

Effects of child CBT and parent management training for children with disruptive behavioral disorders



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MANAGEMENT TRAINING FOR CHILDREN WITH
DISRUPTIVE BEHAVIORAL DISORDERS

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EFFECTS OF CHILD CBT AND PARENT MANAGEMENT TRAINING FOR CHILDREN WITH DISRUPTIVE BEHAVIORAL DISORDERS

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By

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To Stefan, Siri and Elsa

POPULAR SCIENCE SUMMARY OF THE THESIS

The present thesis consists of two separate projects, a meta-analysis and a randomized controlled study. Both projects evaluate treatment effects for children with clinical levels of disruptive behavior disorder such as oppositional defiant disorder and conduct disorder. In the meta-analysis, randomized controlled studies on the effect of parent management training (PMT) were analyzed. In the included studies, PMT was compared to waiting list. Results showed that PMT is an effective treatment for clinical levels of disruptive behavior with a medium effect-size. In addition, the effects of Parent Child Interaction Therapy (PCIT), an individual version of PMT where the child participates in the treatment room was compared to waiting list as well as the effects of PMT combined with child cognitive behavior therapy (child CBT), where the child participates in separate child directed anger management and problem-solving skills training, was evaluated compared to waiting list and to PMT only. Results showed a large effect of PCIT compared to waiting list. Only a few studies were found on PMT combined with CBT with large variation between the studies and no conclusions could be drawn.

In the second project, the randomized controlled trial, treatment effects on 120 children with disruptive behavior disorder diagnosis aged 8-12 years old were evaluated. The treatments compared were PMT alone and PMT combined with child CBT. Treatment effects were evaluated directly after treatment and two years after treatment termination. Results showed that both treatments were effective in reducing disruptive behavior and no differences between the treatments were found on disruptive behavior outcomes. The effects in reduced disruptive behavior remained at the two-year follow-up in both groups.

In measures of social skills, PMT combined with child CBT was significantly more effective compared to PMT only directly after the treatment. At the two-year follow-up, the effects regarding emotion regulation and social communication skills were sustained in the PMT with child CBT group over time. Children in the PMT group improved during the follow-up period, reaching a similar result as the child CBT-group. In the project, change in parental strategies were also evaluated and both treatment groups showed a reduction in harsh and authoritarian strategies directly after treatment and after two years after treatment termination.

A sub-group analysis suggested that children with large disruptive behavior problem levels and children with high risk for antisocial development improved more from the combined treatment compared to PMT only in terms of reduced disruptive behavior directly after treatment.

Treatment effects in the randomized controlled trial was also evaluated from a cost-effectiveness perspective. In this analysis, the proportion of children that had recovered from ODD symptoms were compared, that is, the proportion that showed a reliable improvement (Reliable clinical change) and had symptoms below cut off two years after treatment. A larger proportion of children were recovered, in the PMT combined with child CBT condition

compared to children in the PMT only group. Analysis of cost-effectiveness showed that if decision-makers are willing to pay at least € 62 354 per recovered case of ODD, PMT combined with child CBT is cost-effective. The choice of treatment for decision makers and clinicians depends on severity of the disruptive behavior disorder and are suggested to offer PMT combined with child CBT in severe cases and PMT only in less severe cases.

POPULÄRVETENSKAPLIG SUMMERING PÅ SVENSKA

Doktorandprojektet består av två delprojekt, en metastudie och en randomiserad kontrollerad studie. I båda projekten utvärderades effekten av behandling för barn med kliniska nivåer av utagerande beteendeproblem så som trotssyndrom och uppförandestörning. I metaanalysen utvärderades effekten av föräldraträning, (på engelska Parent Management Training; PMT) i randomiserade kontrollerade studier. I de studier som inkluderades, jämfördes PMT med väntelista. Resultatet visade att PMT är en effektiv behandling av utagerande beteendeproblem när besvären är så pass stora att de når kliniska nivåer. I termer av effektstorlek var effekten av PMT medelstor. I metastudien undersöktes också effekten av att inkludera barnet i behandlingen så som vid den individuella PMT varianten Parent Child Interaction Therapy (PCIT) där barnet deltar i behandlingsrummet tillsammans med föräldern eller om barnet deltar parallellt så som vid PMT kombinerat med separat kognitiv beteendeterapi för barn (barn KBT) där barn tränas i ilske kontrollstrategier och problemlösningstrategier. I metastudien jämfördes PCIT med väntelista och PMT kombinerat med barn KBT jämfördes med både väntelista och enbart PMT. Resultatet visade att PCIT var effektivt jämfört med väntelista och gav stora effekter i termer av effektstorlekar. Då det gäller PMT i kombination med barn KBT hittades enbart några få studier. Då det var stora skillnader mellan resultaten från dessa studier kunde inga slutsatser dras.

I det andra projektet, den randomiserade kontrollerade studien ingick 120 barn i åldern 8–12 år med beteendesyndrom. I projektet utvärderades effekten av PMT kombinerat med barn KBT jämfört med enbart PMT direkt efter behandlingen och också två år efter behandlingens avslut. Resultatet visade att båda behandlingarna var effektiva och gav minskade beteendeproblem och inga skillnader kunde ses mellan behandlingsgrupperna. Resultatet höll sig över tid i båda behandlingsgrupperna.

Då det gäller sociala färdigheter var den kombinerade behandlingen med PMT och barn-KBT signifikant mer effektiv jämfört med gruppen enbart PMT direkt efter behandlingen. Vid två-årsuppföljningen kunde man se att behandlingseffekten höll i sig i PMT med barn- KBT gruppen då det gäller färdigheter i emotionsreglering och social kommunikation medan barnen i enbart PMT gruppen kom ifatt under uppföljningsperioden till samma nivåer som PMT med barn KBT gruppen. I projektet utvärderades också föräldrafärdigheter och båda grupperna visade en minskning av stränga och auktoritära föräldrastراتيجier direkt efter behandling och efter två år.

Analys av effekten av behandlingen i olika subgrupper direkt efter behandling visade att de barn som hade stora svårigheter före behandlingsstart och barn som hade hög risk för antisocial utveckling förbättrades signifikant mer då det gäller minskade beteendeproblem av PMT med barn KBT jämfört med PMT.

Behandlingseffekterna i den randomiserade kontrollerade studien utvärderades också i termer av kostnads-effektivitet. In denna analys jämfördes andelen barn som hade återhämtat sig från trotssyndrom, det vill säga hur stor andel av barnen som hade förbättrats så pass mycket att de visade en kliniskt reliabel förbättring (Reliable clinical change) och hade symptom som låg under gränsvärdet för trotssyndrom två år efter behandling. En större andel barn i PMT med barn KBT gruppen visade en kliniskt signifikant återhämtning jämfört med barnen i PMT gruppen. En analys av kostnadseffektivitet visade att om betalningsviljan hos beslutsfattare är större än € 62,354 (SEK 681,100) per barn som är kliniskt signifikant återhämtat då det gäller trotssyndrom, bedömdes PMT med barn KBT vara kostnadseffektivt jämfört med enbart PMT. Hur beslutsfattare prioriterar då det gäller vilka behandlingsmetoder som skall erbjudas, bör påverkas av beteendeproblemens allvarlighetsgrad och de föreslås erbjuda PMT med barn KBT i fall med svårare beteendeproblem och enbart PMT i lättare och medelsvåra fall.

ABSTRACT

Background: An early identification and treatment of children with disruptive behavior disorders such as oppositional defiant disorder and conduct disorder is important to prevent further development of psychiatric disorders and antisocial behavior. Parent management training (PMT) is considered an effective treatment and has been evaluated in numerous studies and meta-analyses. However, meta-analyses including randomized clinical trials on the sole effect of PMT on clinical levels of disruptive behavior disorder (i.e., disruptive behavior disorder diagnosis or disruptive behavior above clinical cut-off in validated measures) are lacking. Including the child in or alongside parent directed treatment may possibly increase treatment effects. Child cognitive behavior therapy (CBT) where the child receives training in anger management and problem-solving skills is considered an effective treatment although studies where child CBT is combined with PMT are scarce.

Aims: The objective for the present thesis was to evaluate the effects of PMT on clinical levels of disruptive behavior as well as more specifically investigate if there is a difference in effects if the child also participates in or alongside the treatment. Study I aimed at investigating the effect of PMT on clinical levels of disruptive behavior and the differential effects of child involvement in the treatment in a meta-analysis. The aim of Study II and III was to investigate the short- and long-term effectiveness of PMT compared to PMT combined with child CBT in terms of reduced disruptive behavior, increased social skills, improved parent management skills and reduced stress. The aim of Study IV was to investigate the effects of PMT compared to PMT combined with child CBT from a cost-effectiveness perspective.

Methods: In Study I, twenty-five randomized controlled studies on PMT effects on clinical levels of disruptive behavior disorder were included in a meta-analysis. Studies comparing PMT with waiting list were synthesized, as were studies where the child was included in the treatment (i.e., Parent Child Interaction Therapy [PCIT] and PMT combined with child cognitive behavioral therapy [child CBT]). In addition, the effects of PMT combined with child CBT was compared directly to PMT alone. In Study II - IV, 120 children with disruptive behavior disorders were randomized to the PMT method Komet or to Komet combined with the child CBT program Coping Power Program (CPP). Assessments were made at baseline, post-treatment (analyzed in Study II) and at one- and two-year follow-up (analyzed in Study III and IV). Moderator analyses were made on child baseline characteristics.

Results: Study I, the meta-analysis, showed that both PMT and PCIT were more effective than waiting list in reducing disruptive behavior. PCIT had a larger effect in reducing disruptive behavior than PMT when both were compared to waiting list. Study II showed equally reduced disruptive behavior in PMT and compared with PMT with child CBT. Social skills were significantly more improved in the combined treatment. Moderator analyses

showed that PMT with child CBT was more beneficial for children with high levels of ODD problems and high risk for antisocial development in reduced disruptive behavior. In Study III, treatment gains in reduced disruptive behavior were maintained and no difference was detected between both treatment arms at two-year follow-up. The early improvement in the PMT with child CBT condition in social skills was maintained at the two-year follow-up in the measures of emotion regulation- and social communication skills while the PMT condition reached similar improvement during the follow-up period. Study IV used the proportion of children that showed a reliable recovery from ODD which was larger in the combined treatment compared to Komet only. Results showed that if decision makers are willing to pay approximately 62,300 EURO per recovered case of ODD, Komet with CPP yielded positive net benefits, in comparison to Komet only. Sensitivity analysis from a health care perspective where school costs were excluded, a 50 % probability of cost effectiveness was reached at around 10,000 EURO.

Conclusions: The meta-analysis (Study I) gives support to treatment recommendations to offer PMT to children with clinical levels of disruptive behavior and highlights the additional benefits of PCIT. Offering PMT and child CBT simultaneously does not yield a significant treatment effect in reduced disruptive behavior compared to PMT only. The effects of adding child CBT to PMT were seen in a faster improvement in emotion regulation and social communication skills, in a larger proportion of recovered cases, and in beneficial effects among children with large behavior problems. Despite the relatively small cost for child CBT, the investment in combining PMT and child CBT should be guided by the severity of child disruptive behavior.

LIST OF SCIENTIFIC PAPERS

- I. Helander M., Asperholm, M., Wetterborg, D., Öst, L., Hellner, C., Herlitz, A., Enebrink P. The efficacy of parent management training with or without involving the child in the treatment among children with clinical levels of disruptive behavior: A meta-analysis. (Submitted)

- II. Helander M., Lochman, M., Högström, J., Ljótsson, B., Hellner, C., Enebrink P. (2018). The effect of adding Coping Power Program-Sweden to Parent Management Training-effects and moderators in a randomized controlled trial. *Behavior Research and Therapy*. Apr;103:43-52. doi: 10.1016/j.brat.2018.02.001

- III. Helander M., Enebrink P., Hellner, C., Ahlen, J. Long-term effects of adding Coping Power Program-Sweden to Parent Management Training-Two-year follow-up of effects, moderators and reliable clinical change in a randomized controlled trial. (Submitted)

- IV. Nystrand, C., Helander, M., Enebrink, P., Feldman, I., F Sampaio, F. (2020) Adding the Coping Power Program-Sweden to Parent Management Training: the Cost-Effectiveness of Stacking Components for Children with Disruptive behaviour disorders. *European Child and Adolescent Psychiatry*. Sep 13. doi: 10.1007/s00787-020-01638-w.

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LIST OF ABBREVIATIONS

ADHD	Attention-Deficit/Hyperactivity Disorder
APA	American Psychiatric Association
ASPD	Antisocial personality disorder
CBT	Cognitive behavior therapy
CD	Conduct disorder
CHU-90	Child health utility instrument
CPP	Coping Power Program
CU traits	Callous unemotional traits
DALY	Disability-adjusted life-years
DBD	Disruptive behavior disorders
DSM-5	Diagnostic and Statistical Manual of mental disorders, fifth edition
ICER	Incremental cost-effectiveness ratio
EARL	Early Assessment Risk List
K-SADS	Schedule for affective disorders and schizophrenia for school-age children
ODD	Oppositional defiant disorder
PMT	Parent Management Training
PCIT	Parent Child Interaction Therapy
QALY	Quality adjusted life-years
SES	Social economic status
TAU	Treatment as usual
WTP	Willingness to pay

1 INTRODUCTION

Children and adolescents with disruptive behavior disorders or conduct disorders constitute a large problem in every society. In a recent summary of the global burden of mental disorders in children aged 5-14, conduct disorders was identified as the mental disorder that causes the most loss of years due to mortality and burden of the disorder (Disability-adjusted life-years: DALY) in all WHO regions (Baranne & Falissard, 2018). In addition, disruptive behavior is one of the major reasons for contact with Child and Adolescent Psychiatry (Garland et al., 2001; Kazdin, 1995). Disruptive behavior disorders has been increasingly recognized as a major public health concern (Maughan et al., 2004) and is associated with a range of comorbid psychiatric disorders such as mood disorders, anxiety disorders, impulse-control disorders, and substance use disorders (Angold et al., 1999; Nock et al., 2007).

Conduct disorders and disruptive behavior disorders are terms that capture children and adolescents with behavior problems ranging from frequent aggressive outbursts, defiance, non-compliance, use of violence, threats, running away from home, and acts of robbery. The term disruptive behavior disorders captures three different psychiatric disorders in the diagnostic manual DSM 5 under the heading Disruptive, impulse-control, and conduct disorders: Oppositional defiant disorder, (ODD; American Psychiatric Association, APA 2013), Conduct disorder (CD; APA, 2013) and Unspecified Disruptive, Impulse-Control, and Conduct disorder (APA 2013). The term conduct disorders is used for the same disorders in the ICD-10 (WHO; World Health Organization WHO, 1993). In this thesis, the term “Disruptive behavior disorders” is used when describing children or adolescents with ODD, CD or Other specified disruptive, impulse-control and conduct disorder.

Children with disruptive behavior disorders are associated with a large financial societal burden (Christenson et al., 2016; Snell et al., 2013). The direct costs for children aged 3-8 years with severe antisocial behavior, in terms of health care, education and voluntary sector resource use, was estimated up to £ 6,000 annually (Romeo et al., 2006). Further, the costs at age 28 for children diagnosed with CD at the age of 10, were 10 times higher than costs for a person with no CD diagnosis (Scott et al., 2001). For a child with ODD, the additional public costs over a seven-year period, in comparison to a child without a disorder from a high-risk neighborhood, were approximately €18,000 in 2020 years value (Foster & Jones, 2005).

To summarize, both ODD and CD are disorders that heavily burdens society both in terms of financial burden but also in terms of personal suffering for those afflicted. The onset is often during childhood and adolescence and if not treated, disruptive behavior disorders are associated with a large range of severe psychiatric illnesses in adulthood.

When it comes to treatment, a large number of studies and meta analyses have been conducted showing that parent management training (PMT) is effective in the treatment of disruptive behavior in childhood (for example Bakker et al., 2017; Battagliese et al., 2015; Bradley & Mandell, 2005; Comer et al., 2013; Dretzke et al., 2009; Fossum et al., 2008,

2016; Leijten, et al., 2018; McCart et al., 2006; Michelson et al., 2013; Van Aar et al., 2017). In addition there is evidence that child-directed treatment such as social skills training or child CBT is effective in reducing aggressive behavior as shown in a recent meta-analysis (Beelmann & Lösel, 2021). In this field of research, many studies and meta-analyses have been conducted in preventive or subclinical samples mixed with clinical samples. It might be the case that treatments that are effective for preventive and subclinical samples are likewise effective for clinical samples but this has not been thoroughly investigated. There is a firm knowledgebase confirming that PMT by itself is effective as is child CBT as outlined above, however, the number of studies that combine PMT with child CBT are scarce, especially in clinical samples with school-aged children.

1.1 THESIS OVERVIEW

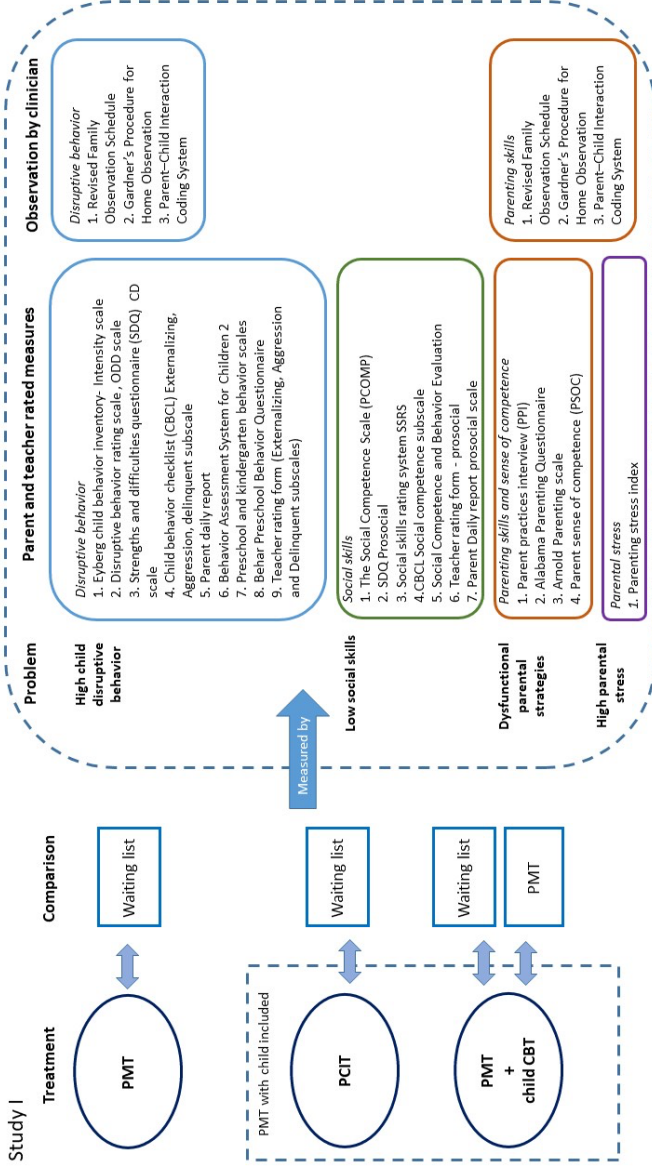
This thesis circles around two overall questions; the effects of PMT in clinical samples and the effect of including the child in or alongside the PMT treatment. In Study I, the effects of PMT in RCTs on clinical levels of disruptive behavior were explored in a meta-analysis, see Figure 1 for an overview on comparisons and measures. In addition, the meta-analysis explored the treatment effects of including the child in or alongside the PMT treatment. In Study II and III, the effects of combining PMT with child CBT were examined compared to PMT only, see Figure 2 for overview. In both the meta-analysis and the RCT, treatment effects were looked at in terms of reduced disruptive behavior but also in terms of improved social skills, more functional parental strategies and reduced stress. The more specific aims of the thesis and the studies included are described in chapter three.

