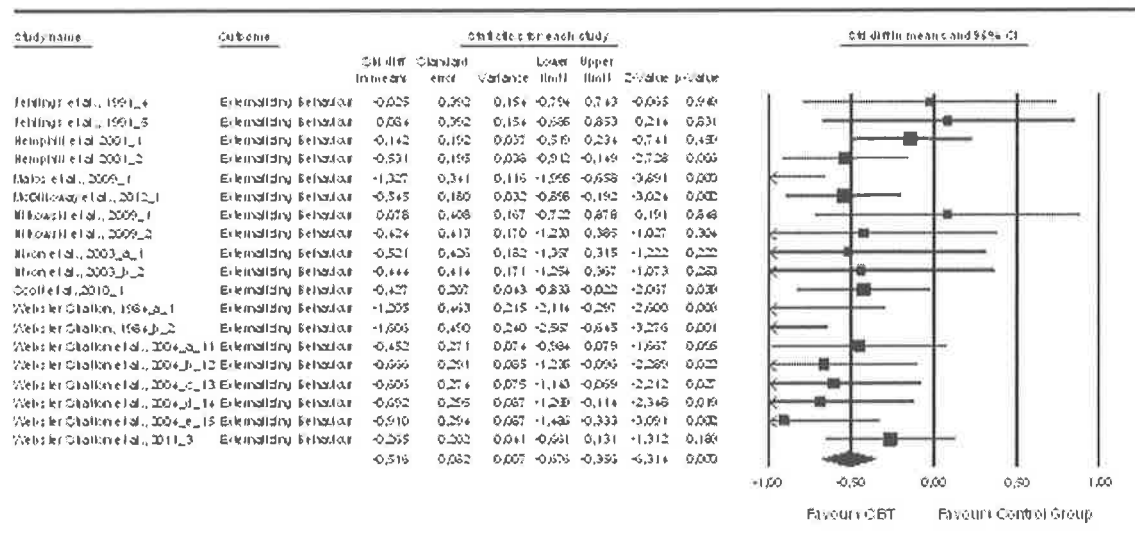


Fig. 2. Forest Plot of meta-analysis of efficacy of CBT on externalizing symptoms.

calculate the mean effect size for these responders.

A medium sized reduction of ADHD symptoms was found in children with a diagnosis of ADHD ( $d = -0.549$ ; 95% CI  $[-0.774, -0.324]$ ,  $N = 6$ ,  $p < 0.001$ ;  $Q$ -value = 6.41;  $df(Q) = 5$ ;  $p = 0.268$ ; and  $I^2 = 21.98$ ). Analyses for the other diagnostic subgroups were not possible as no studies measured ADHD symptoms in children with a diagnosis of ODD and only two studies included children affected by CD.

A negligible effect of CBT was found when treatment was delivered to children and parent together ( $d = -0.264$ ; 95% CI  $[-0.651, -0.124]$ ,  $N = 8$ ,  $p = 0.182$ ;  $Q$ -value = 34.91;  $df(Q) = 7$ ;  $p < 0.001$ ; and  $I^2 = 79.95$ ). Analyses on treatment's efficacy when only parents or children were included were not conducted due to an insufficient number of studies.

### 3.3.3. ODD symptoms measured through validated standardized questionnaires

Overall, a large improvement in ODD symptoms was found when CBT's efficacy was assessed against other treatment/control conditions ( $d = -0.879$ ; 95% CI  $[-1.244, -0.513]$ ;  $z = -4.712$ ;  $N = 10$ ;  $p < 0.001$ ;  $Q$ -value = 39.18;  $df(Q) = 9$ ;  $p < 0.001$ ; and

$I^2 = 77.03\%$ ).

The forest plot is shown in Fig. 4.

Parents reported a large improvement in children's ODD symptoms following CBT ( $d = -0.809$ ; 95% CI  $[-1.195, -0.422]$ ,  $N = 4$ ,  $p < 0.001$ ;  $Q$ -value = 3.877;  $df(Q) = 3$ ;  $p = 0.275$ ; and  $I^2 = 22.62$ ). The small number of studies reporting teachers, children, mother or father's ratings of ODD symptoms did not allow conducting analyses on these groups.

