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Review article

Childhood aggression: A synthesis of reviews and meta-analyses to reveal patterns and opportunities for prevention and intervention strategies

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ABSTRACT

This study provides a synthesis of meta-analyses and systematic reviews on non-pharmacological treatments for childhood aggression. Treatments referred to universal prevention, selective prevention, indicated prevention, or intervention (Mrazek and Haggerty, 1994). Seventy-two meta-analyses and systematic reviews met the inclusion criteria. We describe their characteristics, effect sizes across types of treatments, and the effects of various moderators. For universal and selective prevention, effects were mostly absent or small; for indicated prevention and interventions, effects were mostly small or medium. Only two moderators had a positive effect on treatment effectiveness, namely pre-test levels of aggression and parental involvement. These results identified similarities between indicated prevention and intervention treatments, on the one hand, and universal prevention and selective prevention, on the other. Our findings suggest that research distinguishing between targets of treatments (i.e., factors associated with childhood aggression vs. present aggressive behaviors) would be promising. Moreover, to further increase effectiveness of treatments for childhood aggression, individual differences warrant scientific attention.

1. Introduction

Childhood aggression and its social impairment inflict a tremendous personal and financial burden on affected children, their relatives, peers, and society as a whole (e.g., Dretzke et al., 2005; Fergusson et al., 2005; Foster and Jones, 2005; Hunter, 2003; Knapp et al., 1999; Scott et al., 2001). The prevalence of clinical aggression in children ranges from 2 to 16% (e.g., American Psychiatric Association, 1994; Merikangas et al., 2009; Polanczyk et al., 2015). Early onset childhood aggression continues into adolescence and adulthood for a substantial number of children (e.g., American Psychiatric Association, 1994; Huesmann et al., 2009). Although treatments for childhood aggression are the most commonly studied amongst childhood disorders, their mean effect sizes are lower than those found for, for example, for childhood anxiety ($d = 0.46$ vs. $d = 0.61$; Weisz et al., 2017). Thus, insights in the treatment of aggression are essential.

Childhood aggression is a broad and complex construct. Problematic levels of aggression have their onset at different ages, with different underlying processes, and problems associated with aggression can express themselves in myriad forms (e.g., Barnes et al., 2014; Bolhuis et al., 2017; Frick, 2001; Frick and Dickens, 2006; Tremblay, 2000). This diversity is reflected in various conditions in which aggression is the primary problem that are studied in the literature (e.g., conduct disorder, oppositional defiant disorder, externalizing behavior problems, antisocial behavior, disruptive behavior problems. In addition, the heterogeneity of childhood aggression is reflected in the many proposed subsets and dimensions of aggressive behaviors, for example, overt versus covert aggression (Crick et al. 1997), destructive versus nondestructive aggression (Frick et al., 1993), direct versus indirect aggression (Card et al., 2008), and reactive versus proactive aggression (Raine et al., 2006). Yet, the only consensus in studies examining childhood aggression is that childhood aggression is common, that it may predict various psychosocial problems later on, and that it should be treated at early stages of development (e.g., Baker, 2009; Coie et al., 1993; Comer et al., 2013; Connor et al., 2006; Frick and Dickens, 2006; Johnson et al., 2014).

Since 2000, the number of prevention and intervention strategies for childhood aggression has increased tremendously, an increase which is accompanied by a similar increase in scientific papers (Chorpita et al., 2011). Research shows, however, that prevention

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strategies and interventions for childhood aggression are more effective for some children than for others (Frick, 2001). The vast amount of information and the boundary conditions (i.e., moderators) of treatment effectiveness make it increasingly difficult to translate research results to practice and translate scientific findings to help those who suffer from childhood aggression, including children, parents, and teachers. Meta-analyses and reviews have been published with the goal to structure and synthesize the abundance of findings and studies. Nevertheless, these studies offer little integration and mostly fail to consider prevention and intervention components simultaneously to identify effective components in the treatment of childhood aggression. Thus, to the authors' knowledge, no comprehensive systematic review and synthesis of the existing reviews and meta-analyses on treatments for childhood aggression exists. The present study seeks to fill this gap.

To distinguish between different types of prevention and intervention strategies for childhood aggression, we adopt the categorization presented by Mrazek and Haggerty (1994), consisting of universal prevention, selective prevention, indicated prevention, and intervention. *Universal prevention* aims at a population without any specified risk-factors for developing childhood aggression. *Selective prevention* aims at subgroups who have an elevated risk of developing childhood aggression (e.g., due to socioeconomic status, single-parent status), but who have not yet displayed behaviors associated with childhood aggression. *Indicated prevention* aims at subgroups who have an elevated risk to develop childhood aggression, and are identified as showing behaviors associated with childhood aggression but do not meet diagnostic criteria. Finally, *interventions* aim to treat diagnosed childhood aggression.

Although the literature typically differentiates between prevention and intervention research, we will focus on patterns between prevention and intervention of childhood aggression, given that they often include similar and overlapping components and clinical change strategies (Hoagwood, 2002; Sawyer et al., 2015). As an example, indicated prevention and interventions mainly seem to differ in whether targeted children score above or below a certain diagnostic threshold of childhood aggression related disorders (Grove et al., 2008; Mrazek and Haggerty, 1994). Nevertheless, some authors suggest such a differentiation could be considered an arbitrary or artificial distinction (Boyle et al., 1996; Hoagwood, 2002; Sawyer et al., 2015). Therefore, we will refer to prevention and intervention as treatments in the following.

In this synthesis, we will follow the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement guidelines to identify, screen, and describe the reviews (Moher et al., 2009). It includes all non-pharmacological types of prevention and intervention identified above: Universal prevention, selective prevention, indicated prevention, and intervention. First, we provide a systematic review on the meta-analyses and systematic reviews on treatment effectiveness for childhood aggression. Second, we investigate the effectiveness of the types of treatments. Third, the present study reviews the influence of moderators – participant, treatment, and methodological variables – on the effectiveness of the treatment of childhood aggression. In the discussion, we will elaborate on patterns that occurred within the results and on the implications of those patterns for research and clinical practice.

2. Method

2.1. Literature search

To identify the reviews and meta-analyses, we conducted a systematic literature search for systematic reviews and meta-analyses published in English between January 2000 and October 2017 in accordance with the PRISMA protocol (Moher et al., 2009). Table 1 provides an overview of the search terms and databases. In addition, we searched through reference lists of the identified articles for articles that did not appear in the electronic literature search.

Table 1
Search strategy: Databases and search terms.

Databases			
ERIC	PsycINFO	Pubmed	Review initiatives
Method	**Method**	**Method**	Campbell
Meta-analysis	Meta-analysis	Meta-analysis	Collaboration
Review	Review	Review	Centre for Reviews
Systematic	Systematic		and Dissemination
Sample	**Sample**	**Sample**	Cochrane
Child	Child	Child	Collaboration
Outcome measure	**Outcome measure**	**Outcome measure**	
Aggression	Aggression	Aggression	
Externalizing	Externalizing	Externalizing	
Externalising	Externalising	Externalising	
Oppositional	Oppositional	Oppositional	
Conduct disorder	Conduct disorder	Conduct disorder	
Treatment	**Treatment**		
Intervention	Intervention		
Prevention	Prevention		

Note. Keywords of different groups were combined with 'AND'.