In the literature review that now follows, the diagnoses ODD and CD will first be describes in more detail. Next, the characteristics and risk factors that often lies behind a development into ODD and CD are described. Even though the ODD and CD are separate conditions with different trajectories and prognosis, the risk factors and characteristics that can lead to the development of ODD and CD are the same. In addition, the risk factors and characteristics described in the following section are to a large extent, factors that are addressed in treatments for ODD and CD For a successful treatment of disruptive behavior disorders, the treatment need to be individualized, targeting the risk-factors that are present in the individual case and the treatments offered, need to target several risk factors in order to be effective (Frick, 2016).

The treatments used in the thesis, the PMT program Komet and the child CBT program Coping Power Program, are described in the last section in the literature review as is the research behind. The Coping Power program is described in greater detail since the program is the first child CBT program in Sweden targeting school-aged children with disruptive behavior.

Figure 1

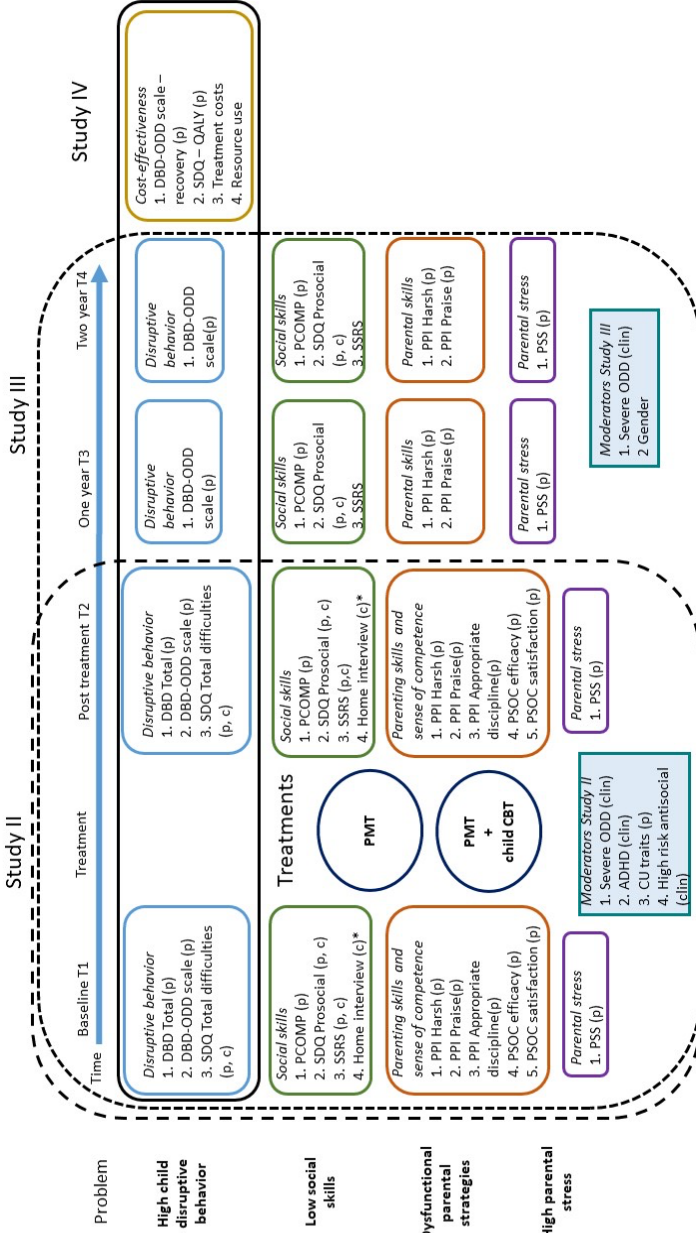
Overview on Study I, a meta-analysis on the effects of PMT on children with clinical levels of disruptive behavior with and without including the child in the treatment.



Note: PMT = Parent Management Training; PMT with child included= PMT with the child included in the treatment or given treatment alongside PMT; PCIT = Parent Child Interaction Therapy; CBT = Cognitive Behavior Therapy; Parent and teacher rated measures = all parent and teacher rated measures used in the included studies; Observation by clinician = Observational measures rated by clinicians.

Figure 2

Overview of the RCT examining the treatment effects of PMT compared to PMT combined with child CBT and the measures used at the different time-points from T1, at baseline to T4 at the two-year follow-up



Note: In study II, treatment outcome were measured at baseline and post-treatment. In Study III, treatment outcome were both measured from baseline to two-year follow-up and between post-treatment and two-year follow-up. For measurement overview, see Table 9 in chapter four on data collection and participants. * = (p) = Parent rated measure; (c) = Child rated measure; (clin) = Clinician rated measure.

2 LITERATURE REVIEW

2.1 DISRUPTIVE BEHAVIOR DISORDER DIAGNOSES

Oppositional defiant disorder (ODD) describes a pattern of angry/irritable mood, argumentative/defiant behavior, or vindictiveness (see Table 1). Conduct disorder (CD) describes a persistent patterns of behavior where the basic rights of others and/or societal norms are violated by aggressive acts to people or animals, destruction of property, deceitfulness, theft or serious violations of rules (see Table 2). These two conditions, ODD and CD can be diagnosed simultaneously. Other specified disruptive, impulse-control and conduct disorder (APA, 2013), applies when symptoms does not meet full criteria for any of the disorders within this diagnostic class but cause clinically significant distress or impairment

Table 1

Oppositional Defiant Disorder (ODD: DSM-5; American Psychiatric Association, 2013)

ODD is defined as a pattern of angry/irritable mood, argumentative/defiant behavior, or vindictiveness lasting at least 6 months as evidenced by at least 4 of 8 symptoms exhibited during interaction with at least one individual who is not a sibling

The angry/irritable mood

1. often losing temper
2. Is often touchy or easily annoyed
3. Is often angry and resentful

The argumentative/defiant behavior

4. Often argues with authority figures or, for children and adolescents, with adults
5. Often actively defies or refuses to comply with requests from authority figures or with rules
6. Often deliberately annoys others
7. Often blames others for his or her mistakes or misbehavior
8. The argumentative/defiant behavior

Vindictiveness

9. Has been spiteful or vindictive at least twice within the past 6 months
-

Table 2

Conduct disorder (CD: DSM-5; American Psychiatric Association, 2013)

A repetitive and persistent pattern of behavior in which the basic rights of others or major age- appropriate societal norms or rules are violated, as manifested by the presence of at least 3 of the following 15 criteria in the past 12 months from any of the categories below, with at least 1 criterion present in the past 6 months.

Aggression:

Aggression to people and animals

- Often bullies, threatens or intimidates others
- Often initiates physical fights
- Has used a weapon that can cause serious physical harm to others (e.g., a bat, brick, broken bottle, knife, gun).
- Has been physically cruel to people
- Has been physically cruel to animals
- Has stolen while confronting a victim (e.g., mugging, purse snatching, extortion, armed robbery).
- Has forced someone into sexual activity

Destruction of property

- Has deliberately engaged in fire setting with the intention of causing serious damage
- Has deliberately destroyed others property (other than by fire setting)

Deceitfulness or theft

- has broken into someone else's house, building, or car
- Often lies to obtain goods or favors or to avoid obligations (i.e., "cons" others)
- Has stolen items of nontrivial value without confronting a victim (e.g., shoplifting, but without breaking and entering; forgery)

Serious violation of rules

- Often stays out at night despite parental prohibitions, beginning before age of 13
- Has run away from home overnight at least twice while living in the parental or parental surrogate home, or once without returning for a lengthy period
- Is often truant from school, beginning before age 13.

Age at onset subtype

- Childhood onset type: at least one criterion characteristic of CD is present before 10 years of age
- Adolescent-onset type: absence of any criteria characteristic of CD before 10 years of age
- Unspecified onset: when the age at onset of CD is unknown

With limited prosocial emotions specifier

This specifier applies to children who meet diagnostic criteria of CD and who also show two or more of the following symptoms over an extended period and across multiple relationships and settings:

- Lack of remorse or guilt
 - Callous- lack of empathy
 - A lack of concern about educational or occupational performance
 - Shallow emotions
-

2.1.1 Prevalence and onset

Both ODD and CD can emerge from before the age of five, and an early onset of ODD and/or CD has a more severe prognosis and constitutes a risk-factor for future antisocial development (Fairchild et al., 2013; Frick & Viding, 2009). The prevalence of ODD ranges between 2% and 14% in epidemiologic samples and 28– 50% in clinical samples (Boylan et al., 2007). Lifetime prevalence of ODD has been estimated to 10.2 % (Nock et al., 2007). Boys show a higher prevalence rate compared to girls prior to adolescence, with the male: female prevalence ratio found to be 1.59:1 (Demmer et al., 2017), while rates of ODD are more similar between genders during adolescence (Boylan et al., 2007; Nock et al., 2007). The prevalence of CD has been found to range from 1.8% to 16% for boys and 0.8 -9.2% for girls and the higher rate of CD among boys seems to last during adolescence (Loeber et al., 2000)

2.1.2 Comorbidities

In terms of comorbidity, both CD and ODD are associated with a range of both externalizing and internalizing psychiatric disorders (Angold et al., 1999; Nock et al., 2007). Studies have shown that an ODD diagnosis in childhood is associated with lifelong mental health disorders in 50% of affected children (Boylan et al., 2007). A common comorbid diagnosis with disruptive behaviors is Attention Deficit Hyperactivity Disorder (ADHD). About 50% of children with ADHD also fulfil ODD diagnosis (Kutcher et al., 2004) and children with CD have a 10-times higher risk of ADHD than those without CD (Angold et al., 1999). The prognosis for children with co-occurring ADHD and ODD/CD is more severe compared to children with only ADHD or only ODD/CD (Angold et al., 1999).

The comorbidity between ODD and CD and internalizing disorders is high (Angold et al., 1999; Boylan et al., 2007). In a systematic review, 25% of children with ODD also had internalizing disorders at some timepoint in childhood and have a larger risk for both depression and anxiety (Boylan et al., 2007). In a recent meta-analysis on the prevalence of mental disorders in adolescents in juvenile detention and correctional facilities, 17.3% of males and 25.8% of females had major depression and 8.6% of males and 18.2% of females had post-traumatic stress disorder (Beaudry et al, 2020).

2.1.3 Predictive validity of the ODD diagnosis

Looking at the ODD diagnosis in more detail, during the last decade a large number of studies have examined the predictive validity of the ODD diagnosis and have concluded that the ODD symptoms comprise one major ODD construct and two underlying dimensions; irritability and defiance (Burke et al., 2014; Evans et al., 2017; Waldman et al., 2021). Moreover, the large majority of children with ODD diagnosis that fulfill the defiant symptoms also fulfill symptoms in the irritable dimension (Nock et al, 2010). The irritability

factor has been found to be associated with depression/dysthymia and generalized anxiety disorder while the defiant behavior factor has been associated with inattention, hyperactivity–impulsivity and CD. The ODD general factor has been associated with all five symptom dimensions, depression/dysthymia, generalized anxiety disorder, inattention, hyperactivity–impulsivity and CD (Waldman et al., 2021). Moreover, irritability has been found to be a stronger predictor of internalizing problems both before and after treatment, while defiant behavior was a stronger predictor of externalizing problems at baseline (Burke et al. 2014). Fortunately, it has also been shown that the risk of developing secondary diagnoses decreases after remission of ODD (Nock et al., 2007).

2.1.4 Developmental pathways of ODD and CD

In the field of ODD and CD research, an issue has been whether there is a life-course-continuity where ODD develops into CD and CD further develops into antisocial personality disorder (APSD; American Psychiatric Association, APA 2013) in adulthood or not. Later research has shown that even though ODD typically has an earlier onset compared to CD, many children with ODD never meet full criteria for CD and many children with CD are not meeting full criteria for ODD (Rowe, Costello, et al., 2010). Further, 50% of children with CD do not develop APSD (Copeland et al., 2009). Thus, although the developmental course is not as straight as earlier believed, children with elevated ODD symptoms are still associated with higher levels of conduct problems over time and a higher probability of receiving charges for serious crimes (Pardini & Fite, 2010) and this development needs halting as does a development into internalizing psychiatric disorders.

2.1.5 The role of genetics

The potential genetic origin of antisocial behavior has been examined in a large number of twin and adoption studies and have identified both heritable and environmental components as well as gene-environment interaction. From a genetic point of view, a recent study has shown that the majority of genetic influences that underlie the comorbidity in ODD and CD were related to the general ODD factor as well as to the two sub dimensions of ODD: irritability and defiant behavior (Waldman et al., 2021). In a twin study, the genetic overlap was examined between the two specific ODD factors, irritability and defiance, and depression and delinquency respectively (Stringaris et al., 2012). Results showed a stronger phenotypic relationship (i.e., observable physical properties, including appearance, development and behavior) between the irritability dimension of ODD and depression compared to delinquency whereas the defiant behaviors dimension were more strongly related to delinquency compared to depression. Further, in a recent study by Waldman et al. (2021), CD, inattention, and hyperactivity/impulsivity has been found to share genetic influences (ranging from 10% to 15% of the variance) in common with defiant behavior, while the genetic influences shared in common with irritability only were minimal ($\leq 2\%$). However, CD shared genetic influences that were common to both irritability and

defiant behavior. Depression and generalized anxiety disorder shared genetic influences uniquely with irritability (ranging from 8 to 9% of the variance) but did not share genetic influences uniquely with defiant behavior ($\leq 1\%$) (Waldman et al., 2021). In sum, there are genetic influences in both ODD and CD and a shared genetic overlap with both internalizing and externalizing disorders.

2.1.6 Children with callous –unemotional traits

Children with Callous Unemotional traits (CU traits) have been identified as a subgroup with risk for a poor prognosis which is the why it has been included as a specifier in the CD diagnosis. Children with CU traits has been found to be under strong genetic influence (heritability of .81) with little influence of shared environment while heritability in the group without CU traits is fairly low (heritability of .30) (Viding et al., 2005). Children who display CU traits are characterized by a preference for dangerous and novel stimuli, a reward-oriented response style, and a lack of reactivity to emotional stimuli that signify distress in others. The temperamental deficits regarding emotional reactivity could make it more difficult to develop appropriate levels of guilt and empathy and may result in CU traits and severe patterns of antisocial behavior (Frick & Viding, 2009). Further, research has shown that there is an increased risk for children with CU traits for meeting the criteria for psychopathy as adults (Lynam et al., 2007).

Children with CU traits show distinct genetic, cognitive, emotional, biological, environmental, and personality characteristics indicating a different etiology explaining the behavior problem problems relative to other youths with severe conduct problems (Frick et al., 2014). In brain imaging studies using fMRI (Functional magnetic resonance imaging), antisocial youth showed lower reactivity in amygdala to fearful faces, compared to typically developing children and children with ADHD (Jones et al., 2009). Youth with CU traits showed differences in their automatic reactivity (Blair, 1999) and in both in resting (Loney et al., 2006) and stress induced cortisol levels (O'Leary et al., 2007). Recent research summarized by Blair and Zhang (2020) indicate reduced structural connectivity in white matter tracts in conduct disorder and abnormalities in the structural connections between limbic areas related to callous-unemotional traits. Limited prosocial emotions is now included as a specifier also in the ODD diagnosis in ICD-11, since children with limited prosocial emotions can be detected as early as in the pre-school years (Hyde et al., 2000; Kimonis et al., 2016), and is associated with more severe and varied antisocial behavior (Enebrink et al., 2005; Rowe, Maughan, et al., 2010)

In contrast to children with CU traits, children with childhood onset of conduct disorders but without CU traits show a different pattern with high impulsivity, low verbal intelligence, poor emotional regulation and higher rates of family dysfunction (Frick & Viding, 2009). Most importantly, they show high rates of anxiety, appear to be distressed by the effect that their behavior have on others, and typically do not have problems in feeling empathy and guilt (Pardini et al., 2007).

2.2 THE DEVELOPMENT OF DISRUPTIVE BEHAVIOR

Children with ODD and CD differ from children that are more typically developing when it comes to individual characteristics (Matthys & Lochman, 2016). In this section, some of the most important characteristics are being described in order to understand the development of disruptive behavior. Apart from characteristics known to function in a different way in children with disruptive behavior, a massive line of research has documented the risk factors for a continued development of antisocial behavior in adulthood (Burke et al., 2002; Jaffee et al., 2012). An antisocial development is not caused by a single risk factor. Instead, combinations and interactions of different risk factors such as individual characteristics, family relations and stressors and environmental factors are assumed to lead to the development of disruptive behavior disorder and antisocial behavior (Dodge & Pettit, 2003; Loeber & Farrington, 1998, 2000). Risk factors for developing disruptive behavior disorders function in a cumulative way where the accumulation of risk factors predicts the onset of disruptive behavior disorders. The individual risk factors for development of disruptive behavior are biological factors, such as genetics and child functional factors such as temperament, difficulties with impulsivity/inhibition, low verbal intelligence and deficiencies in anger management, self-control and social cognition. Risk factors on family level are for example malfunctioning parenting strategies, child maltreatment (Jaffee et al., 2012), insecure attachment, especially avoidant or disorganized attachment (Fearon et al., 2010), parental conflict, inter-parental violence (Farrington, 2005), and antisocial parents (Frick & Morris, 2004). On the environmental level, risk factors are peer rejection and association with deviant peers as well as low SES and disadvantaged neighborhoods.

In the following review of the literature, central risk factors are being described in more detail as are the individual characteristics that are found to differ in children with ODD and CD compared to children without disruptive behavior. The risk factors described are important to understand the development and the maintenance of disruptive behavior but they are also important targets for effective treatments.

2.2.1 Aggressive behavior – reactive and proactive aggression

In the research on aggressive children, the function of aggression has been differentiated in terms of reactive and proactive aggression. Aggressive actions have been classified as proactive, when aggression is used as a mean to achieve a goal, and reactive, when the aggression is a less controlled outburst of anger that appears to be a defensive reaction to a provocation, a frustration or a reaction to not being able to reach a goal (Dodge & Coie, 1987). Children with proactive aggression emphasize the positive and rewarding outcomes of aggression and value the importance of being in power and being dominant in aggressive interactions. (Dodge, 2006; Kempes et al., 2005). Proactive aggression has further been found to be consistently linked with increased levels of antisocial behavior and substance use in early adulthood and adult psychopathic characteristics (Fite et al., 2010). Reactive aggression, on the other hand, has been more associated with emotion regulation difficulties and high

impulsivity (Dodge, 2006; Dodge, et al., 1997; Dodge & Coie, 1987). Reactive aggression is often provoked by a perceived threat, is more defensive in nature and has been associated with internalizing difficulties such as, depression, negative affect, anxiety and with problems with self-regulation (Fite et al., 2010; Vitaro et al., 2002). Further, reactive aggression has been found to be strongly related to hostile attribution bias and peer rejection described below (Vitaro et al., 2002). These two forms of aggression are not mutually exclusive and many children show both types of aggressive behavior (Kempes et al., 2005). A high correlation has been found between the subtypes, but in studies using confirmatory factor analysis, a two-dimensional model that distinguishes between reactive and proactive aggression was found to be more accurate than a one-dimensional model (Poulin & Boivin, 2000).