A moderate reduction of ODD symptoms in children with a diagnosis of ADHD was found ( $d = -0.494$ ; 95% CI  $[-0.715, -0.273]$ ,  $N = 4$ ,  $p < 0.001$ ;  $Q$ -value = 7.60;  $df(Q) = 3$ ;  $p = 0.055$ ; and  $I^2 = 60.54$ ). Analyses on other diagnostic groups were not possible due to the small number of studies available (ODD = 2 studies and CD = 1 study). The intervention was delivered to both children and parents in all the studies reporting on ODD symptoms reduction.

### 3.4. Efficacy of CBT on secondary outcomes

Compared to other treatment/control conditions, CBT was associated with:

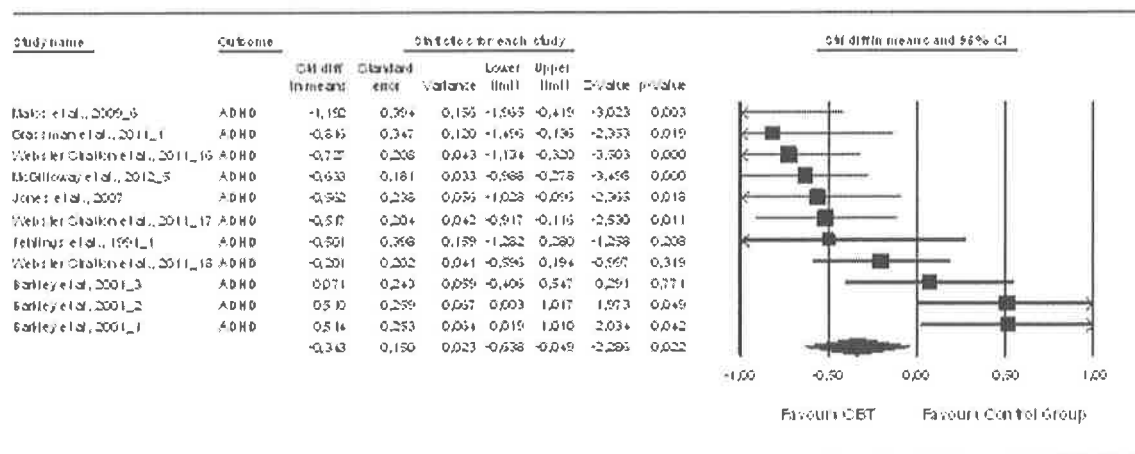


Fig. 3. Forest Plots of meta-analysis of efficacy of CBT on ADHD symptoms.

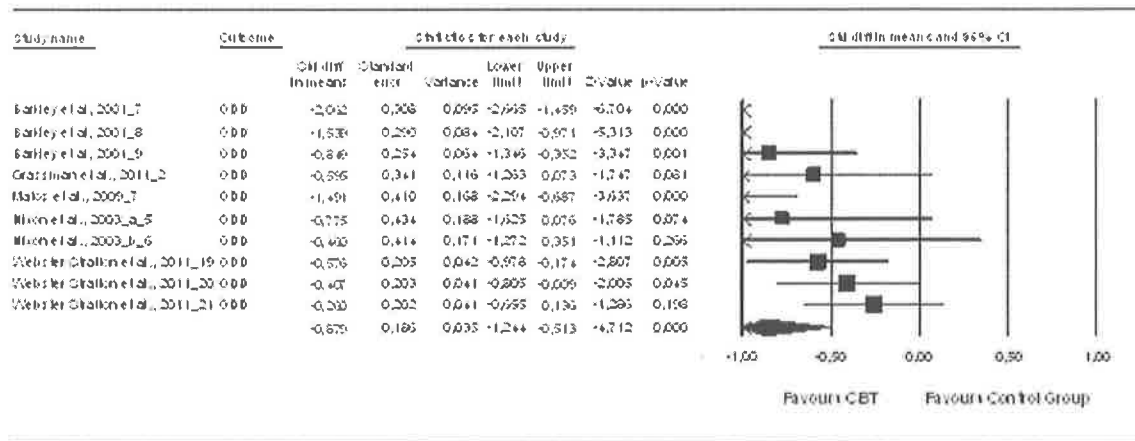


Fig. 4. Forest Plots of meta-analysis of efficacy of CBT on ODD symptoms.