2.2. Inclusion and exclusion criteria

Articles were included in the present study if they: (1) were a meta-analysis and/or a systematic review studying treatment effectiveness on childhood aggression, (2) focused mainly on children aged 6–12, (3) were published in a peer-reviewed journal, and (4) were published in English. Childhood aggression in this study comprised of aggressive behavior, externalizing behavior, disruptive behavior problems, conduct disorder, oppositional behavior, oppositional defiant disorder problems, and antisocial behavior. Articles were eligible for inclusion if they mentioned effectiveness of a non-pharmacological treatment on childhood aggression in the title or abstract.

Because the focus of the present study was on childhood aggression in general populations, we excluded articles that examined aggression as comorbid symptom of another disorder (e.g., autism), traumatic life events, and developmental disabilities. For the same reason, we excluded articles examining the effect of treatment on specific variants and expressions of aggression, such as (cyber)bullying, delinquency, gang membership, truancy, recidivism, and violence. In addition, we excluded reviews or meta-analyses of single-subject/case studies.

2.3. Data extraction

We developed a coding sheet containing 41 variables, including age of participants, year of publication, language of the included articles, the number of included studies, moderators, and the results of the reviews and meta-analyses to extract information from the included reviews and meta-analyses. We also coded discrepancies between the study's definition of the treatment and our classification. To take the quality of each included systematic review and meta-analysis into account, we coded whether the study provided a description of the search terms and databases; whether it specified criteria for studies, participants, treatments, and measurement instruments; whether it explicitly described the process of inclusion and exclusion of the studies; whether it took study quality of the included studies into account; and whether it discussed the possibility of publication bias.

The first author extracted the data. To control for reliability, a trained graduate student coded a randomly drawn sample of 50% of the included articles. Questions and differences in coding were resolved through discussion until both coders reached full agreement. For the quantitative variables (i.e., number of included articles, effect sizes,

lower and upper bound of included years), Cronbach's alphas for rater agreement based on 50% of the studies ranged between 0.99–1.00.

2.4. Synthesis strategy

We first described the literature search and discussed the characteristics of the included systematic reviews and meta-analyses. These characteristics consisted of variables related to sample size, range of years included, and study quality.

Second, for each treatment type (i.e., universal prevention, selective prevention, indicated prevention, and intervention), we extracted the effect sizes for comparison and discussion. We categorized all available effect sizes into no effect, small, medium, and large. For standardized mean differences (i.e., *Cohen's d, Hedges' g*), we considered effect sizes ranging from 0.2 to 0.49 to be small effects, effect sizes ranging from 0.5 to 0.79 to be medium effects, and effect sizes from 0.8 to be large effects (Lipsey and Wilson, 2000). Moreover, we included effect sizes below 0.2 that were significant in the category of small effects. For studies using an effect size measure that was less common (i.e., standard deviation reduction; Epstein et al., 2015), we adopted the size as reported by the authors. For unstandardized test statistics (weighted mean difference; Michelson et al., 2013), we reported the values without interpreting the size of the effect. When studies reported both weighted and unweighted effect sizes, we used the weighted effect size to avoid overestimation of effect sizes.

Third, we investigated the results for the moderators identified during the data extraction. These moderators included participant characteristic (e.g., child age, child gender, pre-treatment level of aggression, socioeconomic status), intervention characteristic (e.g., implementation, treatment, and session-related factors), and methodological characteristic (e.g., informant and research quality).

3. Results

3.1. Literature search

The literature search yielded 8818 articles. Fig. 1 displays the selection process. After removal of duplicates, the titles and abstracts of the identified papers were screened to determine their eligibility. Based on the initial screening of the abstract, we selected 111 papers for full-text screening; 72 articles fulfilled the criteria and were included. Because some systematic reviews also included effect sizes, for reasons of clarity, from here on we adopted the term study for each article, both systematic reviews and meta-analyses.

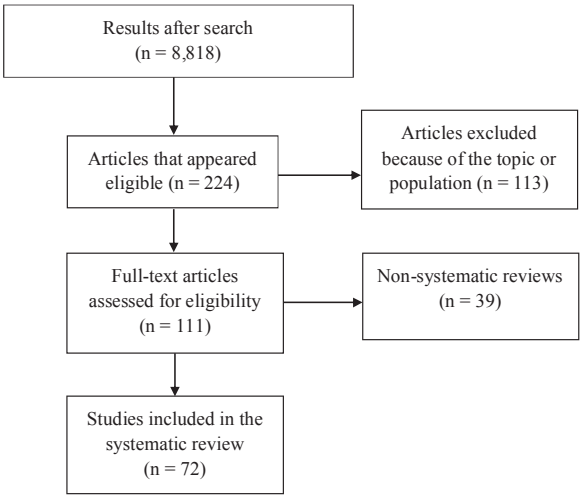

Fig. 1. Flow chart of the literature search.

3.2. Study characteristics

The studies included articles published between 1950 and 2017. The amount of included articles in the studies ranged between 3–254. Ten percent of the studies (seven studies) included a maximum of ten articles, 26% (19 studies) included between 11 and 20 articles, 35% (25 studies) included between 21–50 articles, 19% (14 studies) included between 51–100 articles, 4% (three studies) included between 101 and 200 articles, 3% (two studies) included more than 200 studies. For 3% (two studies), it was uncertain how many articles related to childhood aggression were included, because they only reported the total number of included articles (Chorpita et al., 2002, 2011). Seventy-two percent (52 studies) reported which databases and search terms were used, 25% (18 studies) reported only the databases, and 3% (two studies) reported neither. Sixty-four percent (46 studies) included only published articles, 36% (26 studies) also included book chapters and dissertations. Thirty-one percent (22 studies) evaluated publication bias. Forty-seven percent (34 studies) assessed the quality of the included articles, either by assessing methodological rigor, or with criteria including: Cochrane criteria, Critical Appraisal Skills Program, Jadad Scale, JAMA criteria, Methods Guide for Effectiveness and Comparative Effectiveness Reviews, Outcome Research Coding Protocol, PRISMA guidelines, Quality Index, Quality of Reporting Meta-analyses, and Task Force criteria.

The different type of treatment programs that were examined in the studies were: psychosocial treatments, cognitive behavioral treatments, parent training programs, school-based treatments, and other types, such as solution-focused brief therapy, (multi)systemic therapy, family therapy, media-based treatments, after-school programs, child-centered play therapy, and martial arts. Table 2 presents the frequencies of the different types of treatment programs across universal prevention, selective prevention, indicated prevention, and intervention. The most commonly studied moderators associated with participant characteristics were child age, child gender, pre-test levels of aggression, and socioeconomic status. The most commonly studied moderators associated with treatment characteristics were implementation, treatment, and session-related factors (i.e., intensity, frequency, and duration). The most commonly studied moderators associated with methodological characteristics were the informant and research quality. Table 3 presents moderator frequency across universal prevention, selective prevention, indicated prevention, and intervention.

3.3. Effectiveness of treatments for childhood aggression

We first examined the effectiveness of the four types of treatments. The effect sizes, type of treatments, and the outcome measures are displayed in Table 4, the percentages of the effect sizes are displayed in Table 5.

3.3.1. Universal prevention

Twenty-three studies (32% of total) reported effect sizes for the effectiveness of universal prevention programs. Seventeen percent of these studies found no effect. Seventy percent of these studies found a small effect. Four percent of these studies found a medium effect. Four percent of these studies found a large effect size. Four percent of these studies found a small to medium effect

3.3.2. Selective prevention

Twenty-one studies (29% of total) reported effect sizes for selective prevention. Nineteen percent of these studies found no effect. Sixty-seven percent of these studies found a small effect. None of these studies found a medium effect. Ten percent of these studies found a large effect. Five percent of the studies found a small to medium effect.