2.2.2 Child social skills

2.2.2.1 Emotion regulation

Problems with emotion regulation is associated with a range of psychopathology but may be a particular risk for children with disruptive behaviors (Southam-Gerow & Kendall, 2002). The connection between the irritability symptoms within ODD, as described earlier, and depression and anxiety suggests that children with elevated irritability symptoms may struggle especially with handling emotions of anger and touchiness (Derella et al., 2019). The capacity to regulate emotions and specifically anger control, is essential to successfully decrease conduct problems since with increased emotion regulatory skills it is possible to get access to cognitive processes and use social problem - solving strategies (Lochman et al., 2011). In a study of a cognitive-behavioral intervention enhanced by a focus on emotion regulation and social problem-solving skills (SNAP Stop-now-and-plan), improved emotion regulation skills was associated with significant and substantial reductions in irritability (Derella et al., 2019). The ability to monitor and regulate one's own negative emotions reduces aggressiveness, and it has been found that being aware of angry emotions attempt to generate strategies, seem to suffice in order to decrease aggressive responses (Orobio De Castro et al., 2003).

2.2.2.2 Self-control

Self-control (i.e., self-regulation and inhibitory control) has also been found to be important in the development of adolescent externalizing behavior. Impaired childhood self-control is associated with a large range of negative life experiences, such as, criminal offending, school dropout, substance use or unplanned teenage pregnancies, as well as with negative health and financial outcomes (Moffitt et al., 2011). Low self-control has by itself been found to forward an antisocial development even without the influence of antisocial peers (Franken et al., 2016). Training in self-control where the child is taught skills to stop and think before acting has shown decreased externalizing behavior (Augimeri et al., 2018).

2.2.2.3 *Social information processing model (SIP)*

An influential model for describing children's behavior and lack of skills when faced to a problem is the Social information processing model (SIP). Children with aggressive behavior have deficits in several aspects that are being described in the model.

In this model, it is suggested that children go through five mental stages before they act:

1) Encoding the cues; Aggressive children have been found to base their interpretation of events on fewer cues and this has been found in both children with ODD, children with ADHD and in children with both ODD and ADHD (Matthys et al., 1999).

2) Interpreting the cues; Aggressive children have also been found to have a hostile attribution bias - a tendency to attribute benign or ambiguous social situations and cues of others as more hostile than intended (Dodge & Pettit, 2003; Lochman & Dodge, 1994; Yaros et al., 2014). A recent meta-analysis found a robust association between childhood aggression and hostile attribution and also showed that hostile attribution was stronger in emotionally engaging situations (Verhoef et al., 2019). This bias in the social information processing has been suggested to be influenced by the child's previous social interactions and relationships and the emotional arousal they experience is influenced by affective components from past interactions (Lemerise & Arsenio, 2000; Yoon et al., 1999).

3) Clarification of goals: The third step describes the child's desired goals or outcomes in a situation. Aggressive children have been found to put a greater value on dominance and revenge (Lochman et al., 1993).

4) Response access: The fourth step is to generate possible solutions. Aggressive children has been found to generate fewer solutions in general, and the solutions they generate are less positive (Webster-Stratton & Lindsay, 1999) and more action oriented compared to verbal solutions, (Lochman & Lampron, 1986).

5) Response decision: The last step captures how the child evaluates the responses or possible solutions that they have generated. Aggressive children judge aggressive acts to be less bad in a moral sense compared to other children and evaluate aggression as more acceptable (Boldizar et al., 1989).

In sum, aggressive children have difficulties in all steps in the SIP model. Further, the pattern on how aggressive children exhibit these difficulties, vary between individuals and over time (Kupersmidt et al., 2011; Lansford et al., 2006). The SIP model has made a large impact on the field of understanding and treating aggressive children and the SIP stages described above are targets for extensive research on the prevention and treatment of aggressive behavior, delinquency, criminal behavior and substance abuse (de Castro, 2004; Dodge et al., 2013; Kupersmidt et al., 2011; Lochman & Wells, 2002a)

2.2.2.4 *Antisocial peers*

Having antisocial peers is a well-known risk-factor for antisocial development. A recent study found that, even when taking the direct effects of self-control into consideration, young adolescents select their friends to match their externalizing behaviors and they also adapt their externalizing behavior to become more similar to their friends (Franken et al., 2016). No significant interaction was found between self-control and friends' influence which indicates that adolescents may be influenced by their peers regardless of their self-control level.

Rejection by prosocial peers is another risk factor for antisocial development. Child aggressiveness and deficiencies in emotion regulation and problem-solving skills increases the risk for rejection by prosocial peers which in turn leaves the child to engage with groups of deviant children where aggression is an approved and sought of behavior (Burke et al., 2002). The relationship between aggression and rejection by prosocial peers functions reciprocally. Aggressive behavior has been found to lead to peer rejection (Haselager et al., 2002) and peer rejection is in turn found to lead to further aggressive behavior (Dodge et al., 2003). Furthermore, research suggests that children's aggression is shaped by early rejection by the peer group which influences negatively the way children process social information (described earlier in the social information processing (SIP) model). (Lansford et al., 2010). The SIP deficits bias children's cognition regarding social cues, as described above as hostile attribution bias, and increase the likelihood that children will behave aggressively in the future which in turn increase the likelihood of future rejection by the peer group.

2.2.2.5 *Dimensions of social skills*

Children with disruptive behavior disorders often lack social skills and have deficiencies in emotion regulation, self-control and social information processing as outlined in previous sections. Many of the behaviors that are exhibited by antisocial and aggressive children stem from social inadequacies (Merrell & Gimpel, 2014). Child social skills is a concept that has been defines as having several sub-dimensions. In an extensive review synthesizing two decades of factor analytic research, five dimensions of child and adolescent social skills were identified (Caldarella & Merrell, 1997): (1) *Peer relations*, focusing on positive behavior in relations with peers such as complimenting, showing empathy and inviting others to play. (2) *Self-management*, describes ability to control emotions, compromise with others and follow rules; (3) *Academic skills*, describes ability to carry out tasks independently, follow teacher directions; (4) *Compliance*, describes ability to follow rules and expectations and use free time appropriately; (5) *Assertion*, describes extrovert abilities such as initiating conversations. These five dimensions still has strong empirical support and many of the social skills described in these dimensions have been incorporated in well validated assessment and intervention strategies (Merrell & Gimpel, 2014).

2.2.3 Dysfunctional parental strategies and stress

2.2.3.1 Parental strategies

Dysfunctional parental strategies is a risk factor for an antisocial development. Parenting strategies that are being characterized by either harsh/authoritarian or excessively passive/neglecting parenting style both predicts later conduct problems (Baumrind, 1971, 2012; Jaffee et al., 2012; Johnson et al., 2017). Both these strategies fails to develop a balance between a warm and emphatic parent-child relationship and capacity to set limits and guide the child into desired behavior. The authoritarian parenting style involves using threats and harsh commands and models harsh and aggressive problem-solving strategies. Children with harsh and aggressive parents tend to learn that aggression is a functional way to solve problems and they fail to learn more prosocial problem-solving strategies. Punitive discipline and physical aggression from the parent is linked specifically with child aggression and low parental warmth or involvement is specifically linked with oppositionality (Baumrind, 2012; Stormshak et al., 1999). The passive parenting style with low level of supervision and monitoring is linked to future antisocial development (Hoeve et al., 2009; Schaffer et al., 2009). Poor parental monitoring has further been seen to have an increasing association with disruptive behaviors with increasing child age (Schaffer et al., 2009).

2.2.3.2 Coercive patterns

Parental behavior influences child behavior and child behavior influence parents. Patterson and colleagues formulated the concept of *Coercive Circles* (1984), defined as a pattern in which both the child and the parent reinforces aggressive behavior in the other part (Snyder & Patterson, 1995). He illustrated how child behavior might modify parenting behaviors in maladaptive ways, when for example the child uses whining or yelling to get what it wants resulting in the parent backing off and withdrawing from engagement, and thus the child is reinforced in its behavior. Another example is when the parent requests something from the child and the child answers by ignoring the parent. This leads to the parent raising his/her voice and the child reacting with an outburst and anger. If the child succeeds in not needing to do the requested behavior, he or she is likely to use this strategy again. Furthermore, the more uncooperative the child becomes, the less likely the child is to receive attention and positive feedback from the parent when the child shows appropriate behaviors.(Eddy et al., 2003; Patterson & Fisher, 2002).

2.2.3.3 Parental stress

In families of children with disruptive behavior, the stress of the parent has been described as intertwined with the development and the maintenance of aggressive and oppositional behavior (Kazdin & Whitley, 2003). It has been argued that parental stress and child disruptive behavior acts in a bidirectional way (Yates et al., 2010) and that the processes of parenting stress, parenting, and child behavior problems influence one another in a transactional manner across early and middle childhood (Mackler et al., 2015). Further,

psychosocial interventions for disruptive and aggressive behavior have been found to decrease parental stress (Fossum et al., 2008).

2.2.4 Etiological framework.

The risk factors for developing disruptive behavior disorders are known to a certain extent but functions in a way that is only partially understood. Matthys and Lochman (2016) has outlined a structure for an overall etiological framework for the development of ODD and CD. They describe that the development of disruptive behavior disorders often starts at an early age, as early as 1.5 – 3 years, when the child is showing temperamental characteristics such as restlessness, negativism and irritability. The child's problem behavior evokes negative parenting strategies and the problem behaviors develop into disruptive behavior disorders due to neurobiological factors in the child on one side and negative parenting on the other. Coercive parent-child interaction is elicited by the child's disruptive behavior but the personality characteristics of the parent such as impulsivity contribute to this interaction as well. The negative parent-child interaction sustains the disruptive behavior as well as do negative peer relations. These negative experiences for the child result in deviant cognitive and emotion regulating capacity that in turn sustains the disruptive behavior. The functioning of the child, the parents and the peers are further affected by contextual factors such as neighborhood and school. Matthys and Lochman stated further that causality is considered multidirectional rather than linear and that different sets of causal pathways may lead to the different manifestations of ODD and CD (2016).

2.3 TREATMENT

As mentioned earlier, successful treatment of disruptive behavior disorders needs to be individualized, targeting the risk-factors that are present in the individual case and the treatments that are offered, need to target several risk factors. In the following sections, the treatments that are being described, are all recommended in clinical guidelines for children with disruptive behavior disorders (National Institute for Health and Clinical Excellence, 2017), and they target several central risk factors that underlie the development of disruptive behavioral disorders.

2.3.1 Parent Management Training - PMT

PMT is considered an effective treatment for children with conduct problems showing moderate between-group effect sizes in reduced ODD-, CD-symptoms, or disruptive behavior problems in a large number of meta-analyses (e.g., Bakker et al., 2017; Battagliese et al., 2015; Bradley & Mandell, 2005; Comer et al., 2013; Dretzke et al., 2009; Fossum et al., 2008, 2016; Leijten, et al., 2018; McCart et al., 2006; Michelson et al., 2013; Van Aar et al., 2017). In PMT, parents are taught strategies for improving the quality of the parent-child relationship and handling behavior problems using behavior modification programs. The treatments stems from the theoretical framework developed by Patterson on coercive patterns described in previous section and the finding that altering parental practices can reduce

disruptive behavior in order to reduce negative reinforcement of the disruptive behavior (Patterson et al., 1982). PMT programs include teaching parents to improve positive involvement with their child, to direct parental direction of attention on adaptive behaviors, and to enhance parent–child communication. PMT also includes teaching parents to prepare instructions ahead of time and use clear instructions/commands and respond to the child showing desirable behavior with positive attention and warmth. In addition, parents are also taught how to reduce the reinforcements of negative behavior by reducing their attention to minor disruptive behavior and work with non-punitive consequences (Scott, 2008).

2.3.1.1 Meta analyses of PMT effectiveness

Over the years, over 200 studies have examined PMT effectiveness (Gardner & Leijten, 2017), and 39 meta-analyses at a minimum have analyzed the effects of PMT in intervention studies (Hendriks, Van der Giessen, et al., 2018). Table 3 presents an overview of meta-analyses on clinical levels of disruptive behavior problems with and without RCT design as well as meta-analyses on RCTs on clinical as well as sub-clinical levels of disruptive disorders. Clinical levels of disruptive behavior is defined as all children in the study having ODD or CD diagnosis or disruptive behavior above clinical cut-off in well validated measure of disruptive behavior.

Table 3

Overview of PMT meta-analyses on clinical and non-clinical levels of disruptive and/or RCT design

PMT meta-analyses on children 3-18 with clinical levels of disruptive behavior: RCT design				
Meta-analysis	Control	Identifies results for clinical level of DBD	PMT - alone or with other parent directed treatment	Age
Bakker et al., 2017	No restriction	Yes, CD and/or ODD diagnosis or above clinical cut-off	PMT together with MST, BSFT	0-18
Bradley & Mandell, 2005	Placebo, waiting list, no treatment or treatment as usual	CD and/or ODD diagnosis or above clinical cut-off	PMT evaluated alongside child directed treatment and school-based treatment	0-18
Battagliese et al., 2015	Waiting list	ODD, CD and/or ADHD	PMT alone, together with child CBT and/or or school-based treatments	School-age

PMT meta-analyses on children 3-18 with clinical levels of disruptive behavior: no RCT design

Meta-analysis	Control	Identifies results for clinical level of DBD	PMT	Age
Epstein et al., 2015	No restriction	Yes	PMT + other psychosocial treatment	2-17
Fossum et al., 2016	No restriction	Yes	PMT + other psychosocial treatment	2-17
Fossum et al., 2008	WL, placebo or TAU	Yes	PMT + other psychosocial treatment	6-17
Erford et al., 2014	WL or TAU	Yes, ODD diagnosis	Counseling or psychotherapy directed at the child or through the child's caregiver.	6-17

PMT meta-analyses on children 3-18 that includes both clinical and non-clinical levels of disruptive behavior with RCT design

Meta-analysis	Control	Identifies results for clinical level of DBD	PMT	Age
Michelson et al., 2013	No restriction	No. Clinically referred, routine setting, routine service and non-specialist therapists	Yes	0-12
van Aar et al., 2017	WL, TAU, minimal contact	No	Yes	0-12
Leijten et al., 2013	Any control	No. Identifies baseline severity	Yes	0-12
Comer et al., 2013	WL	No. Targeting disruptive behavior problems—including symptoms of externalizing behavior, aggression, oppositionality/noncompliance, and/or impulsivity/hyperactivity	PMT included in psychosocial treatment	0-8 years
Leijten et al 2018	Any control	No. Prevention and treatment. Includes ADHD	Parenting program based on the principles of (social) learning theory	2-9
Gardner et al. 2019	WL, minimal or no intervention	No. Prevention and indicated intervention	Individual participant data from trials using the PMT method “The Incredible Years”.	0-12
Leijten et al 2019	Any control	No. Universal, selective and indicated prevention and referred or self-referred to treatment. Including ADHD	Behavioral and non-behavioral parenting programs.	2-9

Note: Control= Comparison condition; WL = waiting list; TAU = treatment as usual; DBD = Disruptive behavioral disorders

To summarize, there are several meta-analyses on the effects of PMT that are based on studies with RCT design, which is important in order to draw unbiased conclusions. Two meta-analyses were found that included studies with RCT design on clinical levels of disruptive behavior (Bakker et al., 2017; Bradley & Mandell, 2005). However, both these meta-analyses include studies on PMT effects together with studies on PMT combined with child CBT and/or school interventions (Bradley & Mandell, 2005), or studies on multisystemic treatment, making conclusions on the specific effects of PMT hard to distinguish. As shown in Table 3, many meta-analyses include studies on children with ADHD without disruptive behavior along with studies on disruptive behavior problems, also complicating conclusions (Battagliese et al., 2015; Comer et al., 2013; Leijten et al., 2019; Leijten, Melendez-Torres, et al., 2018). In a few meta-analyses on RCTs, studies conducted in a treatment setting have been identified in order to capture children with elevated or severe problem levels (Leijten et al., 2019; Leijten, Melendez-Torres, Gardner, et al., 2018). However, after a closer look, all these meta-analyses, to some extent, include studies on children with sub-clinical levels of disruptive behavior. To conclude, no meta-analysis have evaluated the specific effects of PMT on clinical levels of disruptive behavior problems in randomized controlled trials.

2.3.1.2 Long term effects of PMT on clinical levels of disruptive behavior

A common problem in RCTs is the scarcity of long-term follow-up studies since families in the waiting-list condition naturally are offered treatment after the ending of the trial. There is however also a lack of long-term studies of PMT effectiveness on clinical levels of disruptive behavior compared to treatment as usual. Long term effects have been examined using within-group effect sizes in a few meta-analyses that included subclinical and non-clinical levels of disruptive behavior. One meta-analysis, (Van Aar et al., 2017), included RCTs only and evaluated long-term effects up to three years after treatment. This meta-analysis, that included both intervention trials and pure prevention trials found a sustained effect of PMT, regardless of the initial levels of child disruptive behavior problems. Another meta-analysis by Fossum et al. (2016) included studies with clinical levels of disruptive behavior and evaluated the long term effectiveness of PMT together with other types of treatment modalities (child CBT, PMT with child directed CBT and family focused treatments). Sustained treatment effects were shown on conduct problems in within-group comparisons. When looking at treatment modality using within-group effects-size, the inclusion of non-RCT studies and the inclusion of different treatment modalities alongside PMT in the analysis, limits the possibilities to distinguish the specific long-term effects of PMT.

2.3.1.3 Moderators of PMT effectiveness

Moderator analyses of treatment effects have been conducted in a large number of meta-analyses (e.g., Bakker et al., 2017; Fossum et al., 2016; Lundahl et al., 2006; Mingeback et al., 2018; van Aar et al., 2017). On family level, the level of social and socioeconomic disadvantage was previously thought to moderate PMT effectiveness negatively. However, in

a large meta-analysis on individual participant data on “The Incredible Years” effectiveness on children between 2 and 10, higher levels of social and socioeconomic disadvantage was not found to moderate treatment effectiveness (Leijten, Gardner, Landau, et al., 2018). This result confirms the results from a meta-analysis where PMT programs were equally effective for families with high and low socioeconomic status immediately post-treatment (Leijten et al., 2013). Treatment gains were however harder to sustain for disadvantaged families (Leijten et al., 2013). In the meta-analysis on individual participant data another finding was that parental depression moderated treatment effects positively, i.e. larger severity in depression pre-treatment was associated with larger treatment effects in reduced behavior problems (Leijten, Gardner, Landau, et al., 2018).

When it comes to child characteristics, severity of parent rated child behavior problems before PMT is initiated has been associated with larger reductions in behavior problems (Deković et al., 2011; Gardner et al., 2019; Leijten et al., 2013, 2017). Child age did not moderate treatment effectiveness (Leijten, Gardner, Landau, et al., 2018; McCart et al., 2006; van Aar et al., 2017). The moderating effect of gender has been reported not to moderate short-term treatment effects in meta-analyses examining PMT effectiveness in clinical and subclinical populations (van Aar et al., 2017). Levels of ADHD or emotional symptoms did not moderate treatment effects in an individual participant data study (Leijten et al., 2017).