- A small reduction in children's internalizing behaviors ( $d = -0.272$ ; 95% CI  $[-0.414, -0.131]$ ;  $z = -3.773$ ;  $N = 11$ ;  $p < 0.001$ ;  $Q$ -value = 5.98;  $df(Q) = 10$ ;  $p = 0.817$ ; and  $I^2 = 0\%$ ; Forest Plot shown in Figure S1).
- A moderate reduction in children's attention deficits ( $d = -0.378$ ; 95% CI  $[-0.522, -0.234]$ ;  $z = -5.143$ ;  $N = 15$ ;  $p < 0.001$ ;  $Q$ -value = 10.01;  $df(Q) = 14$ ;  $p = 0.762$ ; and  $I^2 = 0\%$ ; Forest Plot in Figure S2);
- and a small decrease in aggressive behavior ( $d = -0.284$ ; 95% CI  $[-0.464, -0.104]$ ;  $z = -3.088$ ;  $N = 18$ ;  $p = 0.002$ ;  $Q$ -value = 34.87;  $df(Q) = 17$ ;  $p = 0.006$ ; and  $I^2 = 51.24\%$ ; Forest Plot in Figure S3).
- A moderate increase in children's social competence ( $d = 0.390$ ; 95% CI  $[0.258, 0.522]$ ;  $z = 5.800$ ;  $N = 22$ ;  $p < 0.001$ ;  $Q$ -value = 27.42;  $df(Q) = 21$ ;  $p = 0.157$ ; and  $I^2 = 23.41\%$ ; Forest Plot in Figure S4).
- A large parental stress reduction ( $d = -0.607$ ; 95% CI  $[-0.803, -0.412]$ ;  $z = -6.085$ ;  $N = 17$ ;  $p < 0.001$ ;  $Q$ -value = 35.18;  $df(Q) = 16$ ;  $p = 0.004$ ; and  $I^2 = 54.51\%$ ; Forest Plot shown in Figure S5).
- The use of more effective parenting strategies ( $d = 0.381$ ; 95% CI  $[0.098, 0.665]$ ;  $z = 2.634$ ;  $N = 19$ ;  $p = 0.008$ ;  $Q$ -value = 61.70;  $df(Q) = 18$ ;  $p < 0.001$ ; and  $I^2 = 70.83\%$ ; Forest Plot shown in Figure S6).
- Improved depressive symptoms in mothers ( $d = -0.231$ ; 95% CI  $[-0.441, -0.021]$ ;  $z = -2.155$ ;  $N = 4$ ;  $p = 0.031$ ;  $Q$ -value = 2.141;  $df(Q) = 3$ ;  $p = 0.544$ ; and  $I^2 = 0\%$ ; Forest Plot shown in Figure S7).

#### 3.4.1. Source of variability on secondary outcomes: responders

Of note, not enough studies were available for children as responders. Mothers reported a significant reduction in children's internalizing behavior ( $d = -0.394$ ; 95% CI  $[-0.685, -0.103]$ ;  $N = 3$ ;  $p = 0.008$ ;  $Q$ -value = 1.64;  $df(Q) = 2$ ;  $p = 0.441$ ; and  $I^2 = 0\%$ ), whereas father reported only a negligible change ( $d = -0.111$ ; 95% CI  $[-0.398, -0.176]$ ;  $N = 3$ ;  $p = 0.449$ ;  $Q$ -value = 0.705;  $df(Q) = 2$ ;  $p = 0.703$ ; and  $I^2 = 0\%$ ). Mothers and fathers reported a similar, significant reduction of attention deficits after treatment (Mothers:  $d = -0.422$ ; 95% CI  $[-0.714, -0.131]$ ;  $N = 3$ ;  $p = 0.005$ ;  $Q$ -value = 0.094;  $df(Q) = 2$ ;  $p = 0.954$ ; and  $I^2 = 0\%$ ; Fathers:  $d = -0.315$ ; 95% CI  $[-0.602, -0.027]$ ;  $N = 3$ ;  $p = 0.032$ ;  $Q$ -value = 0.185;  $df(Q) = 2$ ;  $p = 0.911$ ; and  $I^2 = 0\%$ ).