3.3.3. Indicated prevention

Thirty studies (42% of total) reported effect sizes for indicated prevention. Seven percent of these studies found no effect. Sixty percent

Table 2
Number of treatment programs for childhood aggression across types of treatments.

Intervention components	Universal prevention	Nr.	Selective prevention	Nr.	Indicated prevention	Nr.	Intervention	Nr.
Psychosocial treatments	Franklin et al., 2017; Grove et al., 2008	2	Connor et al., 2006; Chorpita et al., 2011; Farmer et al., 2002; Franklin et al., 2017; Greenberg et al., 2001; Sawyer et al., 2015; Grove et al., 2008	7	Connor et al., 2006; Chorpita et al., 2011; Epstein et al., 2015; Eyberg et al., 2008; Franklin et al., 2017; Sawyer et al., 2015; Grove et al., 2008; Greenberg et al., 2001; Rosato et al., 2012; Weisz et al., 2013	10	Bakker et al., 2017; Bradley & Mandell, 2005; Chorpita et al., 2002, 2011; Connor et al., 2006; Farmer et al., 2002; Epstein et al., 2015; Comer et al., 2013; Fossum et al., 2016, 2008; Franklin et al., 2017; Greenberg et al., 2001; Lee et al., 2013; Sawyer et al., 2015; Rosato et al., 2012; Weisz et al., 2013, 2017	17
Cognitive-behavioral	Bennett and Gibbons, 2000; Grove et al., 2008; Smedler et al., 2015	3	Bennett and Gibbons, 2000; Chorpita et al., 2011; Grove et al., 2008; Smedler et al., 2015	4	Bennett and Gibbons, 2000; Chorpita et al., 2011; Grove et al., 2008; Weisz et al., 2013 Smedler et al., 2015; McCart et al., 2006; Smeets et al., 2015; Sukhodolsky et al., 2004	8	Battagliese et al., 2015; Bennett and Gibbons, 2000; Chorpita et al., 2002, 2011; Weisz et al., 2017; Fossum et al., 2016; McCart et al., 2006; Smeets et al., 2015; Sukhodolsky et al., 2004; Weisz et al., 2017, 2013	11
Parent training	Kaminski et al., 2008; Leijten et al., 2013; Lundahl et al., 2006; Nowak & Heinrichs, 2008; Shelleby and Shaw, 2014; Thomas et al., 2017	6	Chorpita et al., 2011; De Graaf et al., 2008; Farmer et al., 2002; Kaminski et al., 2008; Leijten et al., 2013; Lundahl et al., 2006; Menting et al., 2013; Michelson et al., 2013; Nowak and Heinrichs, 2008; Shelleby and Shaw, 2014 Thomas et al., 2017; Tully and Hunt, 2016	12	Barlow and Stewart-Brown, 2000; Briggs et al., 2015; Chorpita et al., 2011; Buchanan-Pascall et al., 2017; De Graaf et al., 2008; Dretzke et al., 2005; Farmer et al., 2002; Gavita & Joyce, 2008; Kaminski et al., 2008; McCart et al., 2006; Leijten et al., 2013; Lundahl et al., 2006; Menting et al., 2013; Michelson et al., 2013; Nowak & Heinrichs, 2008; Reyno and McGrath et al., 2006; Shelleby and Shaw, 2014; Thomas et al., 2017; Thomas and Zimmer-Gembeck et al., 2007; Tully and Hunt, 2016	20	Barlow and Stewart-Brown, 2000; Chorpita et al., 2002,2011; Buchanan-Pascall et al., 2017; Briggs et al., 2015; De Graaf et al., 2008; Dretzke et al., 2005, 2009; Furlong et al., 2012; Gavita & Joyce, 2008; Kaminski et al., 2008; McCart et al., 2006; Leijten et al., 2013; Lundahl et al., 2006; Menting et al., 2013; Michelson et al., 2013; Lee et al., 2013; Maughan et al., 2005; Nowak and Heinrichs, 2008; Reyno and McGrath et al., 2006; Shelleby and Shaw, 2014; Thomas et al., 2017; Tarver et al., 2014; Thomas and Zimmer-Gembeck et al., 2007; Tully and Hunt, 2016	25
School-based treatment	Barnes et al., 2014; Durlak & Weissberg, 2007; Durlak et al., 2011; Farahmand et al., 2011; Franklin et al., 2017; Gansle, 2005; Hahn et al., 2007; Oliver et al., 2011; Park-Higgerson et al., 2008; Ray et al., 2015;Wilson et al., 2001;Wilson and Lipsey, 2006, 2007;Wilson et al., 2003	14	Barnes et al., 2014; Durlak & Weissberg, 2007; Farahmand et al., 2011; Franklin et al., 2017; Gansle, 2005; Hahn et al., 2007; Ray et al., 2015; Wilson et al., 2001; Wilson & Lipsey, 2007; Wilson et al., 2003	10	Durlak & Weissberg, 2007; Farahmand et al., 2011; Franklin et al., 2017; Gansle, 2005; Ray et al., 2015; Stoltz et al., 2012; Wilson et al., 2001; Wilson & Lipsey, 2007; Wilson et al., 2003	9	Durlak & Weissberg, 2007; Farahmand et al., 2011; Franklin et al., 2017; Ray et al., 2015; Wilson et al., 2001; Wilson & Lipsey, 2007; Wilson et al., 2003	7
Other	Candelaria et al., 2012; Hale et al., 2014; Harwood et al., 2017; Montgomery and Maunders, 2015; Ray et al., 2015	5	Chorpita et al., 2011; Farmer et al., 2002; Hale et al., 2014; Candelaria et al., 2012; Harwood et al., 2017; Kremer et al., 2014; Montgomery and Maunders, 2015; Ray et al., 2015; Von Sydow et al., 2013	9	Chorpita et al., 2011; Candelaria et al., 2012; Harwood et al., 2017; Bunge et al., 2016; Montgomery and Maunders, 2015; Ray et al., 2015; Von Sydow et al., 2013	7	Bond et al., 2013; Chorpita et al., 2002; 2011; Candelaria et al., 2012; Bunge et al., 2016; Farmer et al., 2002; Fossum et al., 2016; Harwood et al., 2017; Montgomery et al., 2006; Tarver et al., 2014; Ray et al., 2015; Von Sydow et al., 2013	13

Table 3
Numbers of the studied moderators for treatment effectiveness for childhood aggression.