Looking at moderators on clinical levels of disruptive behavior a conflicting result was found regarding age, gender and treatment format. One meta-analysis, including non-RCTs as well as RCTs, found larger reduction of behavior problems in younger children than older and in individual compared to group format (Fossum et al., 2016) while the other found no moderator effects of age, gender, type of control or treatment format (Bakker et al., 2017). In both of these meta-analyses, the effects of PMT was investigated together with other kinds of treatments such as family based, school-based or multi-systemic treatments. The difference in outcomes might be explained by the fact that they include studies using different research design.

In sum, a large number of meta-analyses have been conducted on the effects of PMT but no meta-analysis has exclusively investigated the effects of PMT on clinical levels of disruptive behavior in RCTs only. Consequently, no moderator analyses have been conducted.

2.3.1.4 PMT in Sweden

In Sweden, a few studies have been conducted that evaluate PMT in randomized trials. The internationally widespread PMT program “The Incredible Years” (Webster-Stratton & Hammond, 1997) has been evaluated compared to waitlist showing effectiveness in reducing behavior problems and transferability to a Swedish context (Axberg & Broberg, 2012). The Swedish PMT program Komet (COmmunication METHod) was developed based on Webster-Stratton’s (Webster-Stratton, 1984), Patterson’s (1982) and Barkley’s (Barkley, 2013) parent management models, all based on social learning theory and strategies from

cognitive behavior therapy. In a randomized controlled trial, the Komet program was compared to either a self-help book or to a waiting list-condition, and showed a significant between-group effects on behavior problems when compared to waiting list (Kling et al., 2010). In a large nationwide study (Högström et al., 2017; Stattin et al., 2015), four treatments targeting disruptive behavior were compared to waiting list, including three PMT programs: The Incredible years, Komet, COPE (Cunningham et al., 1995) and one attachment based program – Connect (Moretti & Obsuth, 2009). The three behaviorally-oriented PMT programs showed decreased ODD symptoms at post-treatment, with Komet showing the largest between-group effect size (Stattin et al., 2015). At the two-year follow-up, the difference between the programs was non-significant meaning that the attachment based program showed similar effects as the PMT programs two years after treatment termination (Högström et al., 2017). In sum, international PMT programs are effective in a Swedish setting and the Swedish PMT program Komet was shown to be equally effective as the international programs The Incredible Years and COPE.

2.3.2 Social and cognitive problem-solving training - Child CBT

PMT by itself targets many of the risk factors that are known to contribute to an antisocial development such as, authoritarian or passive parenting, coercive patterns between parent and child, and parental stress. However, many risk factors remain untreated especially those concerning child individual characteristics and competences such as emotion regulation skills, self-control and deficiencies in social information processing system (SIP). These risk factors and characteristics are targeted by child CBT, (also called cognitive behavioral skills training, social skills training and problem-solving skills training), where children are taught strategies to handle aggression, regulate emotions, use problem-solving techniques, and train perspective taking (Kazdin, et al. 1992; Lochman & Wells, 2002; Webster-Stratton & Hammond, 1997).

There are a large number of CBT programs that target anger management and emotion regulation in the school setting and a few meta-analyses have summarized their effects showing small to moderate treatment effects of CBT (Candelaria et al., 2012; Sukhodolsky et al., 2004). The programs included in these meta-analyses were mostly preventive and did not specifically target clinical levels of disruptive behavior. A large meta-analysis on maladaptive aggression included studies on CBT together with studies on multimodal treatments with school, parent and individual treatment components from both school and clinical setting, showing a medium treatment effect for CBT to reduce aggression (Smeets et al., 2015). The specific effects of child social skills training on aggression, delinquency and violence has been examined in a recent meta-analysis in prevention studies as well as in indicated samples, the latter including children with ODD and CD (Beelmann & Lösel, 2021). Social skills training was found to be significantly more effective in the indicated samples compared to preventive samples with a medium effect-size in the indicated group. In the meta-analysis by Fossum and colleagues (2016), combined PMT with CBT was shown to have a medium within-group effect-size in a sample on RCTs as well as non-RCTs.

In a few studies, child CBT has been combined with PMT and evaluated compared to PMT only for treatment of clinical levels of disruptive behavior: in a group setting for younger children 4-8 years (Larsson et al., 2009; Webster-Stratton & Hammond, 1997) and in an individual format for children aged 8-12 years (Kazdin et al., 1992). One-year follow-ups of child CBT with PMT compared to PMT have shown mixed results. Two studies showed significantly reduced behavior problems in the combined treatment compared to PMT only (Kazdin et al., 1992; Webster-Stratton & Hammond, 1997) while one study showed no significant differences between PMT with child CBT versus the single treatments PMT in behavioral outcomes (Larsson et al., 2009).

A child group CBT treatment for older children (8-14 years), the Coping Power Program (CPP) has been investigated in a school setting; alone or in combination with PMT (Lochman & Wells, 2002b). The CPP with both child and parent component has shown reduced parent and teacher rated aggressive behavior at post-treatment (Lochman & Wells, 2002b) and at follow up compared to waiting list (Lochman & Wells, 2004). The combined child and parent component has also been evaluated compared to treatment as usual that consisted of family therapy or behavior therapy showing a decrease in parent-reported overt aggression that was significantly larger in the CPP condition compared to family therapy, while CPP and behavior therapy did not differ significantly in this respect (Van De Wiel et al., 2007). In addition, CPP seemed to be more powerful compared to treatment as usual in reducing substance use in early adolescence (Zonnevylle-Bender et al., 2007). The child component in CPP has also been evaluated in showing reduced disruptive behavior, increased social competence and cognition, compared to control (Mushtaq et al., 2016) and reduced aggressive behavior and CU traits (Muratori et al., 2017, 2019). CPP has also been evaluated in a pre-post study on children with disruptive behavior disorders showing significant reduction of oppositional defiant disorder symptoms (Aitken et al., 2018).

Originally, the child component in CPP consisted of 34 group sessions and the parent component consisted of 16 sessions. A briefer version of CPP, consisting of 24 sessions for the children and 10 sessions for parents has also been evaluated showing reduced children's externalizing problem behaviors, proactive and reactive aggression, impulsivity traits and callous-unemotional traits. (Lochman et al., 2014).

In sum, there are a few studies that have investigated the effects of child CBT combined with PMT both on clinical levels of disruptive behavior disorders and on children at risk with elevated symptoms. The evidence described above shows that disruptive behavior can be effectively treated with child CBT and PMT. There are however only a few studies that have investigated the additive effect of child CBT to PMT and the results from those studies existing, show varying results. Further, there is no meta-analysis on RCTs on the effects of child CBT with or without being combined with PMT on clinical levels of disruptive behavior. In addition, there are no studies that have evaluated child CBT in the treatment of disruptive behavior problems in Sweden.

2.3.3 Parent Child Interaction Therapy - PCIT

In NICE guidelines (NICE; National Institute for Health and Clinical Excellence, 2017), apart from recommending PMT for the treatment of child disruptive behavior disorders and social and cognitive problem solving training described above, individual parent and child programs are recommended for children with complex needs. Parent Child Interaction Therapy (PCIT; Eyberg & Funderburk, 2011) is an individual parent and child training program where the therapist guides the parent via a bug-in-the-ear device in order to coach the parent to enhance the parent-child relationship, improve parenting skills, and to reduce externalizing behavior problems. PCIT has shown reduced behavior problems with large effect sizes in numerous studies and in a few meta-analyses (Thomas et al., 2017; Ward et al., 2016). However, no meta-analysis with including RCTs on the effectiveness of PCIT on clinical levels of disruptive behavior as inclusion criteria have yet been conducted.

2.3.4 Economic evaluation

Treatment gains can be evaluated in terms of reduced symptoms or suffering. Another way of evaluating the effects of treatment is by putting the symptoms or the disorder in an economic framework. Economic evaluation is a tool developed to inform decision-makers on which interventions they should consider funding, in order to improve societal welfare. In economic evaluations, two or more interventions are compared in terms of their costs and their outcomes/benefits (Drummond et al., 2015). The results of such evaluations are usually expressed in terms of incremental cost-effectiveness ratios (ICERs), where the incremental costs of intervention A versus intervention B are divided by the incremental benefits of intervention A versus intervention B (Sampaio et al., 2018). In economic evaluation, cost-utility is another notion of interest that uses a generic measure of health gains when comparing treatments. In analyses of cost-effectiveness the generic outcome index that most commonly is used is the quality-adjusted life-year (QALY). QALY is calculated by multiplying the length of time spent in a particular health state by a weight which designated the preference society has for that particular health state (Sampaio et al., 2018). The QALYs gained can be related to established threshold values for the willingness-to-pay (WTP) in order to determine whether or not the intervention can be considered good value for the money.

2.3.4.1 The cost effectiveness of PMT

The cost-effectiveness of PMT has previously been estimated in a few studies. The PMT method “The Incredible Years” (IY; Webster-Stratton & Hammond, 1997) was evaluated finding a high probability that the IY program is cost-effective (Edwards et al., 2016; O’Neill et al., 2013) The PMT method Triple-P (Sanders, 1999) was found to be cost effective in the treatment of CD among children, when delivered in a group or an individual format, and the group format was found to be the most cost-effective option (Sampaio et al., 2018).

2.3.4.2 The cost effectiveness of PMT and child CBT

The cost effectiveness of child CBT combined with PMT has been evaluated in a few studies on younger children. In one study, the cost effectiveness of PMT, child CBT and teacher training was examined showing that providing multiple treatment components were cost effective for the reduction of disruptive behavior compared to no intervention (Foster et al., 2007). The combination of child CBT and PMT was however not examined directly in this study. In child and adolescent psychiatry in the Netherlands, CPP including both 23 sessions child CBT and 15 sessions PMT components was evaluated compared to treatment as usual (Van de Wiel et al., 2003). Results showed that both groups reached the same improvements for the children but to a 42% lower cost in the CPP with PMT group compared to the treatment as usual condition. In this study the mean cost per family for CPP with PMT was €350 from pre-treatment to 6 months follow-up while the mean cost per family for treatment as usual during the same time-period was €523. There is currently no study that examines cost effectiveness of CBT treatment on children with disruptive behavior problems in the ages 8-12, alone or in addition to PMT compared to PMT only.

3 RESEARCH AIMS

The objective for this thesis was to evaluate the effects of PMT on children with clinical levels of disruptive behavior disorders as well as more specifically to investigate possible differences in effects if the child also is included in or receives treatment alongside PMT. The specific aims of each respective study are presented below.

3.1 STUDY I

The aim of this meta-analysis was to evaluate PMT efficacy in randomized controlled studies on children aged 3-17 years with clinical levels of disruptive behaviors. Further, this meta-analysis also aimed at analyzing the differential effects if the child was included in or received treatment alongside PMT.

3.2 STUDY II

In Study II, the aim was to investigate the effects of the child-CBT program Coping Power Program (CPP) in combination with the Swedish PMT program Komet post-treatment on child behavior problems, child prosocial skills, parenting behaviors, and parental stress, compared to Komet only for children aged 8–12 years with behavior problems.

3.3 STUDY III

In Study III, the aim was to investigate the two-year follow-up effects of Komet with CPP compared to Komet only on child conduct problems, social skills, parenting behaviors and parental stress.

3.4 STUDY IV

In Study IV, the aim was to estimate the cost-effectiveness of Komet with CPP compared to Komet only using data from the two-year follow-up.

4 MATERIALS AND METHODS

Study I is a meta-analysis on PMT effectiveness in the treatment of clinical levels of disruptive behavior problems and is presented by itself. Study II-IV all share common aspects with regard to participants, treatment interventions that are investigated and the measures used and are presented together.

4.1 THE TREATMENTS USED IN STUDY II-IV

4.1.1 Komet

The Parent Management Training program used in Study II-IV is the Swedish PMT program Komet¹ (Kling et al., 2010). Komet was inspired by the PMT programs Incredible Years (Webster-Stratton & Hammond, 1997) and Parent Management Training - Oregon model (Patterson et al., 1982) has shown similar results as the international PMT programs, the Incredible Years (Webster-Stratton & Hammond, 1997) and Cope (Cunningham et al., 1995) (Högström et al., 2017; Stattin et al., 2015).

Komet is a group-treatment for parents that consists of 11 group sessions of 2.5 hours each with 6 families (parents of 6 target children) in each group. The Komet program includes the treatment components found in most PMT programs aiming to increase positive parent-child interaction and reduce disruptive behavior: Play or positive time together with the child, training in giving clear instructions/commands, praise and rewards to increase reinforcement on positive behavior, reducing the reinforcement of negative behavior by not focusing on minor disruptive behaviors, handling anger outburst calmly, and using non-punitive consequences.

4.1.2 Coping Power Program - CPP

The child CBT program used in Study II-IV is the child-component of the CPP (Lochman & Wells, 2002). The CPP is a manual-based group CBT intervention for children 8-14 years old. In CPP, children are trained in emotion regulation, anger management skills, social problem-solving skills, perspective taking, social skills and handling group pressure, see Table 4 for program overview. The original CPP child groups consist of 32 one-hour sessions. A shorter manual with 24 one-hour sessions was developed in 2006 (Lochman et al., 2006).

In the trial, the parent- and the child groups were offered simultaneously to increase convenience for the families and for this purpose, the format of the child component was adapted to the format of the PMT group. In the Swedish version of CPP, the child component

¹ In this thesis, the Swedish spelling of the Comet program is Komet. The two spellings of the program are used in the studies included in the thesis.

was reshaped from the 24-session, one-hour format into a 15-session version of 2.5 hours (adaption was made in dialogue with program developer professor John Lochman, University of Alabama). This adaption also enabled the treatment to be delivered during one semester. The manual was translated into Swedish and minor adjustments were made in the session content to fit the longer treatment sessions. Adaptions were also made to fit the large proportion of the children within the child- and adolescent psychiatry with hyperactive behavior and attention difficulties. The adaptions that were made were for example an increase in the number of short breaks and oral exercises more often than exercises in writing or use of small groups to maintain attention to the task. The original CPP child component had school-based exercises and tasks which in the Swedish version were transformed to home-based tasks. With an increased timeframe, the amount of free time where the children could play and interact with each other was increased. An advantage of the increased free time was that it gave more opportunities for children and group-leaders to practice problem-solving skills in action if and when conflicts arose. See Table 4 for session outline and Table 5 for group structure in the sessions.

Table 4

Coping Power Program child component session outline

Session	Content
1	Get to know each other. Establishing group rules and contingent reinforcement, establish structure of group meetings. Identifying personal goals with CPP, short and long term
2	Emotion awareness. Becoming aware of physiological arousal when angry.
3	Handling anger, becoming aware of physiological arousal when angry
4	Handling anger using relaxation and self-statements, part 1.
5	Handling anger using relaxation and self-statements, part 2.
6	Perspective taking. Focus on attributions and cue recall, understanding others goals and intentions.
7	Problem-solving training part 1. Identifying the problem, identify possible solutions, identify consequences.
8	Problem-solving training part 2 Training in identifying smart solutions with positive or neutral consequences
9	Problem-solving training part 3 Planning their own videotape of inhibitory self-statements and social Problem-solving with problems of their own choice.
10	Making their own video recording of inhibitory self-statements and social problem-solving with problems of their own choice
11	Problem-solving training part 4. Focus on conflicts with siblings and on perspective taking
12	Social skills training involving methods of entering new peer groups and using positive peer networks
13	Coping with peer pressure to participate in drug use and antisocial actions. Making a poster on the strategies taught
14	Coping with peer pressure. Planning for group termination party.
15	Recap of things taught in CPP, evaluation and feedback. Party with parents where the video and the poster are shown.

Table 5*Group structure and time outline in the sessions*

Activity	Accumulated time
Children arrive. Small chat of how the week has been	10
Recap – what did we do last week?	20
Goals and homework	50
Relaxation exercise	55
Topic of the day	1 hour
Snack	1,20
Exercise of the topic of the day	1,40
Free play or organized play	2 hours
Positive feedback + reward	2.30

4.2 DATA COLLECTION AND PARTICIPANTS**4.2.1 Study I**

In the meta-analysis on PMT effectiveness, RCTs on children between the ages 3 and 17 of with clinical levels of disruptive behavior problems were included. Clinical levels of disruptive behavior was defined either as fulfilling criteria for a diagnosis of ODD or CD, or disruptive behavior problems over clinical cut-off in a well-known and established teacher or parent rating-scale of disruptive behavior. The interventions evaluated were: (1) Standard PMT (in this meta-analysis defined as PMT directed towards parents and including core PMT treatment components (Scott, 2008) ; (2) PMT with child included in the treatment (PCIT); (3) PMT combined with child CBT (PMT with CBT). Treatments had to consist of at least 3 hours of therapist-client contact, via phone or face-to-face. Comparison groups were WL or no treatment. In the case PMT was compared directly to PMT with child CBT, PMT was made comparison. The intention was also to include studies using treatment as usual as comparison but too few studies were found on PMT effects on clinical levels of disruptive behavior.

Database searches were made at four occasions between December 2014 and April 2019. In total, 5168 studies were identified through database searches and after searching through other meta-analyses on PMT effectiveness in the field. A total of 4491 studies were excluded at the abstract level and 539 at full text search, which left 25 studies with data from 28 published articles that were included in the meta-analysis. A total of 2492 individuals participated in the included studies. See Table 6 for descriptive data across comparisons.

Table 6*Descriptive data per comparison in Study I*

Treatment	Comparison	Number of studies per type of rater	Mean age (SD)	Percent boys (SD)	Mean total PMT treatment hours (SD)	Mean number of PMT treatment sessions (SD)	Mean study quality (SD) N=33
Standard PMT	WL	Parent n=16 Teacher n=6 Clinician n= 4	5.83 (1.17)	70.1 (.10)	24.02 (12.80)	13.33 (4.43)	22.61 (4.91)
PCIT	WL	Parent n=6 Clinician n=3	4.54 (0.85)	76.2 (.06)	14.00 (1.05)	12.8 (1.10)	18.67 (3.45)
PMT + child CBT	WL	Parent n=3 Teacher n=3 Clinician n=3	6.97 (1.48)	51.3(44.56)	29.33 (14.74)	15.67 (6.35)	25.00 (5.0)
PMT	PMT + child CBT	Parent post n=4 Parent follow-up n=3	7.99 (2.18)	76.25 (.03)	31.5 (9.85)	15.50 (5.45)	26.75 (2.36)
Total			5.63 (1.72)	69.17 (17.1)	22.32 (10.70)	13.17 (3.85)	21.56 (4.75)

Note: PMT = Parent Management Training, PCIT = Parent Child Interaction Therapy; PMT + child CBT = PMT with child CBT, WL = Waiting list; n = Number of studies per type of rater; Mean study quality = mean rating of quality according to the psychotherapy outcome study methodology rating scale (Öst 2008).

4.2.2 Study II

The study was a randomized controlled design with pre- and post-measurements evaluating the effects of Komet with CPP compared to Komet only. In the study, 120 children, 8-12 years old, diagnosed with Oppositional Defiant disorder, Conduct Disorder or Unspecified disruptive, impulse-control, and conduct disorder and their families were randomized to either Komet or to Komet combined with CPP. The study was conducted within regular child and adolescent outpatient mental health care in Mid-Sweden. Exclusion criteria were (a) autism (b) intellectual disability (c) severe other psychiatric comorbid disorder that required treatment. Baseline and post-treatment data were collected from parents and children through questionnaires and interviews at the outpatient clinics as well as through questionnaires distributed through a secure Internet-based webpage. See Table 7 for participant's characteristics and Table 8 for treatment attendance.