Teachers' reported small, non significant changes in inattention symptoms ( $d = -0.147$ ; 95% CI  $[-0.469, -0.175]$ ;  $N = 3$ ;  $p = 0.371$ ;

$Q$ -value = 0.675;  $df(Q) = 2$ ;  $p = 0.714$ ; and  $I^2 = 0\%$ ). Similarly, whilst parents reported significant changes in children's social competence after treatment ( $d = 0.499$ ; 95% CI  $[0.325, 0.674]$ ;  $N = 10$ ;  $p < 0.001$ ;  $Q$ -value = 8.160;  $df(Q) = 9$ ;  $p = 0.518$ ; and  $I^2 = 0\%$ ), teachers reported smaller changes ( $d = 0.264$ ; 95% CI  $[0.010, -0.519]$ ;  $N = 8$ ;  $p = 0.042$ ;  $Q$ -value = 9.79;  $df(Q) = 7$ ;  $p = 0.201$ ; and  $I^2 = 28.50\%$ ).

#### 3.4.2. Source of variability on secondary outcomes: diagnosis

Moderate changes in social competence were found in children with a diagnosis of ADHD ( $d = 0.469$ ; 95% CI  $[0.075, 0.864]$ ;  $N = 3$ ;  $p = 0.020$ ;  $Q$ -value = 5.14;  $df(Q) = 2$ ;  $p = 0.077$ ; and  $I^2 = 61.05\%$ ) or ODD ( $d = 0.361$ ; 95% CI  $[0.176, 0.547]$ ;  $N = 7$ ;  $p < 0.001$ ;  $Q$ -value = 4.28;  $df(Q) = 6$ ;  $p = 0.639$ ; and  $I^2 = 0\%$ ) after receiving CBT, whereas non-significant changes were observed in children with a diagnosis of CD ( $d = 0.390$ ; 95% CI  $[-0.011, 0.790]$ ;  $N = 3$ ;  $p = 0.060$ ;  $Q$ -value = 2.62;  $df(Q) = 2$ ;  $p = 0.270$ ; and  $I^2 = 23.66\%$ ).

Non significant changes in positive parenting were found in the children with a diagnosis of ADHD ( $d = 0.421$ ; 95% CI  $[-0.352, 1.195]$ ;  $N = 3$ ;  $p = 0.286$ ;  $Q$ -value = 14.76;  $df(Q) = 2$ ;  $p = 0.001$ ; and  $I^2 = 86.45\%$ ), and children with a diagnosis of ODD ( $d = 0.274$ ; 95% CI  $[-0.031, 0.578]$ ;  $N = 10$ ;  $p = 0.078$ ;  $Q$ -value = 3.70;  $df(Q) = 9$ ;  $p = 0.930$ ; and  $I^2 = 0\%$ ).

It was not possible to conduct analyses on the other outcome variables due to the low number of studies available.

#### 3.4.3. Source of variability on secondary outcomes: intervention targets

Improvements in internalizing behaviors were observed only when the treatment was delivered to children and parents together ( $d = -0.262$ ; 95% CI  $[-0.417, -0.107]$ ;  $N = 8$ ;  $p = 0.001$ ;  $Q$ -value = 3.195;  $df(Q) = 7$ ;  $p = 0.866$ ; and  $I^2 = 0\%$ ). No significant changes were found for interventions directed exclusively to parents ( $d = -0.329$ ; 95% CI  $[-0.730, -0.072]$ ;  $N = 3$ ;  $p = 0.108$ ;  $Q$ -value = 2.676;  $df(Q) = 22$ ;  $p = 0.262$ ; and  $I^2 = 25.27\%$ ). A reduction in symptoms of inattention was observed for interventions directed to children only ( $d = -0.671$ ; 95% CI  $[-1.038, -0.303]$ ;  $N = 3$ ;  $p < 0.001$ ;  $Q$ -value = 1.501;  $df(Q) = 2$ ;  $p = 0.472$ ; and  $I^2 = 0\%$ ). Smaller changes were obtained when both children and parents were involved ( $d = -0.290$ ; 95% CI  $[-0.537, -0.044]$ ;  $N = 4$ ;  $p = 0.021$ ;  $Q$ -value = 3.687;  $df(Q) = 3$ ;  $p = 0.297$ ; and  $I^2 = 18.62\%$ ). Greater changes in aggressive symptoms were found when the interventions were offered to both parents and children ( $d = -0.298$ ; 95% CI  $[-0.524, -0.072]$ ;  $N = 13$ ;  $p = 0.010$ ;  $Q$ -value = 32.467;  $df(Q) = 12$ ;  $p = 0.001$ ; and  $I^2 = 63.039\%$ ) than when they were offered to parents