Intervention components	Universal prevention	Nr.	Selective prevention	Nr.	Indicated prevention	Nr.	Intervention	Nr.
Child age	Barnes et al., 2014; Franklin et al., 2017; Grove et al., 2008; Lundahl et al., 2006; Hahn et al., 2007; Nowak & Heinrichs, 2008; Park-Higgerson et al., 2008; Wilson and Lipsey, 2006	8	Barnes et al., 2014; Franklin et al., 2017; Grove et al., 2008; Lundahl et al., 2006; Hahn et al., 2007; Kremer et al., 2014; Nowak & Heinrichs, 2008; Sawyer et al., 2015	8	Franklin et al., 2017; Grove et al., 2008; Lundahl et al., 2006; Nowak & Heinrichs, 2008; Sawyer et al., 2015;Smeets et al., 2015; Sukhodolsky et al., 2004; Stoltz et al., 2012	8	Bakker et al., 2017; Comer et al., 2013; Fossum et al., 2016; 2008; Franklin et al., 2017; Lundahl et al., 2006; Maughan et al., 2005; Nowak & Heinrichs, 2008; Sawyer et al., 2015; Smeets et al., 2015; Stoltz et al., 2012; Sukhodolsky et al., 2004	12
Child gender	Barnes et al., 2014; Franklin et al., 2017; Grove et al., 2008; Nowak & Heinrichs, 2008; Wilson and Lipsey, 2006	5	Barnes et al., 2014; De Graaf et al., 2008; Franklin et al., 2017; Grove et al., 2008; Nowak and Heinrichs, 2008; Sawyer et al., 2015	6	De Graaf et al., 2008; Franklin et al., 2017; Grove et al., 2008; Nowak and Heinrichs, 2008; Sawyer et al., 2015; Smeets et al., 2015	6	Bakker et al., 2017; Comer et al., 2013; De Graaf et al., 2008; Erford et al., 2014; Fossum et al., 2008; Franklin et al., 2017; Maughan et al., 2005; Nowak and Heinrichs, 2008; Sawyer et al., 2015; Smeets et al., 2015	10
Pre-test levels of aggression	Bennett and Gibbons, 2000; Leijten et al., 2013; Lundahl et al., 2006; Nowak & Heinrichs, 2008; Wilson et al., 2003	5	Bennett and Gibbons, 2000; De Graaf et al., 2008; Leijten et al., 2013; Lundahl et al., 2006; Menting et al., 2013; Nowak and Heinrichs, 2008; Wilson et al., 2003	7	Bennett and Gibbons, 2000; De Graaf et al., 2008; Leijten et al., 2013; Lundahl et al., 2006; Menting et al., 2013; Nowak and Heinrichs, 2008; Sukhodolsky et al., 2004;Stoltz et al., 2012; Wilson et al., 2003	9	Bennett and Gibbons, 2000; De Graaf et al., 2008; Leijten et al., 2013; Lundahl et al., 2006; Menting et al., 2013; Nowak and Heinrichs, 2008; Stoltz et al., 2012; Sukhodolsky et al., 2004; Wilson et al., 2003	9
SES	Leijten et al., 2013; Lundahl et al., 2006; Wilson and Lipsey, 2006	3	Leijten et al., 2013; Lundahl et al., 2006	2	Leijten et al., 2013; Lundahl et al., 2006	2	Leijten et al., 2013; Lundahl et al., 2006	2
Implementation	Barnes et al., 2014; Durlak et al., 2011; Franklin et al., 2017; Lundahl et al., 2006; Park-Higgerson et al., 2008; Wilson and Lipsey, 2006; Wilson et al., 2003	7	Barnes et al., 2014; Franklin et al., 2017; Sawyer et al., 2015; Lundahl et al., 2006; Wilson et al., 2003	5	Franklin et al., 2017; Sawyer et al., 2015; Smeets et al., 2015; Lundahl et al., 2006; Wilson et al., 2003	5	Bakker et al., 2017; Erford et al., 2014; Franklin et al., 2017; Sawyer et al., 2015; Smeets et al., 2015; Lundahl et al., 2006; Maughan et al., 2005; Wilson et al., 2003	8
Treatment	Dymnicki et al., 2011; Grove et al., 2008; Lundahl et al., 2006; Nowak and Heinrichs, 2008; Park-Higgerson et al., 2008	5	Grove et al., 2008; Farmer et al., 2002; Kremer et al., 2014; Lundahl et al., 2006; Nowak and Heinrichs, 2008; Sawyer et al., 2015	6	Grove et al., 2008; Farmer et al., 2002; Epstein et al., 2015; McCart et al., 2006; Lundahl et al., 2006; Nowak and Heinrichs, 2008; Sawyer et al., 2015; Stoltz et al., 2012	8	(Epstein et al., 2015; Bakker et al., 2017; McCart et al., 2006; Battagliese et al., 2015; Lundahl et al., 2006; Fossum et al., 2008; Nowak and Heinrichs, 2008; Sawyer et al., 2015; Stoltz et al., 2012	9
Intensity, frequency, duration	Gansle, 2005; Wilson and Lipsey, 2006; Wilson et al., 2003	3	Sawyer et al., 2015; Kremer et al., 2014); Wilson et al., 2003	3	McCart et al., 2006; Sukhodolsky et al., 2004; Buchanan-Pascall et al., 2017; Gansle, 2005; Wilson et al., 2003	5	Bakker et al., 2017; Fossum et al., 2016; 2008; Battagliese et al., 2015; Buchanan-Pascall et al., 2017; Erford et al., 2014; Sawyer et al., 2015; McCart et al., 2006; Sukhodolsky et al., 2004; Maughan et al., 2005; Gansle, 2005; Wilson et al., 2003	12
Informant	Bennett and Gibbons, 2000; Wilson and Lipsey, 2006	2	Bennett and Gibbons, 2000; Sawyer et al., 2015; Menting et al., 2013	3	Bennett and Gibbons, 2000; Sawyer et al., 2015; Menting et al., 2013	3	Battagliese et al., 2015; Bennett and Gibbons, 2000; Weisz et al., 2017; Sawyer et al., 2015; Menting et al., 2013; Maughan et al., 2005; Tarver et al., 2014; Fossum et al., 2008; Dretzke et al., 2009	9
Research quality	Barnes et al., 2014; Bennett and Gibbons, 2000; Nowak and Heinrichs, 2008; Wilson and Lipsey, 2006	4	Barnes et al., 2014; Bennett and Gibbons, 2000; Nowak and Heinrichs, 2008; Sawyer et al., 2015	4	Barnes et al., 2014; Bennett and Gibbons, 2000; McCart et al., 2006; Buchanan-Pascall et al., 2017; Nowak and Heinrichs, 2008; Sawyer et al., 2015	6	Barnes et al., 2014; Bennett and Gibbons, 2000; McCart et al., 2006; Buchanan-Pascall et al., 2017; Maughan et al., 2005; Erford et al., 2014; Fossum et al., 2008; Nowak and Heinrichs, 2008; Sawyer et al., 2015	9

Table 4
Effect sizes for different treatments of childhood aggression.