Of participants randomized to treatment, 103 families (85.8%) (parents or children) completed the post assessment. Looking at those not completing post assessments compared to completers, a significantly larger proportion of families had parents with a lower level of education (primary/high school compared to university, $\chi^2 (1, 118) = 4.60, p = .03$). There were no differences concerning age or gender of either the child or parent in the attrition group compared to those completing post-assessment and there were no significant differences in the dependent variables at baseline between study-completers and those who dropped-out from the post-treatment assessment ($p > .05$). The attrition rate for parents who started treatment in the PMT only group was somewhat larger, but not significant compared to the PMT with CPP group (8% compared to 1.6%; Fisher's Exact Test, $p = .12$).

Table 7

Characteristics and demographics of participants included in the Study II, III and IV

	Total	Komet	Komet with CPP	<i>Statistics</i>	
	<i>n (%)</i>	<i>n (%)</i>	<i>n (%)</i>	<i>t- test/χ</i>	<i>p</i>
	<i>N= 120</i>	<i>N= 57</i>	<i>N= 63</i>		
Age (<i>Mean (SD)</i>)	9.32 (1.22)	9.31 (1.29)	9.33 (1.16)	$t(116) = .11$	.92
Boys	88 (73.3)	40 (70.2)	48 (76.2)	$\chi^2 (1) = .55$	.46
ODD diagnosis	108 (90.0)	50 (87.7)	58 (92.1)	$\chi^2 (1) = .63$	.43
ODD symptoms (<i>Mean (SD)</i>)	5.38 (1.40)	5.28 (1.41)	5.46 (1.40)	$t(118) = -.70$	.49
7-8 ODD symptoms	27 (22.5)	12 (21.1)	15 (23.8)	$\chi^2 (1) = .13$	.72
ODD NOS diagnosis	12 (10.0)	7 (12.3)	5 (7.9)	$\chi^2 (1) = .63$	.43
CD diagnosis	5 (4.2)	2 (3.5)	3 (4.8)	$\chi^2 (1) = .12$	1.0 ¹
ADHD diagnosis	80 (66.7)	37 (64.9)	43 (68.3)	$\chi^2 (1) = .15$	.70
EARL-20B/21G (<i>Mean (SD)</i>)	11.69 (3.58)	11.49 (3.89)	11.87 (3.29)	$t(118) = -.58$	.56
CU traits: high level	25 (21.2)	9 (16.4)	16 (25.4)	$\chi^2(1) = 1.44$	.23
Parent university level of education ²	54 (45.8)	24 (43.6)	30 (47.6)	$\chi^2 (1) = .188$	.67

Note; ODD = Oppositional Defiant Disorder; ODD NOS= Unspecified disruptive, impulse-control, and conduct disorder (fulfills 3 diagnostic criteria of ODD); CD = Conduct Disorder; ADHD = Attention Deficit Hyperactivity disorder; CU traits= Callous/Unemotional traits assessed with the Antisocial Process Screening Device (APSD) in combination with the Strengths and Difficulties Questionnaire (SDQ) Prosocial scale; EARL-20B/EARL-21G = Early Assessment Risk List for boys/girls risk level of future antisocial behaviors; 7-8 ODD symptoms = children who fulfill 7 or more DSM-5 diagnostic criteria for ODD; ¹ p-value is based on Fisher's Exact Test; ² N=118 in total and 55 in the PMT condition; Parent university level of education = University level education compared to elementary + high school level of education.

Table 8

Parental attendance in the Komet and the Komet with CPP condition and child attendance in the CPP group

Attendance in treatment	Komet	Komet with child in CPP	CPP
27 %	45 (81.8%)	62 (98.4%)	50 (87.7%)
50 %	41 (74.5%)	60 (95.2%)	48 (84.2%)
80%	35 (63.6%)	54 (85.7%)	37 (64.9%)

Note: A significant difference of parental attendance in the Komet group compared to the Komet with CPP group was noted at all levels of PMT attendance. PMT attendance at 27% (3 sessions): $\chi^2(1) = 9.57$, $p = 0.01$. PMT attendance at 50% (6 sessions) $\chi^2(1) = 10.19$, $p = 0.01$. PMT attendance at 80% (9 sessions): $\chi^2(1) = 7.72$, $p = 0.01$.

4.2.3 Study III

Study III was a two-year follow-up of Study II, the randomized controlled study comparing Komet combined with CPP with Komet only. In Study III, the data analyzed were parent rated questionnaires collected at baseline, post-treatment, and at one- and two years after treatment termination. The study was based on parent rated outcomes from 118 of the 120 children available due to loss of parent rated data in two cases (Komet, $n = 55$ and Komet with CPP, $n = 63$).

There was a larger loss to follow-up in the Komet condition compared to the Komet with CPP condition, especially at the two-year follow-up. Of the 118 children that participated in the study at baseline, 71 (60.2%) participated in the one-year follow-up and 83 (70.3%) in the two-year follow-up. In the Komet condition 29 (53 %) of the families randomized participated in the assessment at the one-year follow-up and 31 (56 %) at the two-year follow-up. In the Komet with CPP condition, 42 (67 %) of the families randomized participated in the assessment at the one-year follow-up and 52 (83 %) at the two-year follow-up. At the one-year follow-up, a Chi-square test showed no significant difference between the two treatment conditions in number of participants lost to follow-up (Komet $n = 26$, [47.3 %] and Komet with CPP $n = 21$, [33.3%]). At the two-year follow-up, a significantly larger number of participants was lost to follow-up in the Komet condition ($n = 24$, [43.6 %] compared to Komet with CPP $n = 11$, [17.5 %], $p = .01$).

Baseline data in all outcomes were analyzed by missingness separately for each treatment arm, that is those missing at two-years follow-up were compared to completers. A Chi-square test showed, that in the Komet condition, there were significantly higher baseline disruptive behaviors (DBD-ODD), significantly lower emotion regulation and prosocial communication skills (P-COMP) and significantly higher skills in the positive parental strategies using praise and incentives (PPI Praise) in the group missing at the two-year follow-up assessment compared to completers. In the Komet with CPP condition,

significantly lower baseline prosocial competence (SSRS) was found in the group missing at follow-up, compared to completers. These differences in baseline data, show that families in the Komet condition who completed the two-year follow-up assessment differed to a large extent, and rated less problems in the primary outcome measuring child behavior problems, as well as lower problems in child emotion regulation and social communication skills and parental praise and incentives, compared to the original sample. Put together, there was a larger proportion of missing compared to completers in the Komet condition at the two-year follow-up and those missing in the Komet condition had lower baseline values in our primary outcome.

It is judged impossible to determine if the data were missing at random (MAR) or not at random (MNAR) since the values needed to determine this were missing. If the probability of missing in a value is related to the value itself, after controlling for other variables, then data is considered MNAR while the missing value is considered MAR if the probability of missing is related to other measured variables and not to the missing variable itself (e.g., Ibrahim et al, 2010). In our case, although we never can know for granted, we judged the missing data to be MAR.

4.2.4 Study IV

Study IV is based on the same participants as Study III.

4.3 MEASURES

In Study II, III and IV, the measures used were to a large extent the same. In Table 9, the measures used in each article, measurement properties and references are described in detail.

4.3.1 Study I

In the meta-analysis, primary outcomes extracted were measures of behavioral problems rated by parents, teachers, children, and clinicians post-treatment and at six or more months post-treatment. We included well established measures with adequate psychometric properties measuring disruptive behavior problems, see Figure 1. Apart from rating scales, we also included three measures of clinician rated observation of child parent interaction. Secondary outcomes were measures of social skills, positive parenting skills (such as use of praise and incentives), negative parenting skills (such as use of harsh, authoritarian or permissive parenting strategies), parental sense of competence and parental stress.

4.3.2 Study II

In Study II, primary outcomes were parent-rated measures targeting five measures of disruptive behavior and prosocial behaviors, which were completed at the pre- and post-measurements. Secondary outcomes were parent-rated parenting skills and stress as well as child-rated outcomes, see Table 9 for measures, measurement properties and references.

The primary outcome measures in Study II were the *The Parent/Teacher Disruptive Disorder Behavior rating scale* (DBD) total score, the oppositional/defiant scale (DBD ODD) that corresponds to the diagnostic criteria of the ODD diagnosis as well as the *The Strengths and Difficulties Questionnaire*, total difficulties scale (SDQ Total difficulties) that captures both emotional and behavioral problems at large. In order to capture child prosocial skills, we used three measures: The *SDQ Prosocial scale*, the *Social Competence Scale – Parent version* (P-COMP) and a third measure, the Norwegian modified version of the *Social skills Rating System* (SSRS).

Secondary outcomes were outcomes of parenting skills and practices, as well as parenting sense of competence and stress. Parenting strategies was assessed using the *Parenting Practices Interview* (PPI). In study II, three subscales were used: Appropriate discipline, Harsh and inconsistent disciplines and Praise and Incentives. To evaluate parental self-efficacy and satisfaction in the parental role, the *Parenting sense of competence* (PSOC) was used, divided in the two subscales parental satisfaction, and parental efficacy. Parental stress was assessed by the *Perceived Stress Scale*. In the present study a short version of 10 items was used.

In the child-rated assessment, we used the *The Strengths and Difficulties Questionnaire* total difficulties scale and the prosocial scale. Child social skills was also assessed using the Norwegian version of the *Social Skills Rating System* total score. The children completed the *Home interview with Child* to assess problem-solving strategies and the tendency to interpret others' actions as hostile.

4.3.2.1 Moderators in Study II

In the moderator analysis, baseline severity of ODD symptoms, level of CU traits, level of risk for antisocial development and comorbid ADHD was used, see Table 9. For baseline severity of ODD, as well as baseline comorbid ADHD, a semi structured diagnostic interview, the *Kiddie –SADS, Present and Lifetime Diagnosis* was used. To find children with more severe problem levels, the number of ODD diagnostic criteria fulfilled was divided into two groups; the high problem level with seven to a maximum of eight diagnostic criteria fulfilled and the light to moderate problem level with three to six diagnostic criteria of ODD fulfilled. This moderator was made dichotomous. The variable comorbid ADHD was dichotomous, present or not present at baseline. Baseline level of callous unemotional (CU) traits was measured with a scale where items from the Antisocial process screening device (APSD) and the SDQ prosocial scale are combined (Dadds et al., 2005). This APSD-SDQ scale has shown good internal validity in several studies (Dadds et al., 2009). High levels of CU traits were identified by including the children above 80th percentile (above 8 points).

Table 9
Outcome variables used in Study II, III and IV

Outcome variable	Rater	Assesses	Example items	Number of items	Reliability	Reference	Study
<i>Child behavior problems</i>							
Disruptive behavior rating scale (DBD) total	Parent	Symptoms of attention difficulties, hyperactivity, oppositional defiant disorder and conduct disorder	Often interrupts or intrudes on others, often shifts from one uncompleted activity to another, often argues with adults, often bullies, threatens, or intimidates others.	45	$\alpha = .90$ at pre- and .94 at post-assessment	Pelham et al., 1992.	II
Disruptive behavior rating scale ODD scale (DBD ODD)	Parent	Symptoms of oppositional defiant disorder	Often argues with adults	8	from $\alpha = .79$ to .90	Pelham et al., 1992.	II, III, IV
Strengths and Difficulties Questionnaire - total difficulties (SDQ total difficulties)	Parent, child	Children's emotional and behavioral problems	Often unhappy, depressed or tearful, restless, overactive, cannot stay still for long, often loses temper	25	$\alpha = .77$ at pre- and $\alpha = .83$ at post	Goodman, 2001.	II
<i>Child social skills</i>							
Strengths and Difficulties Questionnaire - prosocial scale (SDQ prosocial)	Parent, child	Captures child capacity to consider other people's feelings and child helpfulness towards others and targets the social skills dimension <i>Peer relations</i> .	Helpful if someone is being hurt, upset or feeling ill, and kind to younger children.	5	$\alpha =$ from .70 to .75.	Goodman, 2001.	II, III
Social competence scale – Parent version (P-COMP)	Parent	Assesses child emotion regulation skills and prosocial communication skills and targets the social skills dimension <i>Self-management</i> .	Resolves problems with friends alone, controlling temper when there is a disagreement.	12	$\alpha =$ from .84 to .90	Conduct Problems Prevention Research Group (CPPRG), 1995	II, III
	Parent, child	Captures prosocial competence such as helping others, complying with rules, asking others for information, ability to communicate with adults and responding appropriately to teasing. Multidimensional measure that target all five dimensions of social skills.	Makes new friends easily, volunteers to help, gives compliments to friends or other children in the family"	38	$\alpha = .82$ at pre- and .89 at post	Gresham & Elliot, 1990; Sörflie et al., 2008	II, III

Outcome variable	Rater	Assesses	Example items	Number of items	Reliability	Reference	Study
Home interview with child-hostile scale	Child	The tendency to interpret others' actions as hostile intended.	Pretend you are walking down the hallway in school carrying books, (...) Brett bumps you from behind (...) you fall and the books fly around (...). Why do you think Brett bumped into you?	II		Conduct Problems Prevention Research Group CPPRG, 1991	II
Home interview with child-action scale	Child	Assess problem-solving strategies.	Pretend you are walking down the hallway...(continued as above) What would you do?	II		Conduct Problems Prevention Research Group CPPRG, 1991	II
<i>Parent strategies, competence and stress</i>							
Parental practices inventory (PPI) - Harsh and inconsistent discipline	Parent	Assesses harsh as well as submissive responses to child misbehavior	In general, how often do you do the following when your child misbehaved: Raise your voice, (scold or yell)	15	$\alpha=.80$ at pre-, and .76 at post-assessment	Webster-Stratton, Reid, & Hammond, 2001.	II, III
Parental practices inventory (PPI) Appropriate Discipline	Parent	Assesses the extent to which the parent responds to misbehavior with non-aggressive but firm consequences	In general, how often do you do the following when your child misbehaved: Get your child to correct the problem or make up for his/her mistake?	12	$\alpha=.80$ at pre-, and .80 at post-assessment	Webster-Stratton, Reid, & Hammond, 2001.	II
Parental practices inventory (PPI) Praise and Incentives	Parent	Assesses the extent to which parents responds with hugs, praises and rewards when a child shows desired or expected behavior	In general, how often do you do the following when your child behaves well or does a good job: Praise or compliment your child	11	$\alpha=.77$ at pre-, and .77 at post-assessment	Webster-Stratton, Reid, & Hammond, 2001.	II, III
Parenting sense of competence (PSOC) - Efficacy	Parent	Defined as the person's perceived competence in the parenting role	"Considering how long I've been a mother/father, I feel thoroughly familiar with this role".	8	$\alpha=.75$ at pre- and .72 at post-assessment	Ohan, Leung, & Johnston, 2000	II
Parenting sense of competence (PSOC) - Satisfaction	Parent	Defined as the person's liking of the parenting role	"Even though being a parent could be rewarding, I am frustrated now while my child is at his/her present age".	9	$\alpha=.78$ at pre- and .81 at post-assessment	Ohan, Leung, & Johnston, 2000	II

Outcome variable	Rater	Assesses	Example items	Number of items	Reliability	Reference	Study
Perceived Stress Scale (PSS)	Parent	Targeting the degree to which situations in life are appraised as stressful	"In the last month, how often have you felt that you were unable to control the important things in your life?"	14	$\alpha = .84$ at pre- and .90 at post-assessment	Cohen, Kamarek, & Mermelstein, 1983	II, III
<i>Moderators</i>							
Severity of ODD	Clinician	Diagnostic interview Kiddie-SADS (KSADS). Number of ODD diagnostic criteria fulfilled. Low to medium 3-6 criteria. High 7-8 criteria.				Kaufman et al., 1997	II, III, IV
ADHD or ADHD UNS	Clinician	KSADS, see above Yes or no				Kaufman et al., 1997	II
Clinician rated risk for future antisocial development	Clinician	Early Assessment Risk List for boys/girls (EARL-20 B/G) High/medium to low				Augimeri et al., 2001; Levene et al., 2001	II
CU traits	Parent	Antisocial Process screening Device (APSID) combined with SDQ prosocial). High levels of CU traits were identified by including the children above 80th percentile (above 8 points).		8	$\alpha = .70$ at pre- and .72 at post-assessment.	Dadds et al., 2005	II
Gender		Child gender					III

Note: Reliability = Cronbach's alpha (α) at pre and post assessment in Study II and range in Study III, meaning that at the four assessment points, alpha ranges between the two values presented.

4.3.3 Study III

In Study III, the primary outcome was the oppositional/defiant subscale of the Disruptive Disorder Behavior rating scale rated by parents (DBD -ODD). Since the effect on ODD symptoms was the major reason for treatment, the primary outcome in Study III was narrowed to specifically target ODD symptoms. Secondary outcomes were parental ratings of child social skills, parenting skills and parental stress. Social skills were measured with the same three measures as in Study II. For parenting strategies, two subscales were used from Parenting Practices Interview (PPI): Harsh and inconsistent disciplines subscale that assesses harsh as well as submissive responses to child misbehavior and Praise and incentives subscale that evaluates the extent to which parents responds with hugs, praises and rewards when a child shows desired or expected behavior. The Perceived Stress Scale (PSS) was used to assess the degree to which situations in life are appraised as stressful.

4.3.3.1 Moderator analysis Study III

In Study III only one of the moderators from Study II was used, baseline severity of ODD symptoms. The moderator “high risk for antisocial development” as measured by EARL-20 B/G was not used in Study III due to the large proportion of missing values. When looking at the attrition in more details, a Fisher exact test showed that a significantly larger proportion of children with high risk for antisocial development was lost to follow-up in the Komet condition ($n = 7$ [87.5 %], $p = 0.02$) compared to Komet with CPP ($n = 1$, [0.16.6%], $p = 1.0$). ADHD and CU traits had not been found to moderate treatment outcome in Study II and were thus left out. We chose to add gender as a new moderator to explore if we could detect any treatment differences between girls and boys.

The moderator analyses in Study III was affected by the attrition to a large extent. At the two-year follow-up, 17 (21%) of the families who remained in the study had children with a high number of ODD criteria. Of these, only six children (19%) in the Komet condition and 11 children (21%) in the Komet with CPP condition remained in the study contributing with follow-up data. Regarding gender, 27.3% were girls in the Komet condition and 23.8% in the combined condition at baseline, whereas 16.1% ($n = 5$) of the girls were in the Komet with CPP condition and 23.1% [$n = 12$] in the combined condition at the two-year follow-up.

4.3.4 Study IV

In Study IV, the clinically significant change as measured by reliable change index (RCI; Jacobson & Truax, 1991), was used to estimate changes in ODD symptoms as rated in the ODD subscale between baseline and the two-year follow-up. The proportion of recovered cases was used as the primary outcome. See description of Reliable clinical change below in the analysis section.