only ( $d = -0.325$ ; 95% CI  $[-0.671, -0.021]$ ,  $N = 3$ ,  $p = 0.066$ ;  $Q$ -value = 1.114  $df(Q) = 2$ ;  $p = 0.573$ ; and  $I^2 = 0$ ). Parent stress improved with interventions directed to parents ( $d = -0.699$ ; 95% CI  $[-1.157, -0.241]$ ,  $N = 5$ ,  $p = 0.003$ ;  $Q$ -value = 14.22;  $df(Q) = 4$ ;  $p = 0.007$ ; and  $I^2 = 71.87$ ) and with interventions directed to parents and children together ( $d = -0.560$ ; 95% CI  $[-0.790, -0.330]$ ,  $N = 11$ ,  $p < 0.001$ ;  $Q$ -value = 19.50  $df(Q) = 10$ ;  $p = 0.034$  and  $I^2 = 48.73$ ). Finally, benefits for positive parenting were found for therapies directed exclusively to parents ( $d = 0.832$ ; 95% CI  $[0.381, 1.284]$ ,  $N = 5$ ,  $p < 0.001$ ;  $Q$ -value = 9.60  $df(Q) = 4$ ;  $p = 0.048$  and  $I^2 = 58.34$ ) and not for interventions including both parents and children ( $d = 0.274$ ; 95% CI  $[-0.295, 0.788]$ ,  $N = 6$ ,  $p = 0.372$ ;  $Q$ -value = 35.19  $df(Q) = 5$ ;  $p < 0.001$  and  $I^2 = 85.79$ ).

#### 4. Discussion

The present meta-analysis of 21 RCTs included a total of 1960 participants and found that CBT is effective to reduce ODD symptoms ( $-0.879$ ), parental stress ( $-0.607$ ), externalizing symptoms ( $-0.52$ ), and ADHD symptoms ( $-0.343$ ). Moreover, the Cognitive Behavioral Treatment improve parenting skills ( $-0.381$ ), social competence ( $-0.390$ ), attention ( $-0.378$ ), aggressive behaviors ( $-0.284$ ), internalizing symptoms ( $-0.272$ ) and maternal depressive symptoms ( $-0.231$ ).

##### 4.1. Externalizing behavior

Cognitive-behavioral therapy was associated with a significant reduction of externalizing symptoms in children affected by ODD and ADHD. Parents reported a larger benefit than teachers. According to previous data, the intervention appeared more beneficial when an adult caregiver was involved in the treatment of the child (Furlong et al., 2013; Lochman et al., 2011; Masi et al., 2014; Perrin, Sheldrick, McMenamy, Henson, & Carter, 2014; Wolraich et al., 2011).

##### 4.2. ADHD symptoms

A moderate effect of CBT was found on the reduction of ADHD symptoms. Parents reported a larger reduction of symptoms than teachers. This might be due to teachers' lower sensitivity to symptoms change and to their limited involvement in the intervention.

Scholastic difficulties might be due to the large variety of stimuli available in the classroom. These stimuli might have a negative impact on the performance of children in cognitive tasks (Lineweaver et al., 2012; Pelham et al., 2011). Also, impulsivity - a core deficit of ADHD - has been associated with academic underachievement (Neef et al., 2005). ADHD children's choices might be affected more by the quality and immediacy of the reinforcers than by their long term benefits. This is particularly relevant at school, where reinforcers are not always positive and often demonstrate their benefits in the longer term (Neef et al., 2005).

##### 4.3. ODD symptoms

A large reduction of ODD symptoms was found following CBT and parents reported greater changes than teachers. A moderate reduction of oppositional and defiant symptoms was found also in children affected by ADHD. This might be due to the high comorbidity between ODD and ADHD (Biederman et al., 2008; Burns & Walsh, 2002; Harvey, Metcalfe, Herbert, & Fanton, 2011).