Article	Universal prevention	Selective prevention	Indicated prevention	Intervention	Type of program	Outcome measure
Bakker et al., 2017				d = 0.01 – 0.37	Psychological treatments	Conduct disorder or conduct problems
Barlow and Stewart-Brown, 2000			x	x	Group parent education programs	Externalizing behavior
Barnes et al., 2014	d = -0.14*	d = -0.14*			School-based cognitive-behavioral intervention	Aggression
Battagliese et al., 2015				d = -0.52	School-based cognitive behavioral interventions	Externalizing behavior (including ADHD)
Bennett and Gibbons, 2000	d = 0.23*	d = 0.23*	d = 0.23*	d = 0.23*	Cognitive behavior therapy	Antisocial behavior
Bond et al., 2013				x	Solution-focused brief therapy	Externalizing behavior
Bradley and Mandell, 2005				*SMD* = 0.25 – 1.06	Treatments for ODD	ODD
Briggs et al., 2015			x	x	Single-parent group interventions	Child compliance
Buchanan-Pascall et al., 2017			g = 0.38	g = 0.38	Parent group interventions	Externalizing problems
Bunge et al., 2016			x	x	Cognitive behavioral intervention technologies	CD, ODD, ADHD
Candelaria et al., 2012	d = 0.34	d = 0.34	d = 0.34	d = 0.34	Anger management programs	Aggression
Chorpita et al., 2002				x	Empirically based treatments	CD and ODD
Chorpita et al., 2011		x	x	x	Empirically based treatments	Disruptive behavior
Comer et al., 2013				g = 0.71 – 0.90	Psychosocial treatments	Disruptive behavior
Connor et al., 2006		x	x	x	Prevention programs and psychosocial treatments	Aggression, conduct problems, antisocial behaviors, and violence.
De Graaf et al., 2008		d = 0.88*	d = 0.88*	d = 0.88*	Triple P level 4	Disruptive behavior problems
Dretzke et al., 2005			*SMD* = -0.35 – -0.73*	*SMD* = -0.35 – -0.73*	Parent training	CD
Dretzke et al., 2009				*SMD* = 0.40 – 0.67	Parent training	CD
Durlak et al., 2011	g = 0.17 – 0.26				School-based social and emotional learning	Conduct problems
Durlak and Weissberg, 2007	*SMD* = 0.18	*SMD* = 0.18	*SMD* = 0.18	*SMD* = 0.18	After school programs	Noncompliance, aggression, delinquent acts, disciplinary referrals, rebelliousness, and other types of conduct problems
Dymnicki et al., 2011	g = 0.11				Elementary school based programs	Overt aggression
Epstein et al., 2015			1.2 SD decrease	1.2 SD decrease	Psychosocial interventions	Disruptive behaviors
Erford et al., 2014				$d+$ = 0.36 – 0.68	Counseling or psychotherapy	ODD
Eyberg et al., 2008			x	x	Psychosocial treatments	Disruptive behavior
Farahmand et al., 2011	g = 0.02*	g = 0.02*	g = 0.02*	g = 0.02*	School-based mental health and behavioral programs	Conduct problems
Farmer et al., 2002		x	x		Treatment approaches with demonstrated evidence	Disruptive behavior
Fossum et al., 2008				d = 0.62	Psychotherapy	Disruptive, aggressive, and oppositional behaviors
Fossum et al., 2016				d = 0.64	Psychological interventions	Conduct problems
Franklin et al., 2017	d = 0.02	d = 0.02	d = 0.02	d = 0.02	Teacher-delivered psychosocial interventions	Externalizing behaviors
Furlong et al., 2012				*SMD* = -0.53	Behavioral and cognitive-behavioral group-based parenting programs	Conduct problems
Gansle, 2005	d = 0.54*		d = 0.54*	d = 0.54*	School-based interventions	Anger and externalizing behavior
Gavita and Joyce, 2008			d = 0.75*	d = 0.75*	Group based cognitively enhanced parent training	Disruptive or externalizing behavior
Greenberg et al., 2001	x	x	x		Prevention programs	Externalizing behavior

(*continued on next page*)

Table 4 (*continued*)

Article	Universal prevention	Selective prevention	Indicated prevention	Intervention	Type of program	Outcome measure
Grove et al., 2008	d = 0.17*	d = 0.17*	d = 0.17*		Prevention programs	Behavior referrals, aggression, delinquency, conduct problems, arrests or court contacts, oppositional symptoms
Hahn et al., 2007	x	x			Universal school-based programs	Violent and aggressive behavior
Hale et al., 2014	x	x			Family, community, or Web-based prevention	Aggression
Harwood et al., 2017	d = 0.38 – 0.65	d = 0.38 – 0.65	d = 0.38 – 0.65	d = 0.38 – 0.65	Martial arts	Externalizing behaviors
Kaminski et al., 2008	*SMD* = 0.25*	*SMD* = 0.25*	*SMD* = 0.25*	*SMD* = 0.25*	Parent training	Child behavior problems
Kremer et al., 2014		g = 0.11			After-school programs	Externalizing behavior
Lee et al., 2013				x	Psychological treatments	Disruptive behavior problems
Leijten et al., 2013	x	x	x	x	Parent training	Disruptive behavior problems
Lösel and Beelmann et al., 2003	d = 0.26*	d = 0.26*	d = 0.26*		Child skills training	Antisocial behavior
Lundahl et al., 2006	d = 0.42*	d = 0.42*	d = 0.42*	d = 0.42*	Parent training	Externalizing behavior
Maughan et al., 2005				d = 0.30	Behavioral parent training	Externalizing behavior
McCart et al., 2006			d = 0.40*	d = 0.40*	Behavioral parent training and cognitive-behavioral therapy for youth	Antisocial behavior
Menting et al., 2013		d = 0.27*	d = 0.27*	d = 0.27*	Incredible Years parent training	Disruptive behavior
Michelson et al., 2013		ECBI-I -20.90 ($p < .001$), ECBI-P -6.03 ($p < .001$), CBCL Ext -3.66 ($p = .006$), and SDQ CD -.059 ($p < .001$)	ECBI-I -20.90 ($p < .001$), ECBI-P -6.03 ($p < .001$), CBCL Ext -3.66 ($p = .006$), and SDQ CD -.059 ($p < .001$)	ECBI-I -20.90 ($p < .001$), ECBI-P -6.03 ($p < .001$), CBCL Ext -3.66 ($p = .006$), and SDQ CD -.059 ($p < .001$)	Parent Management Training	Disruptive behavior
Montgomery and Maunders et al., 2015	x	x	x	x	Creative bibliotherapy	Externalizing behavior
Montgomery et al., 2006				x	Media-based cognitive-behavioral treatments	Externalizing behavior problems
Nowak and Heinrichs, 2008	g = 0.35*	g = 0.35*	g = 0.35*	g = 0.35*	Triple P	Child behavior problems
Oliver et al., 2011	*SMD* = 0.18 – 0.20				Teachers' classroom management	Problem behaviors
Park-Higgerson et al., 2008	*SMD* = -0.09				School-based prevention programs	Externalizing, aggressive, or violent behavior
Ray et al., 2015	d = 0.34*	d = 0.34*	d = 0.34*	d = 0.34*	Child-centered play therapy	Externalizing behaviors
Reyno and McGrath et al., 2006			x	x	Parent training	Externalizing behavior problems
Rosato et al., 2012			x	x	Psychosocial interventions	Overt aggression
Sawyer et al., 2015		d = 0.25*	d = 0.25*	d = 0.41	Psychosocial interventions	Antisocial behavior
Shelleby and Shaw et al., 2014	x	x	x	x	Parenting interventions	Conduct problems
Smedler et al., 2015	x	x	x		Prevention programs	Externalizing behavior
Smeets et al., 2015			d = 0.50*	d = 0.50*	Cognitive behavior therapy	Aggressive behavior
Stoltz et al., 2012			d = 0.30*	d = 0.30*	Individual interventions with or without additional components	Externalizing behavior
Sukhodolsky et al., 2004			d = 0.67*	d = 0.67*	Cognitive behavior therapy	Anger or aggression
Tarver et al., 2014				*SMD* = 1.01	Self-directed parenting interventions	Externalizing behavior
Thomas et al., 2017	*SMD* = .87	*SMD* = .87	*SMD* = .87	*SMD* = .87	Parent-child interaction therapy	Externalizing behavior problems

(*continued on next page*)

Table 4 (*continued*)