The secondary outcome was change over time in Quality-Adjusted Life-Years (QALYs). QALY is a standardized measure of disease burden that combines both survival and health-

related quality of life into a single index. When QALY is calculated, a health state needs to be assigned a value ranging from zero to one, with zero representing death and one representing ideal health. In this study, QALY's was derived from the Strength and Difficulties Questionnaire, using a method that predicts Child Health Utility—9D (CHU9D) scores from SDQ scores (Goodman, 2001), which in turn was used to predict QALYs. The CHU9D is a generic preference-based instrument, targeting domains of worry, sadness, pain, sleep, tiredness, annoyance, school, daily routine and activities, with five response categories in each domain. The CHU9D has been developed for children 7-11 years and focuses on the health impact related to quality of life, rather than impairment (Ratcliffe et al., 2012). The original mapping study between SDQ and CHU9D used preference weights from an Australian adolescent child and adolescent psychiatry population (Ratcliffe et al., 2012). Total QALY scores were estimated for each study arm over a two-year period: between pre- and post-treatment (four months), between post-treatment and one-year year follow-up, and between one- and two-year follow-up.

Intervention costs were only estimated for CPP, as Komet was delivered in both conditions. Costs were salary costs for therapist training time and group delivery time. Material and venue costs were estimated based on trial data and cost estimations for group sessions at Child- and Adolescent Mental Health Services in Stockholm (Furber et al., 2014). Costs were collected from a limited societal perspective and direct costs related to costs for delivering the treatment and medical use by the children, and resources used at school were included. Data on resource use in school was collected at baseline, at post-treatment and at one- and two-year follow-up, using a questionnaire that was created specifically for this trial.

4.4 ANALYSIS

4.4.1 Study I

In the meta-analysis, between-group effect-sizes at post-treatment and follow-up were calculated using group means and standard deviations. Summary measure was Hedges g , calculated using the R package `compute.es` (Del Re, 2020). Most studies presented multiple measures, and in some cases also multiple treatment arms, per study. This posed a problem of correlated data since the different outcomes may be rated by the same person and sometimes at different time points. The standard best practice for handling within-study correlation in meta-analyses is the use of robust variance estimation (Pigott & Polanin, 2020). Robust variance estimation (Hedges et al., 2010; Tanner-Smith et al., 2016) can handle dependent data and thus permits an inclusion of multiple effect sizes and multiple comparisons from the same study sample without loss of information associated with dropping effect sizes. In analyses employing robust variance estimation, multiple effect sizes are reweighted using an approximate variance–covariance matrix, resulting in valid point estimates and significance tests even when the variance–covariance matrix of effect sizes within studies remains unknown (Hedges et al., 2010). All analyses were estimated assuming random effects and an inter-correlation within studies of $q = .8$.

In the meta-analysis, two moderator analyses were conducted. In the first, type of PMT treatment was analyzed compared to waiting list in order to detect any differences in effect based on type of treatment. In this moderator analysis, the effects of PMT versus waiting list was made constant and the effects of PCIT versus waiting list, and PMT with child CBT versus waiting list were compared to PMT versus waiting list. In the second moderator analysis, the effects of child and study characteristics (i.e., mean age in years; % boys; total treatment time; treatment duration in weeks; and study quality) on PMT results were analyzed in a meta-regression in the standard PMT vs waiting list comparison.

4.4.2 Study II

In Study II, the pre-post study, linear mixed models (LMM) were applied to analyze effects of the two treatments over time. In the analysis of repeated measurement data LMM is adequate method, which involves the benefit of not deleting participants with an incomplete number of observations (Hedeker & Gibbons, 1997). The difference in change from pre- to post-treatment between child CBT combined with PMT compared to PMT only was evaluated on all the dependent variables by testing the significance of treatment * time in a LMM analysis that included random intercept using Maximum likelihood estimation (ML). Moderation effects were analyzed by adding the moderator to the model (moderator*treatment*time).

Between-group effect sizes (Cohen's *d*) at post-treatment were calculated using the beta-estimates obtained in the LMM by dividing the difference in slope (i.e., coefficient of time * group interaction effect) by the pooled pre-treatment standard deviation of the measure (Feingold, 2009). Within-group effect sizes were in Study II based on observed values and calculated by dividing the mean difference with respective standard deviation, correcting for correlation between time-points. Analyses of missing data was conducted using Little's missing completely at random test. Data were analyzed using IBM SPSS version 23.

4.4.3 Study III

In Study III, linear mixed models (LMM) were used to analyze the long-term effects of the two treatment arms. The LMMs were performed in two ways. First, treatment effects were examined over the whole time period (T1 to T4). The treatment effects was also examined specifically over the follow-up period (T2 to T4) in segmented LMMs by partitioning the time variable into a separate treatment-interval, and a follow-up interval. Attrition and its possible effect on the long-term outcome was explored following the procedure described by Hedeker and Gibbons (1997) by entering a dummy-coded variable of attrition (that is, missing or non-missing at the two-year follow-up) into the LMM evaluating the outcome. Statistical analyses were performed in SPSS version 25 and in the R software program (R Development Core Team, 2017).

Effect sizes (Cohen's *d*) were estimated based on the beta-estimates that were obtained from the LMMs and was calculated the same way as in Study II. Within-group effect-sizes were calculated by multiplying the beta-coefficient of time with number of months (to estimate the change in scores over the whole time period), and dividing with the pooled standard deviation of the measure at the pre assessment (Feingold, 2009).

Reliable Change Index (RCI; Jacobson & Truax, 1991) was used to interpret the clinical significance of the effect in parent-rated ODD symptoms (DBD-ODD). In Study III, data from those who completed the two-year assessment was used in the RCI analysis. Children were categorized according to four categories: recovered; improved, unchanged, or deteriorated. Children who were reliably changed between pre-treatment and two-year follow-up, and moved from a clinical population to a non-clinical population were categorized as *recovered*. A reliable change was defined as the difference in the DBD-ODD scale between pretreatment and two-year follow-up, divided by the standard error of the measure. An RCI below -1.96 or above 1.96 was considered a reliable statistical change at $p < 0.05$. We defined a clinical population as scores at or above the 95th percentile on the ODD-scale, gender and age specific, in a Swedish normative sample (Unpublished data). Children who showed a reliable decrease but did not move from a clinical to a non-clinical population were categorized as *improved*. Children with no reliable change were categorized as *unchanged*, and children with a reliable increase of symptoms were categorized as *deteriorated*. No inferential tests of statistical differences between the groups were used due to low power. The proportions of children in the different categories for both treatment arms were compared separately. We also compared the same proportions by subdividing into high or low clinician-rated baseline ODD.

4.4.4 Study IV

In Study IV, missing data was imputed in the two treatment arms separately using multiple chained-equations with predictive mean matching to impute missing values (MICE package in R; Buuren & Groothuis-Oudshoorn, 2011). When data is considered missing at random, both Multiple Imputations (MI) and Maximum likelihood estimation (ML) are considered accepted methods to handle the missingness (Enders, 2010; Sullivan et al., 2018). When comparing the datasets after MI and ML respectively in Study III and IV, the two methods reached similar means and standard deviations in the two treatment arms.

Differences between the groups at baseline in the DBD-ODD subscale and Child Health Utility (CHU9D) scores at 2 years follow-up were assessed using a t-test. Reliable Change Index (Jacobson & Truax, 1991) was used to interpret the clinical significance of the effect in parent-rated ODD symptoms (DBD-ODD), see description above. In Study IV, Reliable change index was used in the imputed dataset and not on those with complete data as in Study III. The results from the RCI classification in Study III and IV were close but not identical. Recovered cases in Komet with CPP were 37% ($n = 23$) in the imputed dataset compared to 35 % ($n = 18$) among those with complete data and in the Komet group 26 % (n

= 14) in the imputed data and 26 % (n= 8) in the dataset with complete data. To estimate the probability of being “a recovered case”, a logistic model was used at the two-year follow-up. Differences in total QALYs over time were assessed using a linear regression model. Baseline differences between the groups were controlled for in DBD-ODD and utility scores in the analyses. Differences in resource use at baseline were assessed using a Wilcoxon rank-sum test, accounting for the non-normality in the distribution of costs. Generalized linear models (GLM) were used to estimate differences in costs between groups.

Incremental cost-effectiveness ratios (ICER) was calculated using estimates of the total accumulated costs, “recovered” cases and QALYs over the two-year follow-up, dividing the average difference in costs between groups by the average difference in effects. In the base-case analysis, a net benefit regression approach was used to estimate the expected net monetary benefit of Komet with CPP compared to Komet (Hoch & Dewa, 2014). The incremental net benefit (INB) is the difference in the mean net benefit for each group. The INB allows for a comparison of costs and effects in the same regression framework accounting for the correlation between the costs and the outcomes. INB can be used as an outcome variable in a multiple linear regression equation. The mean net benefit is derived from averaging all individual net benefits and it allows for calculation of 95% confidence intervals (CI) correctly, as it accounts for the correlation between effects and costs. The INB yields an unbiased estimate of incremental net benefit, since costs and effects are being included in the same regression.

In the sensitivity analysis, different values of willingness-to-pay (WTP) for one unit of improvement in the health outcome were used to test how sensitive the cost-effectiveness results were. If mean $\theta_1 > 0$, the intervention was deemed cost-effective. Four different sensitivity analyses were conducted to test the impact of assumptions made in the analysis, and their effect on the results: (1) Assuming implementation in a clinical real life setting, rather than in a trial setting (which would affect the intervention costs), (2) analysis of individuals with complete data on the outcomes of interest (n=66), (3) limiting the perspective to a health care payer perspective including only those costs that were associated with the treatment, which may be more relevant to the decision-maker, and (4) only including cases that had completed at least 80% of the sessions (for CPP).

4.5 ETHICAL CONSIDERATIONS

Study I, the meta-analysis, did not need ethical approval since no personal data was handled. The three studies II-IV all share the same ethical approval received from the Research Ethics Committee at Karolinska Institutet, Sweden (Dnr 2011/1587-31/5, 2013/1555-32, 2014/1507-32, 2014/2111-32). The studies II-IV were conducted within regular child- and adolescent psychiatry in the treatment of patients seeking help for clinical levels of disruptive behavior disorder. All patients were offered Komet, which is the recommended treatment for ODD and there were no risk for any participants not to be offered the recommended treatment.

Group based treatment with disruptive children have in one study led to iatrogenic effects of deviancy training as measured with teacher ratings of delinquency (Dishion & Andrews, 1995). Analyses revealed that subtle dynamics of deviancy training during unstructured transitions in the groups that predicted growth in self-reported smoking and teacher ratings of delinquency (Dishion & Tipsord, 2011). However, other research, have not found evidence for iatrogenic deviancy training effects within group interventions for disruptive youth (Weiss et al., 2005). To reduce a possible risk for deviancy training in Study II - IV, group leaders in CPP were, as a part of the CPP manual, specifically trained in keeping a high degree of structure during group sessions and pay extra attention to subtle signs of deviancy training in order to interfere quickly if needed.

5 RESULTS

5.1 STUDY I

Meta-analysis on the effects of PMT and PMT with the child included in or alongside treatment

Standard PMT was found to be significantly more effective compared to waiting list with a medium effect-size in parent-rated measures of disruptive behavior and negative parenting skills at post-treatment. For social skills, parenting positive skills and parental sense of competence, standard PMT was not significantly more effective compared to waiting list, even though effect sizes were between 0.50 and 0.73. Teacher-rated disruptive behavior showed no significant effects while clinician-rated showed a small but significant effect benefitting PMT over waiting list.

When looking at the differential effects of PMT where the child was included in the treatment as in PCIT and PMT with child CBT, PCIT was significantly more effective compared to waiting list with large effect sizes in reduced disruptive behavior. The effects of PMT combined with child CBT compared to waiting list was examined in three studies showing small to medium effect-size but confidence intervals were large and no significant effects were found in parent- or teacher-rated outcomes.

In order to investigate if there was a difference in effects depending on type of treatment and whether the child was included in or alongside the PMT treatment or not, a moderator analysis was conducted with studies on standard PMT, PCIT and PMT with child CBT compared to waiting list. PCIT compared to waiting list was found to be more effective compared to standard PMT versus waiting list with significantly larger effect size, while PMT with child CBT compared to waiting list did not differ significantly from standard PMT compared to WL in the three studies included. In addition, the effects of standard PMT was compared directly to PMT with child CBT in an analysis on four studies at post-measurement and in three studies at 12 months follow-up. No significant differences in effects were discovered in disruptive behavior outcomes. There were large variations between the studies in all outcomes, adding uncertainty to the results.

In a final moderator analysis, we analyzed if child characteristics, treatment characteristics and study quality moderated treatment results in the standard PMT compared to waiting list comparison. No significant differences were found when adding the continuous moderators child age, treatment time, and treatment duration, indicating that these factors did not moderate treatment effectiveness. However, study quality was found to moderate treatment effect significantly, with a larger effect size associated with higher study quality.

The main result from this study showed that PMT is an effective treatment for children with clinical levels of disruptive behavior and PCIT versus waiting list was significantly more

effective compared to PMT versus waiting list. PMT with child CBT did not differ significantly from PMT only or waiting list.

5.2 STUDY II

The effectiveness of combined KOMET with CPP compared to KOMET only at post-treatment.

At post-treatment, both Komet and Komet with CPP improved in reduced disruptive behavior problems and increased social skills. No significant differences were found between the treatments in the three behavior outcomes (DBD-total, DBD ODD or the SDQ total). However, a significant time * treatment interaction was found in two of the measurements of social skills (P-COMP and SDQ prosocial) meaning that children in the combined intervention improved to a larger extent, with a medium between group effect size, in increased social skills post-treatment.

As for parent rated outcomes of parenting skills, parenting sense of competence or parental stress, both treatment conditions improved significantly with no difference between the conditions. In the children's self-ratings post-treatment, no significant differences were found between the interventions in any outcome.

Moderator analyses were made on baseline severity of ODD symptoms, level of CU traits, level of risk for antisocial development and comorbid ADHD showing that severity of ODD symptoms moderated the results of both disruptive behavior and social skills. For the children with more severe ODD, the combined treatment of Komet with CPP was significantly more beneficial compared to Komet only in reduced disruptive behavior in the DBD ODD scale and reduced behavioral and emotional problems in the SDQ total difficulties scale. Komet with CPP was likewise significantly more beneficial for the group with severe ODD in increased social skills as measured with SSRS and SDQ prosocial. Further, the group with high risk for antisocial development at baseline, benefitted more from Komet with CPP compared to Komet only in all the behavioral outcomes (DBD total, DBD ODD and SDQ total difficulties). No moderator effects were shown for the groups of children with elevated levels of CU traits or comorbid ADHD.

Study II consists of a published article and a corresponding corrigendum since an alignment error was found in the dataset that mainly affected child data and moderators. All data were controlled and all analyses remade. The interpretation of the main results did not change, but one of the moderator analyses no longer showed that prosocial problem-solving skills improved more for children with high CU traits in the combined treatment compared to PMT only as stated in the main article.

5.3 STUDY III

The effectiveness of Komet with CPP compared to KOMET at two-year follow-up

The two-year follow-up of Komet compared to Komet with CPP for children with disruptive behavior disorder, 8-12 years old, showed that the reduction of disruptive behavior seen at post-treatment in both groups was sustained over time with no significant differences between the groups. Regarding social skills, the significant improvement seen in the SDQ prosocial scale in the Komet with CPP group at post-treatment went back to pre-treatment levels at the two-year follow-up. In the Komet group, no change was seen from baseline to the two-year follow-up in SDQ prosocial. However, in the PCOMP, measuring child emotion regulation and social communication skills, the significant improvement in the Komet with CPP group at post-treatment was sustained over time, while children in the Komet condition improved and reached the same result in these outcomes during the follow-up period.

The moderator analyses at the two-year follow-up were largely affected by the pronounced attrition in the Komet group leaving only six children in the group with severe baseline ODD and five girls for the gender moderator. In the Komet with CPP group, the attrition was not as pronounced as described earlier. The attrition in the Komet condition made the results from moderator analyses highly uncertain, especially in the group with severe baseline ODD, which restricts conclusions.

In an exploratory analysis, within-group effect size from estimated data are shown for the moderator low/moderate versus high ODD on the outcomes where high/low ODD moderated the effect at post-treatment, see Table 10. The results in the Komet with CPP group, the group with high baseline ODD (which is judged reliable with less missing compared to the Komet group), improved significantly compared to baseline with a large effect size in reduced disruptive behavior (DBD ODD) and medium effect sizes in improved child capacity to consider other people's feelings and child helpfulness (SDQ prosocial) as well as in child prosocial competence (SSRS). In the Komet with CPP group with low to moderate ODD, a small effect size was seen from pre to two years follow-up in DBD ODD while SDQ prosocial deteriorated and SSRS showed no effect. In the Komet with low to medium ODD severity at baseline, a large within-group effect size was shown from baseline to two-year follow-up in DBD ODD which indicated that Komet by itself was helpful for those with low to moderate ODD symptoms.

Table 10

Exploration of subgroup within-group effect-sizes (d) at two-year follow-up on high/low baseline ODD on estimated data on the outcomes that moderated the effect at post-treatment in the Komet and the Komet with CPP conditions

Outcome	Komet		Komet+CPP	
	Low/moderate (n=43)	High (n=12)	Low/moderate (n=48)	High (n=15)
DBD-ODD	-0.99***	-0.24	-0.33*	-1.01**
SDQ-prosocial	0.16	-0.33	-0.40**	0.61*
SSRS	-0.32	1.02*	0.03	0.64*

Note: Low/moderate ODD= children fulfilling 3-6 diagnostic criteria of ODD in clinical diagnostic interview at baseline; High-ODD = children fulfilling 7-8 diagnostic criteria of ODD in clinical diagnostic interview at baseline; DBD ODD = The Parent/Teacher Disruptive Disorder Behavior rating scale – Oppositional Defiant Disorder scale; P-COMP = Social Competence Scale- Parent, SDQ prosocial= Strengths and Difficulties Questionnaires Prosocial scale. Significant change from baseline to two-year follow-up; * = $p < .05$, ** = $p < .01$, ***, $p < .001$.

Clinical significant change (RCI; Jacobson & Truax, 1991) was analyzed for the primary outcome, DBD-ODD in the sub-sample of children with complete data at two years follow-up ($N = 83$). When looking at the treatment outcome in terms of RCI, children in the Komet with CPP condition appeared to recover to a larger degree whereas there was no difference in proportion between the conditions for those who improved. Further, a larger proportion in the Komet condition was unchanged compared to the Komet with CPP group and a larger proportion in the Komet with CPP condition deteriorated compared to the Komet condition. In an exploratory subgroup analysis of clinically significant change divided by level of clinician-rated ODD symptoms at baseline, children with high number of ODD symptoms at pre assessment appeared to improve more in the Komet with CPP condition, while children with low to moderate ODD were similarly recovered/improved in both treatment condition, but fewer deteriorated in the Komet condition. In an additional analysis, not included in the article, clinically significant change was explored in the group with 80% attendance in Komet and in Komet with CPP, respectively, see Table 11. The same pattern emerge, with a larger proportion of children recovering in the combined treatment, a larger proportion improving in the Komet condition, a larger proportion remaining unchanged in the Komet condition and a larger proportion deteriorating in the Komet with CPP condition.