##### 4.4. Attention deficit

CBT produces a significant medium effect on inattention symptoms. This result is particularly relevant due to the deficits in the attention supervisor system that characterizes the illness (Bayliss & Roodenrys, 2000; Gozal & Molfese, 2007; Sagvolden, Johansen, Aase, & Russell, 2005). In fact, ADHD symptoms are caused by neuropsychological deficits in the attentional supervisor system (AAS) (Barkley, 2013; Sagvolden et al., 2005) and determined by the interaction between individual factors (e.g. dopaminergic system) and environmental and social factors (Arnsten & Dudley, 2005; Killeen, Tannock, & Sagvolden, 2012; Sagvolden et al., 2005). It is important to underline that inattention symptoms in ADHD seems to remain stable over time (Colomera-Diogo, Miranda-Casas, Herdoiza-Arroyo, & Presentación-Herrero, 2012) and that the use of psycho stimulants, intensive behavioral treatments, executive function and attention trainings show limited efficacy and do not improve academic, behavioral, or cognitive functioning (Rapport, Orban, Kofler, & Friedman, 2013).

Fathers reported smaller reductions of attention deficit symptoms than mothers. This might be due to spending less time communicating with their children (Wood, 2010). Recent studies showed that mothers of children with externalizing disorders were more likely than fathers to search for help and were more likely to perceive children's difficulties when these difficulties were moderate (Mason, 2007). When the externalizing symptoms were severe, fathers were more likely to perceive the problematic behaviors (Mason, 2007).

Teachers reported non-significant changes in inattention problems. This might be due to the impact of attention deficits on scholastic performance and to the greater attentional efforts required at school (Lineweaver et al., 2012; Neef et al., 2005; Pelham et al., 2011).

Treatments directed to children only had a larger impact on inattention problems than treatments delivered to children and parents together. A possible explanation for this finding is that attention and executive function trainings are individual therapies (Chacko, Kofler, & Jarrett, 2014). Treatments involving both children and carers are typically focused on reducing the behavioral symptomatology and the psychiatric symptoms, however the long term effects of evidence-based pharmacological and psychosocial treatments for ADHD are poor and do not target key areas of functional impairment (i.e., family, social, and academic functioning) and executive functioning effectively (Chacko et al., 2014).

##### 4.5. Aggressive behavior

Cognitive Behavioral Treatment showed small effects on aggressive behavior. Fathers perceived greater benefits than mothers. A greater reduction of aggressive behaviors was observed in children affected by ADHD. This might be due to the more favorable prognosis of this condition compared to ODD and CD (Cherkasova, Sulla, Dalena, Pondé, & Hechtman, 2013).

Children with a diagnosis of ADHD are at high risk for developing other types of behavior disorders, including Oppositional Defiant Disorder and Conduct Disorder. This is important because the long-term outcomes of children suffering from these comorbidities are likely to be more unfavorable than the long term outcomes of children suffering from ADHD only (Hofvander, Ossowski, Lundström, & Anckarsäter, 2009; Karantanos, 2012).

The presence of aggressive behaviors is one of the criteria to diagnose ODD or CD (APA, 2013). Children suffering from these disorders often have little empathy or concern for the feelings and wishes of others and are prone to misperceive others' intentions towards them. Guilt and remorse over clear misdeeds are often

absent, whereas poor frustration tolerance and irritability are often expressed. Self-esteem is poor although an image of "toughness" is presented. The small reduction found in aggressive behaviors following CBT could be due to the severity of the conduct disorders. These are considered one of the most difficult and intractable mental health problems in children and adolescents and treatments for this condition can be complex and challenging, due to the child's uncooperative attitude, fear and distrust of adults (AACAP, 2013).

Interestingly, CBT showed its efficacy on aggressive behaviors only when delivered to parents and children together. This can be explained by the crucial role of parenting strategies in the development and maintenance of externalizing problems (Buonanno, Capo, Romano, Di Giunta, & Isola, 2010). Several studies have found an association between harsh parenting and children externalizing behaviors (Erath, El-Sheikh, & Cummings, 2009; Erath, El-Sheikh, Hinnant, & Cummings, 2011; Mackenbach et al., 2014; Reid, Patterson, & Snyder, 2002). This relation is likely to be reciprocal.