Article	Universal prevention	Selective prevention	Indicated prevention	Intervention	Type of program	Outcome measure
Thomas and Zimmer-Gembeck et al., 2007			*d* = -2.16 - -0.31*	*d* = -2.16 - -0.31*	PCIT and Triple P	Aggression, extreme tantrums, and opposition
Tully and Hunt, 2016		x	x	x	Brief parenting interventions	Externalizing behavior
Von Sydow et al., 2013			x	x	Systemic therapy	Externalizing disorders
Weisz et al., 2013			*d* = 0.31*	*d* = 0.31*	Evidence-based psychotherapies	Externalizing behaviors
Weisz et al., 2017				*d* = 0.46	Psychological therapy	Conduct problems
Wilson et al., 2001	*d* = 0.17*	*d* = 0.17*	*d* = 0.17*	*d* = 0.17*	School-based prevention programs	Aggressive behavior
Wilson et al., 2003	*d* = 0.16 – 0.32*	*d* = 0.16 – 0.32*	*d* = 0.16 – 0.32*	*d* = 0.16 – 0.32*	School-based demonstration and routine practice programs	Aggressive behavior
Wilson and Lipsey, 2006	*SMD* = 0.21				School-based social information processing interventions	Aggressive behavior
Wilson and Lipsey, 2007	*d* = 0.21	*d* = 0.29*	*d* = 0.29*		School-based prevention programs	Aggressive behavior

Note. Effect sizes of multiple types of treatments calculated simultaneously were indicated with an asterisk.

of these studies found a small effect. Seventeen percent of these studies found a medium effect. Seven percent of these studies found a large effect. Six percent of these studies found effects ranging between small and medium. Three percent of these studies found effects ranging between small and large.

3.3.4. Intervention

Thirty-nine studies (54% of total) reported effect sizes for intervention. Five percent of these studies found no effect. Forty-four percent of these studies found a small effect. Twenty-three percent of these studies found a medium effect. Eight percent of these studies found a large effect. Three percent of these studies found effects ranging between no effect and a small effect. Eleven percent of these studies found effects ranging between small and medium. Five percent of these studies found effects ranging between small and large. Three percent of these studies found effects ranging between medium and large.

3.3.5. Summary

Overall, the majority of reported effect sizes (61%) were on indicated prevention and interventions. The most prevalent category of effects for all types of treatments was a small effect (65%). For universal and selective prevention effects were mostly absent or small, whereas for indicated prevention and intervention effects were mostly small or medium.

3.3.6. Moderating variables

We investigated the results of the included studies for commonly investigated moderators. These moderators included participant characteristics, intervention characteristics, and methodological characteristics.

3.3.7. Participant characteristics. Child age

Nineteen of the studies (26% of total) took age into account as a moderator of treatment effectiveness for childhood aggression. Sixteen percent of these studies found larger treatment effectiveness for younger children (Fossum et al., 2016; Nowak and Heinrichs, 2008; Stoltz et al., 2012). Eleven percent found larger treatment effectiveness for older children (Comer et al., 2013; Park-Higgerson et al., 2008). Five percent found no effect of age between groups, but did find stronger effects for younger children when looking at within-group effect sizes (Fossum et al., 2008). Five percent found that treatments were more effective for younger (3–5 years old) and older children (9–11 years old) but less effective in between for children aged 6-8 (Maughan et al., 2005). Finally, five percent found that treatments were less effective for children in elementary and middle school compared to kindergarten and high school (Hahn et al., 2007). Fifty-eight percent of these studies found that child age did not have a significant moderating effect (Bakker et al., 2017; Barnes et al., 2014; Erford et al., 2014; Franklin et al., 2017; Grove et al., 2008; Kremer et al., 2014; Lundahl et al., 2006; Sawyer et al., 2015; Smeets et al., 2015; Sukhodolsky et al., 2004; Wilson and Lipsey, 2006).

3.3.8. Gender

Thirteen studies (18% of total) included child gender as a moderator for treatment effectiveness in reducing childhood aggression. Eight percent found that treatment effectiveness was larger for boys (Comer et al., 2013), while the remaining eight percent found that treatment effectiveness was larger for girls (De Graaf et al., 2008). Eighty-five percent of these studies found no significant moderating effect (Bakker et al., 2017; Barnes et al., 2014; Erford et al., 2014; Fossum et al., 2008; Franklin et al., 2017; Grove et al., 2008; Maughan et al., 2005; Nowak and Heinrichs, 2008; Sawyer et al., 2015; Smeets et al., 2015; Wilson and Lipsey, 2006).

3.3.9. Pre-treatment level of aggression

Nine studies (13% of total) included children's levels of aggression

Table 5
Frequencies and percentages of effect sizes of different types of treatments.

	Universal prevention	Selective prevention	Indicated prevention	Intervention	Total
No effect	4 (17%)	4 (19%)	2 (7%)	2 (5%)	12 (11%)
Small effect	16 (70%)	14 (67%)	18 (60%)	17 (44%)	65 (58%)
Medium effect	1 (4%)	0 (0%)	5 (17%)	9 (23%)	15 (13%)
Large effect	1 (4%)	2 (10%)	2 (7%)	3 (8%)	8 (7%)
Other	1 (4%)	1 (5%)	3 (10%)	8 (21%)	13 (12%)
Total	23 (20%)	21 (19%)	30 (27%)	39 (35%)	113 (100%)

Note: For standardized mean differences, we considered effect sizes from 0.2 and effect sizes below 0.2 that were significant to be small effects, from 0.5 to be medium effects, and from 0.8 to be large effects. Other effects include: no effect to small, small to medium, small to large, and medium to large effects. If a systematic review or meta-analysis reported effect sizes for multiple types of treatments, we included them all.

prior to treatment as a moderator. Sixty-seven percent of these studies found a positive association between pre-treatment levels of aggression and treatment effectiveness for childhood aggression (De Graaf et al., 2008; Leijten et al., 2013; Lundahl et al., 2006; Menting et al., 2013; Sukhodolsky et al., 2004; Wilson et al., 2003). Thirty-three percent found that this factor did not moderate treatment effectiveness (Bennett and Gibbons, 2000; Nowak and Heinrichs, 2008; Stoltz et al., 2012).

3.3.10. Socioeconomic status

Three studies (4% of total) included socioeconomic status (SES) as a moderator. The first of these studies found that treatments were more effective for families with a higher SES (Lundahl et al., 2006). In contrast, the second study found that treatments were more effective for low SES compared to higher/mixed SES (Wilson and Lipsey, 2006). Finally, the third study found that SES interacted with pre-treatment levels of aggression, suggesting that disadvantaged samples improved less due to treatment when they had lower levels of aggression at pre-test (Leijten et al., 2013).

3.3.11. Treatment characteristics. Implementation

Seven studies (10% of total) examined whether a treatment was implemented to groups or individuals. Forty-three percent of these studies found that treatments for childhood aggression were more effective when implemented individually (Lundahl et al., 2006; Maughan et al., 2005; Nowak and Heinrichs, 2008). Fifty-seven percent of did not find that including group vs. individual implementation moderated treatment effectiveness (Bakker et al., 2017; Erford et al., 2014; Franklin et al., 2017; Smeets et al., 2015).

Seven studies (10% of total) included the person who implemented the treatment. Fourteen percent of these studies found larger effects for specialist-implemented programs compared to teacher-implemented programs (Park-Higgerson et al., 2008). Fourteen percent found that treatments implemented by researchers had larger effects compared to treatments implemented by professionals and paraprofessionals (Sawyer et al., 2015). Fourteen percent found that treatments implemented by teachers had a larger effect than interventions implemented by researchers (S. J. Wilson et al., 2003). Forty-three percent found that whether the treatment was implemented by a professional did not moderate treatment effectiveness (Barnes et al., 2014; Maughan et al., 2005; Wilson and Lipsey, 2006). Fourteen percent did not find a difference between implementation by teachers or non-school personnel (Durlak et al., 2011).