Table 11.*Clinically significant change in the subgroup with 80 % attendance in both treatment conditions.*

Treatment	Komet	Komet + CPP
	80 % participation	80 % participation in both Komet and CPP
	N = 23	N= 32
Recovered	5 (21.7 %)	12 (37.5 %)
Improved	7 (30.4 %)	5 (15.6 %)
Unchanged	10 (43.5 %)	10 (31.3 %)
Deteriorated	1 (4.3 %)	5 (15.6 %)

Note: Measure 80 % participation = 9 Komet sessions and 12 CPP sessions; DBD ODD = The Parent/Teacher Disruptive Disorder Behavior rating scale – Oppositional Defiant Disorder scale; Recovered = Children who were reliably changed between T1 and T4, and moved from a clinical population to a non-clinical population; Improved = children who showed a reliable decrease, but did not move from a clinical to a non-clinical population; Unchanged = children with no reliable change; Deteriorated = children with a reliable increase in symptoms.

5.4 STUDY IV

The cost-effectiveness of Komet with CPP compared to Komet only

At baseline, no significant differences between the two interventions were found in ODD symptoms as measured with the primary outcome DBD-ODD or in the CHU9D health utilities. The incremental difference in total cost between groups over the trial period did not differ significantly. The probability of being a “recovered” case of ODD in the primary outcome was higher in the Komet with CPP group, in comparison to Komet only (odds ratio of 1.70, SE =.47). Differences in QALY gains between the two arms were small in magnitude, Komet with CPP showing lower QALY gains (-.002, SE=.01). In the base-case analysis, the proportion of “recovered” cases were estimated over the two-year trial period in relation to resource use during the same time. The results indicated that Komet with CPP yielded positive net-benefits when the WTP was approximately 62,350 EURO per “recovered” case, in comparison to Komet only. The probability of cost-effectiveness for Komet with CPP ranged between 8% for a WTP of zero, to 64% using a WTP threshold of 100,000 EURO, in relation to Komet only.

A range of sensitivity analyses were conducted to test the impact of assumptions made in the analysis, and their effect on the results. Service use in school differed largely between the groups with children in the Komet group using less services in school. The unbalanced attrition might have an impact on this result since children with large behavior problems were missing at two-year follow-up at a larger extent. This has probably affected the sensitivity analysis in the group of study completers where the probability of cost effectiveness does not increase with a larger WTP level. In the sensitivity analysis from a health care perspective

where school costs were excluded, a 50 % of cost effectiveness was reached at around 10,000 EURO.

In the secondary outcome, the differences in QALY gains between Komet and Komet with CPP were small in magnitude and Komet with CPP showed lower QALY gains (-.002, SE=.01). The incremental effect difference was small and both treatment conditions showed steady levels of health-related quality of life throughout the trial period.

6 DISCUSSION

The general aim of this thesis was to evaluate the effects of PMT on clinical levels of disruptive behavior as well as more specifically to investigate if there is a difference in effects of PMT if the child is included in the treatment or receives parallel treatment alongside PMT. To address this issue, four studies have been conducted. Short- and long-term effects and moderators of change of PMT and PMT combined with child CBT was evaluated both in Study I, the meta-analysis and in Study II and III, the RCT. To clarify the utility of the compared treatments in the RCT, cost effectiveness was examined in Study IV. The four studies included in the thesis, have in different ways confirmed previous research of PMT effectiveness in the treatment of disruptive behavior. In addition, the studies in this thesis have added to the evidence-base by showing that PMT is an effective treatment of children with clinical levels of disruptive behavior both in short- and in long-term. Further, the four studies have also shed light upon the question if there is an added value of including the child in or alongside PMT.

6.1 SUMMARY OF THE MAIN FINDINGS

The main finding from Study I, the meta-analysis, were that PMT was significantly more effective in the treatment of children with of clinical levels of disruptive behavior, with a moderate effect size, compared to waiting list in reducing disruptive behavior and harsh parental strategies. PCIT was significantly more effective compared to waiting list in reducing disruptive behavior with a large effect sizes. In addition, PCIT compared to waiting list was found to have significantly larger effect-size compared to PMT compared to waiting list. Only a few studies were found on PMT combined with CBT with large variation between the studies and no conclusions could be drawn.

Study II found that the Swedish PMT treatment Komet was an effective treatment in reducing disruptive behavior, improving child social skills, parental strategies, parental sense of competence and reducing parental stress. At post-treatment, no significant differences were found between Komet and Komet combined with CPP in reduced disruptive behavior or in parenting skills, parental sense of competence and parental stress. However, Komet with CPP was significantly more beneficial in parent-rated child social skills at post-treatment compared to Komet only. Further, moderator analyses showed that children with high baseline ODD severity as well as children with high risk of antisocial development benefitted significantly more from Komet with CPP compared to Komet in reduced disruptive behavior and reduced emotional and behavioral difficulties. Children with high baseline ODD severity were improved significantly in social skills in Komet with CPP compared to the Komet only condition. No moderator effects were found from ADHD or CU traits. Furthermore, the children reported reduced emotional and behavioral difficulties, improved social skills and problem-solving skills, and reduced hostile attribution in both treatment conditions. No differences were found between the conditions in child rated outcomes.

Study III showed that, over a two-year follow-up period, both Komet and Komet with CPP were effective in reducing disruptive behavior, increasing social skills and reducing harsh parental strategies. Adding CPP to Komet did not produce any significant difference in treatment outcome compared to Komet from pretreatment to two-year follow-up. However, a difference in treatment outcome was found regarding the time-point of improvement. In the Komet with CPP condition, the improvement in increased emotion regulation skills and prosocial communication skills (PCOMP), one of the two outcomes with significant time * treatment interaction at post-treatment, were reached during the treatment period while the children in the Komet condition continued to improve reaching the same results during the follow-up period. The other measure of social skills that was significantly improved at post-treatment in the Komet with CPP condition, the SDQ prosocial, regressed during the follow-up period.

In Study IV, the cost-effectiveness study, findings showed that over the two-year trial period, the probability of being a “recovered” case of ODD as measured with DBD-ODD was higher in the Komet with CPP group, in comparison to Komet only. The differences in QALY gains between the conditions were small in magnitude. Komet with CPP yielded positive net benefits, in comparison to Komet only. In terms of willingness-to-pay level, this corresponds to approximately €62,300 per recovered case of ODD. In the sensitivity analysis from a health care perspective, a 50 % probability of cost effectiveness was reached at around WTP of €10,000. Looking at those with 80 % attendance in child CBT, a 50 % probability of cost effectiveness was reached at around a WTP of €25,000.

Thus, taken together, these findings help to clarify that PMT is an effective treatment on children with clinical levels of disruptive behavior and adds knowledge to the literature on the effects of PMT when the child is included in add the treatment or participates in treatment alongside PMT.

6.2 INTERPRETATION AND REFLECTIONS OF MAIN FINDINGS

Study I was the first meta-analysis on the effects of PMT on children with clinical levels of disruptive disorder, using RCTs only. Study II, III examined the effects of the PMT treatment Komet combined with the child CBT program Coping Power Program compared to Komet only in a randomized controlled trial in child and adolescent psychiatric setting. The RCT the studies were based upon was the first study to examine group child CBT compared to PMT on clinical levels of disruptive behavior for school-aged children and the first with a two-year follow-up on clinical levels of disruptive behavior.

6.2.1 Clinical levels of disruptive behavior problems

6.2.1.1 The effect of PMT on clinical levels of disruptive behavior

In the Study I, meta-analysis, it was showed that PMT is effective with a medium effect size in reducing disruptive behavior problems in clinical levels of disruptive behavior. This result

corresponds well with earlier studies on clinical levels of disruptive behavior on RCTs (Bradley & Mandell, 2005) as well as non-RCTs (Fossum et al., 2016; Fossum et al., 2008). By including only RCTs on the effects of only PMT in children with clinical levels of disruptive behavior, Study I adds certainty to the effectiveness of PMT. The use of RCTs reduced risk for confounding factors indicating a robust result. Including only clinical levels of disruptive behavior shows that PMT is effective for those with the largest problem levels such as in children with ODD and CD. The result of Study I supports the use of PMT in clinical settings such as Child- and adolescent psychiatry.

In study II and III, the RCT, both PMT and PMT with child CBT improved over time in reduced disruptive behavior symptoms with no differences in treatment effects at post or at two-year follow-up. Thus, Study II and III adds to the literature by showing that PMT is an effective treatment by itself in reducing disruptive behavior in children with clinical levels of disruptive behavior and furthermore that these treatment gains were sustained over time in both groups.

6.2.1.2 The effects of PCIT on clinical levels of disruptive behavior

The effects of PCIT, the individual PMT treatment program where the child is present in the treatment, were analyzed compared to waiting list in the meta-analysis showing a large effect size and the results in a moderator analysis indicated that that PCIT was more effective than standard PMT with larger effect-sizes when both treatments were compared to waiting list. This comparison has not been done previously on children with clinical levels of disruptive behavior problems but are in line with a previous meta-analyses on PCIT studies on clinical as well as subclinical levels of behavior problem (Thomas et al., 2017) also showing a large effect size compared to WL. The difference in effect between PCIT and PMT might be explained by the treatment format, with both the parent and the child in the treatment room, which enables the treatment to be highly individualized. We were not able to relate this result to individual standard PMT studies since those RCTs found on individual PMT had included sub-clinical levels of disruptive behavior and were excluded from the analysis. The number of PCIT studies included in the analysis were fairly low ($k=6$). However, the variability between the PCIT studies was low and the effect size large, which indicates a robust result. This result supports the use of PCIT in the treatment of disruptive behavior in clinical samples such as child- and adolescent psychiatry.

PCIT has previously been found to be effective in numerous sub-groups with additional problems apart from disruptive behavior such as children exposed to violence as well as abuse and neglect, children with autism and children with learning disabilities (for overview, see Lieneman et al., 2017). Further, PCIT was one of the methods that was found to have an effect on child abuse and neglect in a review by SBU- The Swedish Agency for Health Technology Assessment and Assessment of Social Services (2018). PCIT as method is not used on a regular basis in social services and in child- and adolescent psychiatry in Sweden, which is surprising seeing the effectiveness of the method.

6.2.1.3 The effects of combining PMT with child CBT on clinical levels of disruptive behavior

The effects of adding child CBT to PMT compared to PMT only on disruptive behavioral outcomes was examined in both in Study I, the meta-analysis and in Study II and III, the RCT, finding no significant difference in treatment effect. In the meta-analysis, the effects were examined on PMT with child CBT finding no significant effects, neither in the waiting list comparison nor when PMT with child CBT was compared to PMT directly. However, the number of studies comparing PMT with child CBT to waiting list was low ($k=3$), as was the case in the PMT with child CBT versus PMT comparison ($k=4$). There was a large variation between the studies ranging from an effect size close to zero to a large effect size which implies that there might be other factors explaining the results not included in the study. In the studies on PMT with CBT compared to both WL and PMT, the age of children included varied between school-aged children and pre-school children. Treatment format also varied with individual treatment as well as group treatment. In short, no valid conclusions can be drawn on PMT with child CBT effectiveness in the meta-analysis.

In Study II and III, no difference in treatment effect were detected on disruptive behavior outcomes in Komet with CPP compared to Komet only. Seeing that the treatment components in PMT and in child CBT do not overlap it is surprising that the effects of PMT with child CBT are not larger than those of PMT. It might be the case that PMT, being the efficient treatment it is, as shown above, drowns the effects of child CBT in disruptive behavioral outcomes. A recent meta-analysis on child CBT or social skills training (depending on preferred terminology), showed effect sizes between 0.36 and 0.62 on disruptive behavioral outcomes when child CBT without PMT was compared to waiting list, untreated control or treatment as usual in an indicated sample (including ODD and CD), which suggests that Child CBT has effects of its own (Beelmann & Lösel, 2021).

When analyzing Reliable Change Index (RCI; Jacobson & Truax, 1991) to identify reliable clinical improvement in parent-rated ODD symptoms, the probability of being a “recovered” case of ODD was 1.7 times more likely in the Komet with CPP group in comparison to Komet only in imputed data in Study IV. Among those with complete data and among those with 80 % attendance to the treatment in Study III, and a larger proportion of children were recovered in the Komet with CPP condition compared to Komet. Although the RCT is a fairly small study, the larger proportion of recovered cases in the combined condition indicates valuable effects. However, in Study III it was shown that the proportion of those that deteriorated also was larger in the Komet with CPP condition which reveals a spread in the results. The proportion of deteriorated children in PMT with CPP were however in line with rates of deterioration found in other studies on treatment effects of PMT at 18 months (Thijssen et al., 2017) and 24 months follow-up (Ghaderi et al., 2018). In addition, the low rate of those deteriorated in the Komet condition might reflect the fact that those missing in the Komet condition had lower baseline DBD-ODD ratings compared to those completing follow-up assessment. To summarize, adding CBT to PMT might lead to a larger rate of

recovery from disruptive behavior compared to PMT only. However, the study sample is small, which hinders firm conclusions on the effects on disruptive behaviors.

6.2.2 Social skills

In both the meta-analysis and the RCT, treatment effects of PMT and PMT with child CBT were measured in terms of change in social skills. In the studies on the effects of PCIT, effects on social skills were not measured.

6.2.2.1 The effect of PMT on social skills

No significant effects of PMT on social skills were seen at post-treatment neither in the meta-analysis nor the RCT. In the meta-analysis, where PMT was compared to waiting list, broad confidence intervals indicate a spread in the results. In the RCT, no within-group effects were seen post-treatment in any of the social skills outcomes. From these results one can conclude that, no immediate effect was detected on child social skills following PMT.

Looking at long-term effects of PMT in the RCT, children in the PMT group showed an increase in one of the measures of social skills, the PCOMP, a measure of emotion regulation and social communication during the follow-up period. This improvement in the PMT condition might be understood as PMT by itself produces increased emotion regulation and social communication skills over time but it can also be explained by natural maturation. Attrition in the PMT group with significantly lower baseline PCOMP ratings in the group missing compared to completers, complicates conclusions.

6.2.2.2 The effect of PMT combined with child CBT on social skills

Child CBT are programs designed to increase emotion regulation skills and problem-solving skills and an increase in social skills is therefore what would be expected. However, no significant results were detected in Study I, in the four studies that were included in the meta-analysis on PMT with child CBT compared to PMT only neither at post-treatment nor at one-year follow-up in parent-rated outcomes of social skills.

In Study II and III, three measures of social skills were included, SDQ, PCOMP, and SSRS, measuring different dimensions of social skills, together covering the five dimensions of social skills outlined by Caldarella and Merrel (1997), that is peer relations, self-management, academic skills, compliance and assertion. SDQ prosocial, measures capacity to consider other people's feelings and child helpfulness, and thus fits into the peer relations dimension. The items in PCOMP focus on emotion regulation and social communication, targeting the self-management dimension. SSRS is a broad multidimensional measure that consists of the five subscales: cooperation, assertion, self-control, responsibility and empathy that targets all five dimensions, although in Study II and III, the total score of SSRS was used. The difference in the results in the three measures of social skills can be explained by the fact that they measure different dimensions of social skills.

At post-treatment two of the social skills measures, PCOMP and SDQ prosocial, showed a time * group interactions, benefitting PMT with CPP. At two years follow-up, the improvement in the PMT with CPP group was sustained in emotion regulation and social communication skills (PCOMP), while the children in the PMT condition improved during the follow-up period, reaching a similar level. The improvement in emotion regulation and social communication skills was thus achieved earlier in time in the PMT with CPP group compared to the PMT group. Improved emotion regulation skills may directly improve the irritability dimension of ODD as described in chapter two. A recent study on the effects of Stop Now and Plan (SNAP) compared to standard services could demonstrate that the effects of SNAP was mediated via improved emotion regulation skills (Derella et al., 2019). Unfortunately, a direct measures of irritability was not included in Study II and III as all ODD symptoms were assessed with the outcome measure DBD ODD. In future studies of the effects of CPP, it would be valuable to examine possible mediating effects of emotion regulation skills on the irritability symptoms.

In the second measure of social skills, SDQ prosocial, a significant improvement in capacity to consider other people's feelings and child helpfulness was seen post-treatment in Study II in the PMT with child CBT condition in parent rated outcomes. However, this increase regressed during the follow-up period and no change could be seen in any of the two treatment conditions from pretreatment to follow-up in Study III. The dimension of social skills as measured by SDQ prosocial, the capacity to consider others' emotions and child helpfulness, was not improved by either PMT itself or by adding CPP to PMT in the long term. One possible explanation could be that the capacity to consider others' feelings and helpfulness is less prone to sustained change compared to emotion regulation skills. Another possible explanation could be that expectations from parents in the PMT with CPP group being higher at post-treatment which possibly influenced their ratings, which in that case would be a Gamma change or a redefinition of the social skills that were measured (Golembiewski et al., 1976). SDQ prosocial has not been used in other studies on anger management and problem-solving skills training which restricts comparisons.

In the third measure of social skills, the multidimensional measures of prosocial competence SSRS, including scales of both adaptive behavior and social skills, no significant effect was seen over the whole trial period, and no time * treatment interaction effect was seen in parent-rated or in child-rated outcomes. Since the total score of SSRS was being used in the trial, it is possible that the measure was less sensitive to change over time and that a change in the sub dimensions was concealed or counteracted.

In child rated outcomes of social skills, both groups improved in SSRS and in Home interview with child. The children commented that they remembered the problems in Home interview with child that they were supposed to find solution for, which probably have affected the result.

The capacity to regulate emotions and communicate socially is specifically important for anger management (Mushtaq & Lochman, 2011) and is targeted directly in Coping Power Program. Emotion regulation and social communication have previously been found to have a mediating role, predicting improvement in aggressive behavior (Burke & Loeber, 2016) and reduction in irritability as described above (Derella et al., 2019). The ability to monitor and regulate negative emotions has further been found to reduce aggressiveness to a larger extent than other anger management strategies such as perspective taking and delay of response, strategies that instead were found to increase aggression in a group of highly aggressive children (Orobio De Castro et al., 2003). Put together, if it is possible to help children achieve skills that enable them to regulate emotions relatively fast, the finding that PMT with CPP leads to faster change compared to PMT only, is an important contribution to the field of disruptive behavior disorder treatment and might have implications for clinical practice.

6.2.3 Parental strategies and sense of competence

6.2.3.1 The effect of PMT on parental strategies and sense of competence

Both the meta-analysis and in the RCT, showed that the use of negative parenting strategies such as harsh and inconsistent discipline were reduced, following PMT. In the RCT, both treatment conditions improved significantly in reduced harsh parenting during treatment as shown in Study II and no further significant change occurred during follow-up indicating a robust result. Seeing that harsh parenting is a risk factor for future antisocial development (Jaffee et al., 2012; Johnson et al., 2017) a robust reduction is of great importance to halter future antisocial development. Thus, it can be concluded that PMT by itself reduces the use of harsh parenting strategies directly after treatment and the result in the RCT indicate that this effect is sustained over time.

As for positive parental strategies, no significant effect was seen in parent rated outcomes in the meta-analysis post-treatment. A significant treatment effect was seen in the RCT in Study II at post-treatment which regressed during the follow-up period in Study III indicating less robust results.

It might be the case that PMT yields a short-term effect on the use of positive parenting strategies. In the meta-analysis, both the observational clinicians rated measures and parent rated outcomes of positive parenting strategies showed a medium effects-size post treatment and the observational measures were close to significant. Further, the association between parent-reported and observed parenting behavior has been examined in a multilevel meta-analysis finding a weak but significant overall correlation (Hendriks et al., 2018) and seeing the medium effects on positive parental strategies in both parent rated and clinician observed outcomes indicates beneficial effects on positive parental strategies such as praise and incentives following PMT. The broad confidence intervals in the parent ratings indicates that there are underlying factors that might explain the spread in the result.