#### 4.6. Internalizing behavior

CBT was associated with a small reduction of internalizing behaviors, particularly in children with a diagnosis of ADHD and when delivered to both children and parents. Mothers reported a greater change. The small effect found on internalizing behaviors could be due to the main focus of the treatments used in the studies analyzed, which was on overt or behavioral symptoms rather than emotional problems (Lochman et al., 2011).

#### 4.7. Social competence

A significant effect of CBT on social competence was found. This improvement was perceived mostly by parents and was greater in children with ADHD or ODD than children with CD. Children affected by CD are more compromised in this area due to the greater severity of the condition and the presence of callous-unemotional (CU) traits with limited prosocial emotions (APA, 2013).

#### 4.8. Parental stress

A large reduction in parental distress was observed following CBT, when treatment was delivered to parents only or to parents and children together. This corroborates findings from other studies which indicate that CBT is effective in reducing parental distress and psychiatric symptoms when treatment is multimodal and involves parents too (Lochman et al., 2011).

#### 4.9. Positive parenting

A moderate improvement in the use of positive parenting strategies was associated with CBT. A large effect was found when the intervention was delivered to parents only. This might be explained by the parent training sessions provided as part of CBT. Parent training is aimed at teaching parents alternative ways to identify and conceptualize child problem behaviors. Parents are encouraged to use positive parenting practices and role-playing and feedback are used to learn stress management and build family cohesion and communication (Lochman et al., 2011; Masi et al., 2014). Evidence-based behavioral parent training programs for children with externalizing problems focus on teaching parents to reinforce positive behaviors, ignore minor misbehaviors, and punish serious misbehavior through time out and response cost procedures (Eyberg, Nelson, & Boggs, 2008; Pelham & Fabiano,

2008).

Therapist-led parent training has been found to improve parent–child communication, increase parenting self-esteem, alleviate maternal depression and parenting stress and reduce child behavioral problems (Reyno & McGrath, 2006).

#### 4.10. Maternal depression

A small improvement in maternal depressive symptoms was observed following CBT. Many studies suggest that children of depressed mothers are at high risk for the development of psychopathology. In particular, maternal depressive symptoms might predict internalizing and externalizing behavior problems (Betts, Williams, Najman, & Alati, 2014; Lee et al., 2013; Thomas, O'Brien, Clarke, Liu, & Chronis-Tuscano, 2014). Recent studies indicate that this association might be explained by the difficulties experienced by depressed mothers in using positive parenting strategies (Lovejoy, Graczyk, O'Hare, & Neuman, 2000; Sellers et al., 2014). This provides support for targeting maternal depression in the cognitive-behavioral treatments of externalizing symptoms (Chronis, Gamble, Roberts, & Pelham, 2006; Margari et al. 2013).

### 5. Conclusion

This meta-analysis assessed the impact of CBT on externalizing problems and comorbid difficulties. The results indicate that CBT is associated with a moderate reduction of externalizing symptoms, ADHD and oppositional defiant symptoms, and inattention problems. CBT is also associated with improved social competence and reduced parental distress. A small reduction of internalizing problems, aggressive behaviors and maternal depressive symptoms are found following CBT.

The magnitude of the effects obtained on parental distress and psychopathology and on educative practices confirms the key role of parenting styles in the maintenance of externalizing problems. However, only few studies investigated the reduction of maternal symptomatology after CBT. Future work will be able to clarify whether introducing specific screening and intervention sessions for mothers can improve treatment's efficacy.

Overall, this meta-analysis suggests that CBT is effective in targeting externalizing disorders. The use of CBT protocols in clinical health services could improve the wide dissemination of evidence-based treatments for these conditions.

The results of this meta-analysis support the hypothesis that multimodal treatments involving children, parents and caregivers (e.g. teachers) are particularly beneficial to reduce externalizing symptoms (Hutchings, Martin-Forbes, Daley, & Williams, 2013; Lochman et al., 2011; Lochman & Wells, 2004; Muratori et al., 2014; Webster-Stratton, Jamila Reid, & Stoolmiller, 2008). However, the strength of this study is that it focuses not only on externalizing symptoms, but also on parental distress and psychopathology. This represents an innovative approach to analyze the key role of maternal depression and dysfunctional parenting strategies in the vulnerability to and maintenance of disruptive behaviors.

#### Conflict of interest

None declared.

#### Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.brat.2015.10.008>.

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