3.3.12. Treatment

Five studies (7% of total) examined whether the global type of treatment moderated effectiveness. Twenty percent of these studies found a positive effect for selective prevention compared to universal prevention (Park-Higgerson et al., 2008) and 20 percent found a positive effect for universal prevention compared to selective prevention (Barnes et al., 2014). Forty percent found stronger effects for intervention compared to prevention (Nowak and Heinrichs, 2008; Sawyer et al., 2015). Twenty percent found no moderating effect of prevention type (i.e., universal vs. selective vs. indicated prevention; Grove et al., 2008).

Five studies (7% of total) included the specific type of treatment component as a moderator (e.g., cognitive behavioral therapy, parent training). Twenty percent of these studies found larger effects for behavioral therapy than for family therapy (Fossum et al., 2008), while in contrast 20 percent found larger effects for behavioral parent training than for cognitive behavioral therapy (McCart et al., 2006). Sixty percent found no effect (Kremer et al., 2014; Sawyer et al., 2015; Stoltz et al., 2012).

Five studies (7% of total) examined the moderating effect of parental involvement. Twenty percent of these studies found that treatments with a parent component were more effective, either alone or combined with other components (Epstein et al., 2015). Forty percent found that cognitive-behavioral treatments were more effective when they were delivered to both parents and children (Battagliese et al., 2015; Farmer et al., 2002). Forty percent found no difference between treatments aimed at parents, children, or multiple systems (Bakker et al., 2017; Lundahl et al., 2006).

3.3.13. Session-related factors

Fourteen studies (19% of total) focused on treatment intensity, including number of sessions, session duration, and treatment intensity, yielding 19 moderator effects. Five percent of these studies found that number of sessions per week in one study did not have an effect (Battagliese et al., 2015) and 26 percent found that session duration had no effect (Bakker et al., 2017; Buchanan-Pascall et al., 2017; Erford et al., 2014; Sawyer et al., 2015; Wilson and Lipsey, 2006). In contrast, 11 percent found larger effects for longer durations of treatment (Gansle, 2005; Wilson and Lipsey, 2006) and five percent found larger effects for higher treatment intensity (Wilson et al., 2003). Finally, five percent found a negative moderating effect of number of sessions, indicating smaller effects for more sessions (Maughan et al., 2005). Forty-seven percent found that number of sessions did not significantly moderate treatment effectiveness (Bakker et al., 2017; Battagliese et al., 2015; Erford et al., 2014; Fossum et al., 2016, 2008; Kremer et al., 2014; McCart et al., 2006; Sawyer et al., 2015; Sukhodolsky et al., 2004)

3.3.14. Methodological characteristics. Informant

Ten studies (14% of total) included the informant of childhood aggression as a moderator. Thirty percent of these studies found larger effects for parent-reports compared to independent observations (Dretzke et al., 2009; Maughan et al., 2005; Tarver et al., 2014). Ten percent found larger effects for parent-reports compared to teacher-reports (Battagliese et al., 2015). Ten percent found larger effects for parent-reports compared to teacher- and self-reports (Weisz et al., 2017). Ten percent yielded larger effect for observations by researchers compared to parent- or teacher-report (Menting et al., 2013). Forty percent found no effect (Bennett and Gibbons, 2000; Fossum et al., 2016; Sawyer et al., 2015; Wilson and Lipsey, 2006).

3.3.15. Research quality

There were ten studies (14% of total) that included research quality as a moderator, yielding 14 effect sizes. Twenty-one percent of these studies found a negative effect of an overarching measure of research quality (e.g., a score based on sample size, random assignment, low attrition rates, inclusion of one normed/blinded outcome measure, presence of an attention placebo control group, and whether posttest data was reported for all pre-test measures; (Bennett and Gibbons,

2000; McCart et al., 2006; Nowak and Heinrichs, 2008). Seven percent found greater treatment effectiveness for studies with a low risk of bias compared to studies with a high or unknown risk (Buchanan-Pascall et al., 2017). Twenty-one percent found that whether a sample was assigned randomly did not moderate treatment effectiveness (Barnes et al., 2014; Sawyer et al., 2015; Wilson and Lipsey, 2006). Seven percent found that random assignment had a positive effect on treatment effectiveness (Nowak and Heinrichs, 2008). Seven percent found that random assignment had a negative effect on treatment effectiveness (Maughan et al., 2005). Seven percent found that whether research included an assessment of reliability had a negative moderating effect on treatment effectiveness (Maughan et al., 2005). Seven percent found that the presence of diagnostic information positively moderated treatment effectiveness (Fossum et al., 2008). Seven percent found no effect of whether the program was studied by the developer (Wilson and Lipsey, 2006). Seven percent found no effect of blind assessment (Erford et al., 2014). Seven percent found no effect of sample size (Erford et al., 2014).

3.3.16. Summary

To sum up, the effects of moderating variables on the effectiveness of treatments for childhood aggression were mixed. In the majority of studies including age as a moderator (58%), there was no moderating effect. For studies including child gender, 85% of the studies found no moderating effect. For studies including pre-test levels of aggression, 67% of the studies found a positive moderating effect, indicating larger treatment effectiveness for children with higher pre-test levels of aggression. The moderating effects of SES were mixed. Of the studies comparing implementation to groups or individual, 57% of studies found no effect of implementation to individuals compared to implementation to groups. Of studies investigating the moderating effect of the person implementing the treatment, 57% found no moderating effect. In the studies comparing the moderating effects of different treatment programs, 60% found no effect. The moderating effect of type of treatment was mixed. Of studies investigating the moderating effect of parental involvement, 60% found positive moderation of parent involvement. Of the studies examining the moderating effect of session-related factors or treatment intensity, 78% of the moderator effects were not significant. The moderating effect of the informant was mixed. The moderating effect of research quality was mixed.

4. Discussion

This study provided a synthesis of systematic reviews and meta-analyses to obtain a comprehensive overview of the existing literature on the effectiveness of treatments for childhood aggression. The included studies were heterogeneous in the types of treatments and moderators, and in levels of study quality. The most prevalent effect size for treatments for childhood aggression was small. Two moderators had an effect in the majority of studies in which they were included. First, a positive moderation of pre-test levels of aggression on treatment effectiveness indicated that treatments were more effective for children with higher pre-test levels of aggression. Second, parental involvement had a positive moderating effect on treatment effectiveness, indicating that treatments were more effective when parents were involved. For the other moderators, effects were absent or mixed. Additionally, two overarching patterns emerged. In the following, we will discuss these patterns and describe their theoretical and clinical implications.

4.1. Effect sizes vary as a function of treatment targets

The literature differentiates between prevention and intervention (Grove et al., 2008; Sawyer et al., 2015). Prevention pertains to universal prevention (i.e., for children without any specified risk-factors for developing childhood aggression), selective prevention (i.e., for children with an elevated risk for developing childhood aggression), and indicated prevention (i.e., for children with an elevated risk for developing childhood aggression identified as showing behaviors associated with childhood aggression). Interventions pertain to treating children with diagnosed aggression (Mrazek and Haggerty, 1994).

Our results suggest that rather than clustering indicated prevention with prevention strategies, it shares more features with intervention. First, the effect sizes for universal prevention and selective prevention were almost all absent or small, whereas effects for indicated prevention and intervention were mostly small or medium. Second, studies assessing treatment effectiveness of indicated prevention and intervention focused on similar treatment programs, namely psychosocial treatment programs, cognitive-behavioral treatment programs, and parent training programs. Likewise, studies assessing treatment effectiveness of universal prevention or selective prevention examined similar types of programs, namely mainly school-based programs.