It can of course be possible that using praise is not such an as effective strategy. A recent multilevel meta-analysis examining the effects of specific PMT techniques in both observed and parent reported data on sub-clinical and clinical levels of disruptive behavior, found that praise as strategy did not affect child compliance whereas the time-out and ignore procedures were found to increased child compliance (Leijten, Gardner, Melendez-Torres, et al., 2018). On the other hand, programs that included praise as technique together with logical consequences showed stronger effects on child disruptive behavior at post-treatment in another meta-analysis on key parenting components (Leijten et al., 2019) and improved use of parental praise was shown in a meta-analysis on individual participant data (Leijten, Gardner, Landau, et al., 2018).

As for long term effects of praise, when key parenting components were examined in the long-term in a meta-analysis on clinical and sub-clinical disruptive behavior, no parenting program techniques were associated with stronger long-term effects (Leijten et al., 2019). The result in study III supports this conclusion.

To conclude, the short-term effects of PMT on positive parental strategies have shown conflicting results. Study I contributes to the field by showing medium effects of PMT post treatment on positive parental strategies and identifying a need of further studies in a clinical sample.

Regarding parental sense of competence, no significant differences in effects were found between PMT and waiting list in the meta-analysis, although a medium effect size and broad confidence intervals indicate that underlying factors might explain the spread in the result. However, the result the meta-analysis is in line with the previously mentioned meta-analysis using individual participant data on clinical and subclinical samples where no effects were found on parental self-efficacy (Leijten, Gardner, Landau, et al., 2018).

In the RCT, a medium to large within-group effect size in parental sense of competence was seen at post-treatment from PMT and no differences was seen between the groups which indicate that PMT might have an impact on parental sense of competence in a clinical sample. The results in Study II are in line with the results in the large study where the effects of Komet were compared to international PMT programs and showed a significantly larger improvement in parental sense of competence compared to the PMT program The incredible years post treatment with sustained effects at two-year follow-up in clinical and sub-clinical samples (Högström et al., 2017). The results in Study II confirms the effects of Komet in a clinical sample.

6.2.3.2 The effect of PCIT on parental strategies

In the meta-analysis, the effects of PCIT on parental strategies compared to waiting list were assessed by clinicians in an observational measure showing significantly improved positive parental strategies and close to significant reduction of negative parental strategies. To

conclude, PCIT seem to have a beneficial effect on improving both negative and positive parental strategies.

6.2.3.3 The effects of PMT combined with child CBT on parental strategies

In the meta-analysis, too few studies on the effects of PMT combined with child CBT were found. In the RCT, no difference in effects were seen between the treatment conditions which meaning that no additive effects was identified on parental strategies when adding child CBT to PMT.

6.2.4 Parental stress

6.2.4.1 The effect of PMT on parental stress

Treatment effects of PMT on parental stress was seen post-treatment in both in Study I, the meta-analysis, (with a medium effect size that were close to significant) and in Study II, the RCT. However, no long-term effects of PMT on parental stress were seen in Study III, the two-year follow-up, where the stress reduction seen initially had regressed. The results corresponds well to the results described in meta-meta-analysis on the effects of PMT on parental characteristics where parental mental health (which in this meta-meta-analysis captures parental stress to a large degree) was found to improve significantly through parent-based interventions at post-intervention, but with small effects and did not reach significance at follow-up (Weber et al., 2018). In a meta-analysis on individual participant data on the effects of the PMT program The Incredible Years, no improvement on parental stress was found (Leijten, Gardner, Landau, et al., 2018). Taken together, PMT seem to reduce parental stress directly after treatment but, as indicated in Study III, this reduction does not seem to remain over time.

6.2.4.2 The effect of PCIT on parental stress

PCIT was shown to be effective in reducing parental stress post-treatment in the meta-analysis. PCIT showed a large effect size compared to waiting list and in the moderator analysis, PCIT compared to waiting list was close to be significantly more effective than PMT compared to waiting list. Long term follow-up of PCIT effectiveness regarding parental stress is lacking.

6.2.4.3 PMT with child CBT

No difference in treatment effects between PMT combined with child CBT were found in neither the meta-analysis nor the RCT.

6.2.5 Moderators of treatment effect

6.2.5.1 Moderators of treatment effect of PMT

The moderating effects of child gender and age on the effects of PMT compared to waiting list were examined in Study I. Previous meta-analyses on the efficacy of PMT that have included non-clinical levels of disruptive behavior and various forms of treatment designs did not find a moderator effect of age (Gardner, et al., 2019; Van Aar et al., 2017) or gender (Van Aar et al., 2017). The moderator analysis in Study I, confirms these findings in clinical samples. However, when looking at the RCTs included in the meta-analysis, most studies have similar mean age and the range between studies is narrow (mean age 5.83, SD 1.17 see Table 6) and it is not surprising that no moderator effect is detected. In the search for studies on PMT effects to include in the meta-analysis, no studies were found on clinical levels of disruptive behavior that included children above age 13. Thus, instead of finding moderator effects of age, Study I identifies a knowledge gap on the effects of PMT on adolescents with clinical levels of disruptive behavior.

When it comes to gender, the studies in the meta-analysis had a large proportion of boys (mean 70.1%, SD .10, see Table 6). The moderating effect of gender is usually examined in meta-analyses using proportions although it is difficult to draw conclusions on gender effects in meta-analyses using proportions especially since most studies have a larger proportion of boys. An individual participant meta-analysis would have been needed to detect moderator effects of gender. However, no individual participant meta-analysis has yet been conducted on the moderating effects of gender in clinical samples of disruptive behavior. In Study III, gender as a moderator was examined at the two-year follow-up showing no effects of gender over time in measure of ODD symptoms which adds to the literature concerning the moderating effects of gender on PMT effects in clinical samples of disruptive behavior.

Furthermore, no moderating effects were found in the meta-analysis on treatment duration and total treatment time, which also is in line with previous meta-analyses mixing subclinical and clinical samples (e.g., van Aar et al., 2017). In the meta-analysis, the RCTs included all offered the core treatment components of PMT (e.g., Scott, 2008). Thus, the conclusion to be drawn is that when PMT that includes the core components is offered children with clinical levels of disruptive behavior, total treatment time in hours and the duration of the treatment over time does not matter.

Study quality was the last moderator that was examined in the meta-analysis and results showed that higher study quality was associated with a larger effect size in the PMT versus waiting list comparison. This result indicates that the effect of PMT compared to waiting list is reliable and it is less likely to be affected by confounders.

6.2.5.2 Moderators of treatment effect in PMT compared to PMT with child CBT

In Study II it was found that children with severe ODD that fulfilled most or all ODD symptoms, benefitted significantly more from PMT with CPP compared to small effect size from PMT only in reduced ODD symptoms. In addition, children with high risk for antisocial development benefitted significantly more from PMT with child CBT at post-treatment compared to PMT only. In Study III, the moderator analysis was obscured by attrition. Only six or half of the children in the group with severe ODD and only one child with high baseline risk for antisocial development remained in the study at the two-year follow-up in the PMT condition. In PMT with CPP, three out of four children with severe ODD all but one of the children with high risk for antisocial development contributed with data at follow-up. This unbalance in attrition between the treatment arms regarding moderator effects at two-year follow-up restricts generalizability of the study finding. Although not a part of the analysis, it can be noted that the results in the PMT with CPP condition were sustained over the two-year follow-up period in both of the subgroups with severe ODD and high risk for antisocial development at baseline. In terms of reliable clinical change, the group of study completers with high ODD severity in the PMT with CPP condition recovered to a larger extent and did not deteriorate while children in the PMT condition did not recover and deteriorated to a larger extent. The small number of children and the unbalanced attrition restricts conclusions and further studies are needed with a larger sample that might mitigate the effects of the expected attrition.

6.2.6 Cost-effectiveness of PMT combined with child CBT

Study IV showed that, using imputed data, the probability of being a “recovered case” from ODD was larger for children in the PMT with CPP group compared to PMT only. The analysis of cost effectiveness in Study IV showed that children in the PMT with CPP-condition showed positive net benefits at around 62,350 EURO per “recovered” case of ODD, in comparison to PMT only. Sensitivity analysis from a health care perspective showed including only treatment costs, a 50 % probability of cost effectiveness was reached at around a WTP of € 10,000. Looking at those with 80 % attendance in child CBT, a 50 % probability of cost effectiveness was reached at around a WTP of € 25,000.

In the evaluation of cost-effectiveness, it should be noted that studies on the specific costs of ODD are limited (Christenson et al., 2016) and the one full economic evaluation that has been conducted with estimates of ODD costs were made in a high risk sample which might have underestimated the costs for a child with ODD compared to a child without disorder (Foster et al., 2007). Thus, it is uncertain how much a child with ODD costs to the society.

To conclude, even though the costs for adding child CBT to PMT are relatively small, the decision to offer both treatments compared to PMT depends on the WTP for reduced risk for further psychopathology. Seeing that the irritability dimension in ODD predicts future depression and anxiety while the defiant dimension in ODD predicts CD, there is a need to

look further at the gains of successful ODD treatment in a broader perspective, also including the reduced risk for internalizing symptoms as well as CD and Antisocial personality disorder (Burke et al., 2014; Evans et al., 2017; Waldman et al., 2021). If it is possible to successfully treat a child with ODD, this could result in savings for multiple payers as well as reduced burden of disease for children and families affected.

6.3 LIMITATIONS

In considering the results from the four studies included in the present thesis, there are some limitations that warrants attention. To begin with the limitations in Study I, the meta-analysis. Due to lack of studies that fulfilled the inclusion criteria, too few studies of PMT versus treatment as usual were found and the goal to examine long-term between-group effect sizes of PMT could not be reached. It was expected not to find many long-term studies in the PMT versus waiting list comparison, due to the need to offer children and their parents treatment when needed, but it was expected to find more studies on clinical levels of disruptive behavior in the PMT versus treatment as usual comparison overall and specifically with long-term follow-ups. Another limitation was that only a few studies were found on PMT with CBT on clinical levels of disruptive behavior either compared to waiting list, treatment as usual or to PMT. Further, the studies found on PMT with child CBT varied in terms of child and treatment characteristics and differed largely in terms of results which restricted the possibilities to draw conclusions.

The clinical trial included in this thesis presented in Study II, III and IV have some major limitations that restricts generalizability. A large limitation in the trial was that the study sample was small at start. The data collection phase in the trial was ended after two and a half years due difficulties in recruiting children, lack of time and an insecure financial situation, leaving the trial with a somewhat small number of children included. Furthermore, the trial suffered from unbalanced attrition at the follow-up points with a larger proportion missing in the PMT condition compared to the PMT with CPP condition. Those missing in the PMT condition had lower baseline values in important outcomes. Treatment dropouts is unfortunately common in PMT treatment. In a recent review, it was stated that approximately 25% of those meeting inclusion criteria do not enroll in the study and an additional 26% drop-out during treatment (Chacko et al., 2016). To account for the expected attrition, more participants should have been enrolled at start. This would have resulted in a higher chance of having enough children to make adequate moderator analyses at the two-year follow-up. Furthermore, power calculation for doing cost-effectiveness studies was not conducted prior to Study IV and the study was most likely underpowered which leads to a risk of underestimating the differences between the treatments regarding cost effectiveness.

Given the unbalanced attrition with a larger proportion remaining both in the treatment and in the study in the Komet with CPP condition, it is possible that the combined Komet with CPP condition was able to motivate families to remain in the treatment (and in the study) to a higher degree. Another possible explanation why parents were retained to a larger degree in

the combined condition is that they might find the child CBT relevant and important to their children. Among the families that did not want to participate in the Komet condition, a common explanation was that they had wanted to be randomized to the Komet with CPP condition. The aforementioned review by Chacko et al. (2016) found that the only factor that was significantly different between families who drop out from PMT relative to those that completed PMT was parents' perspectives regarding the relevance of PMT. Thus, the relevance of the treatment seems to be important to reach and motivate the children and families in need for treatment. Nonetheless, being a randomized controlled study, where conclusions are based on the assumption that the groups are equally subjected to variability, the unbalanced attrition posed a problem when it comes to generalizability.

The possibility to draw firm conclusion from empirical studies rely heavily on the relevancy and the validity of measures and there are limitations in the clinical trial that concerns the measures used. Study II lacked a good measure of child-rated aggression and was left with the broader measure SDQ total difficulties. The children remembered the situations they were presented for in Home interview with child, which most likely have influenced their answers. Further, child-rated data was not collected at the follow-up assessment. Looking back, it would probably have been possible to collect child-ratings via phone or via Internet and find ways to reach the view of the child without interfering too much with the child. In Study III, parental sense of competence was not included in the analysis of long-term effects since there were a large number of outcomes and no differences were seen between the groups at post-treatment. It would have been valuable to see if adding child CBT to PMT makes a difference regarding parental sense of competence. A major limitation of Study IV was that no validated measure was used to collect data on resource use and data was missing in the survey that was used. This led to assumptions regarding frequency and length of resource use, which adds uncertainty to the results. Further, medical costs were included in the analysis of resource use, which is problematic since medication is not primarily recommended as treatment for children with ODD and should mainly be used to treat comorbid disorders such as ADHD.

A further limitation was the failure to get an adequate number of teacher-rated outcomes of behavior problems and social skills, as originally planned. The response-rate of teachers was 28%, which was too low to analyze. The data collection of teacher ratings could have been organized differently with more direct contact with the teachers to increase the response rate.

7 CONCLUSIONS

The results from the studies included in this thesis show that PMT is effective in the treatment of children with clinical levels of disruptive behavior disorders in reducing disruptive behavior and improving parental strategies. The results are based on RCTs which adds weight to the evidence. An early treatment with PMT has the potential of limiting the development of comorbid disorders both in terms of externalizing disorders, CD and antisocial personality disorder and in terms of internalizing disorders such as anxiety and depression (Nock et al., 2007). Furthermore, effective treatment of ODD and CD is likely to reduce the global burden (Baranne & Falissard, 2018) as well as the large financial costs associated with the disorders (Christenson et al., 2016; Snell et al., 2013).

The studies included in the thesis have also put light upon possible treatment gains when the child either receives a separate and parallel treatment or participates in treatment together with the parent. From the meta-analysis, it was concluded that PCIT, the PMT approach where the parent receives guidance and feedback from the therapist through a bug in the ear while interacting with the child, showed large effects on reduced disruptive behavior and improved parental skills which should have implications for future treatment recommendations.

Even though it was not possible to draw firm conclusions of the additive effect of child PMT to PMT in the meta-analysis, Study II and III indicates that there are treatment gains of adding child CBT to PMT compared to PMT in terms of earlier improvement in emotion regulation and social communication as well as a larger proportion of children being recovered from ODD. Seeing the importance of the ability to regulate emotions and its link to reduced aggression (Mushtaq & Lochman, 2011; Orobio De Castro et al., 2003) to reduced hostile attribution (Verhoef et al., 2019) and reduced risk of being rejected by prosocial peers (Burke et al., 2002), adding child CBT to PMT seems to bring a valuable effect targeting important risk factors.

Moderator analyses showed that Komet with CPP was more beneficial in the short term for children with a more severe condition as defined by either a large number of ODD symptoms fulfilled or a high risk of future antisocial development. The long-term effects for children with severe ODD are still obscure, especially for the children in the Komet condition due to attrition. In the Komet with CPP condition within-group effect size showed sustained effects in the group with high ODD. However, the sample was small. Accordingly, more studies are needed to draw firm conclusions of long-term effects in the group with severe ODD.

In terms of cost-effectiveness, the question of whether adding CPP to PMT is cost-effective depends on decision-maker's willingness to pay. In children with high risk for an antisocial development and in children with severe ODD with large emotion regulation difficulties as well as defiant symptoms, the adding child CBT to PMT is probably justifiable.

7.1 CLINICAL IMPLICATIONS

From a clinical perspective, the conclusions to be drawn of this thesis is that PMT is an effective treatment for clinical levels of disruptive behavior. If the clinician only has access to one treatment, PMT is the treatment of choice for children up to thirteen years of age. PCIT is an effective treatment for children up to eight years of age and had shown effectiveness also for subgroups of children with severe problems. Even though PCIT has shown good results in reduced disruptive behavior in numerous RCTs and is spread world-wide, including in the Scandinavian countries Denmark and Norway, PCIT is not a commonly used treatment method in Sweden. The results in Study I support increased use of PCIT in child and adolescent psychiatry and social services in Sweden.

When is it beneficial to add child CBT to PMT? Adding child CBT to PMT led to a faster improvement in emotion regulation and social communication that was maintained over time. An earlier increased skill to regulate emotions could help disruptive children to handle conflicts more efficiently and become more accepted in social contexts with prosocial peers and thereby avoiding peer rejection and reduce risk for an antisocial development. Given the results in Study II (which were maintained in Study III), where children with severe ODD and children with high risk for antisocial development were more improved in the combined treatment compared to PMT only, and adding previous knowledge of the beneficial effects of child CBT in indicated samples (Beelmann & Lösel, 2021), one might suggest to decision-makers and clinicians that children with a high risk for antisocial development, children with severe ODD and children with large emotion-regulation problems should be offered the combined treatment while children with lower risk and less severe ODD problems should be offered PMT only.

7.2 FUTURE DIRECTIONS

Recent research on the factor analytic structure of the ODD diagnosis has highlighted that ODD comprise one major construct and two underlying dimensions; irritability and defiance (Evans et al., 2017) and effective treatment of ODD diminishes the risk for development of internalizing disorders such as depression and anxiety disorders (Nock et al., 2007). Research on how PMT affect the irritability and defiance symptoms would be valuable to further the knowledge in the field. Future studies should also examine the effects of PMT with child CBT on emotion regulation skills and the link to the irritability and defiant dimension of ODD. Data for this analysis has been collected in the present project and could be of use to further knowledge on the differential effects of treatment on ODD dimensions.

This thesis has shed light on possible effects of child CBT when combined with PMT for children with severe problems. However, larger studies on the effects of PMT with CBT for children with severe problems are needed to verify the results in Study II and III. In addition, studies with longer follow-up time are needed, preferably on outcomes on both ODD symptoms and register studies on the occurrence of later criminal behavior.

The studies in this thesis all focus on treatment for clinical levels of disruptive behavior such as ODD and CD. When ODD is efficiently treated, it leads to a diminished risk for a development of CD. In a society where criminal gangs recruit new members among young children (e.g., Dahl & Cato, 2021), it is utterly important with an early identification of high-risk children in order to equip children themselves as well as their parents with functional strategies that reduces risk for antisocial development.

Apart from future research, it is important to use and implement the knowledge that we now have. We know that it is important with an early identification of children with disruptive behavior disorders and, as this thesis underlines, treatment given early in time has the potential of treating ODD and decreasing the risk for development into delinquency. In media and in the political debate in Sweden, there is a tendency to focus on delinquent adolescents and criminal gangs and on how the jurisdictional system should act to prevent crime. This thesis points at the importance for politicians and policymakers to pay more attention to younger children. We have detailed knowledge about the risk factors for an antisocial development and we have treatments that are cost-effective that targets these risk factors. An increased focus on and implementation of effective treatments for young and school-aged children with disruptive behavior disorders has the potential to make substantial difference regarding reduced delinquency. In addition, effective treatment of disruptive behavioral disorders early in time reduces personal suffering for the children and families involved, reduces the risk of developing other psychiatric disorder and antisocial behavior and may also reduce the global burden of conduct disorders.

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