These patterns reflect an important difference between the two clusters of treatments. While universal and selective prevention target risk factors of childhood aggression (Durlak et al., 2011; Oliver et al., 2011; Park-Higgerson et al., 2008; Wilson and Lipsey, 2006), indicative prevention and intervention target the (sub-clinical) symptoms of childhood aggression itself. Most risk factors associated with aggression, such as a lack of cognitive, social, and behavioral skills, are nonspecific and influence multiple dimensions of mental disorders and psychosocial problems, rather than being predictive of a single outcome, such as childhood aggression (Bradley and Corwyn, 2002; Lahey et al., 2017; Mcmahon et al., 2003). For most children, such risk factors do not lead to childhood aggression. Consequently, it is more challenging for universal and selective prevention programs to be effective than for indicated prevention and intervention programs. Therefore, treatment effectiveness may be less determined by the type of treatment program than by the treatment targets (i.e., risk factors vs. (sub)clinical symptoms of childhood aggression).

A focus on treatment targets may also have implications for research and treatment practices. Treatments are often studied separately for children with diagnosed disorders (e.g., Sawyer et al., 2015), leaving out children without a diagnosis or with sub-clinical symptom levels. Nevertheless, our synthesis suggests that indicated prevention effectiveness is comparable to interventions, suggesting that children with sub-clinical aggression may benefit from treatment. Furthermore, children displaying aggression are likely to profit more from earlier treatment (Baker, 2009; Coie et al., 1993; Comer et al., 2013; Connor et al., 2006; Frick and Dickens, 2006; Johnson et al., 2014). In addition to preventing the development of full-blown childhood aggression, indicated prevention may attenuate the development of other disorders (e.g., anxiety disorders, substance use disorders; Shankman et al., 2009) and sub-clinical disorders (e.g., sub-clinical anxiety, sub-clinical substance use disorders; Lewinsohn et al., 2004). These findings underline the possible gains of clustering subclinical and diagnosed intervention programs when examining treatment effectiveness.

4.2. Role of moderators in treatment effectiveness

A majority of the studies that included pre-test levels of aggression found that higher levels were associated with higher treatment effectiveness for childhood aggression. One explanation for this effect could be that there is more room for improvement for individuals with higher levels of aggression. It is also possible that higher levels of aggression allow clinicians to assign indicated prevention or interventions targeting aggression rather than nonspecific risk factors, thereby increasing effectiveness of the treatment (Mrazek and Haggerty, 1994). Finally, some children may be more susceptible to treatment than others (Belsky and Pluess, 2009). If high levels of aggression indicate that children are more susceptible to environmental influences conducive to the development of childhood aggression, this may also indicate that they are more susceptible to benefitting from a treatment. To examine this suggestion, longitudinal, genetically informed designs

would be particularly promising.

A majority of studies that included the moderating effect of parental involvement found that it had a positive effect on treatment effectiveness for childhood aggression. Consistent with this finding, research suggests that treatments focused only on parents, parental psychopathology, and parenting strategies already may have a positive effect on child behavior (Hudziak and Bartels, 2008; Hudziak and Ivanova, 2016; Weissman et al., 2006). Childhood aggression is strongly influenced by both genetic factors and the environment (e.g., Burt, 2009; Fedko et al., 2016; Hudziak et al., 2003; Porsch et al., 2016; Van Beijsterveldt et al., 2003; Wesseldijk et al., 2016). Given the genetic influence on aggression, it is not unlikely that parents of children with (symptoms of) aggression show aggression-related symptoms themselves (Frick et al., 1992). Given the environmental influence on aggression, parents may amplify their children's (risk to develop) aggression through negative or ineffective parenting strategies (Belsky et al., 1998; Berg-Nielsen et al., 2002). Therefore, an opportunity for future research may be to focus more on parental influences as possible moderators of treatment effectiveness. Factors such as parental dysfunction, parental psychopathology, and family stress are associated with a higher risk to develop childhood aggression (Frick et al., 1992; Goodman et al., 2011; Loeber and Hay, 1997).

Finally, the majority of the commonly included moderators (e.g., age, gender, SES, treatment characteristics, methodological characteristics) were not consistently associated with treatment effectiveness. Overall, treatments for childhood aggression yielded small effects, and only two of the commonly included moderators explained why some children responded better to treatment than others. Recognizing childhood aggression as multidimensional disorder – both in development (Nock et al., 2006; Tremblay, 2000) and expression (Bolhuis et al., 2017; Tremblay, 2010) - may be more auspicious than the current often applied 'one size fits all approach'. Given this multidimensionality, more customized approaches for treatment of childhood aggression seem promising. The present study included diagnostic classifications of childhood aggression that are neither simple nor specific. Individuals with the same diagnosis can have remarkably distinct symptoms and/or combinations of symptoms. New approaches that examine the heterogeneity in aggressive behavior by including, for example, biological and physiological information and change of behavior over time (e.g., Fanti, 2016), hold promise for identifying predictors and correlates of specific types of aggression and subsequently develop and apply more targeted treatments.

The heterogeneity of childhood aggression in the present study underlines the need for a clearer taxonomy for childhood aggression. It was beyond the scope of the present study to examine whether the heterogeneity in population influenced treatment effectiveness. Childhood aggression and related disorders often rely on identifying combinations of subsets of symptoms, or criteria, to define diagnoses. To illustrate, Bolhuis et al., (2017) discerned multiple dimensions from the Child Behavior Checklist Aggression scale and Rule Breaking scale including physical aggression, irritability, oppositional or disobedient behavior, and rule breaking. Burt (2013) demonstrated that aggressive and non-aggressive rule-breaking dimensions of antisocial behavior show both similarities and differences. These findings highlight that the utility of different diagnoses and thresholds of symptoms for the evaluation of treatment effects is limited.

In addition to classifying childhood aggression with a more concise and clear taxonomy, biological information may contribute to more customized treatment approaches. Increasingly, researchers unravel the interplay between genes and the environment to inform treatment practices and identify novel treatment targets (Boomsma, 2015; Burt, 2013).

4.3. Limitations and future recommendations

Synthesis studies play an important role in cumulative science by combining and integrating information across multiple studies and, in our case, a time period of more than 60 years. Despite its contributions, there were also some limitations. One limitation concerns a weakness of each systematic review and meta-analysis, namely that the results reflect the quality of the included studies. Second, there is some overlap in the articles included by the studies (e.g., 27 of the articles in Hahn et al. (2007) were also included in Wilson and Lipsey et al., 2007), and it is not unlikely that studies with larger effect sizes were included more often. This may have implications for the reported treatment effectiveness and moderator effects. Nevertheless, the considerable number of systematic reviews and meta-analyses included strengthens our confidence in the robustness of our findings.

5. Conclusion

The present study provided a comprehensive synthesis of the literature on treatment effectiveness for childhood aggression. We identified patterns in the literature on treatment effectiveness and identified opportunities for future research. Overall, treatments for childhood aggression yielded small effects. Our results suggest that there is merit in clustering treatment programs based on treatment targets (i.e., risk factors vs. (sub)clinical symptoms of childhood aggression). More systematic research examining the moderating role of risk factors associated with parental factors, individual development, and expression would be promising to further our understanding of treatment effectiveness. Such work has the potential to inform the tailoring of treatments for individual children to augment existing strategies for prevention and intervention for childhood aggression.

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