



# Treatment of child externalizing behavior problems: a comprehensive review and meta–meta-analysis on effects of parent-based interventions on parental characteristics

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## Abstract

This is the first meta–meta-analysis examining the effects of parent-based interventions for children with externalizing behavior problems on parental characteristics (parenting, parental perceptions, parental mental health, parental relationship quality). Parent training interventions are recognized as evidence-based interventions for the treatment of externalizing behavior problems, although meta-analytic effects are heterogeneous. The objective of the present study was to comprehensively combine meta-analytic results on parent training interventions to arrive at valid effect predictions. Electronic databases were searched (PsycINFO, Medline, PubMed). In total, 11 meta-analyses were included that mainly comprised parents of children under the age of 13 years. Analyses were based on random effects models. Effect estimates were transformed to standardized mean differences (SMD) and corrected for primary study overlap. Results revealed a significant moderate overall effect for parenting (SMD 0.53) as well as for parents' report of parenting (SMD 0.60) and parental perceptions (SMD 0.52). Effects remained stable to follow-up. Results for observational data, parental mental health and parental relationship quality were small and only partially significant. Considerable heterogeneity within results was revealed. Overall, parent training interventions proved to be effective in improving parental characteristics for parents of children with externalizing behavior problems. Effectiveness was stronger regarding characteristics explicitly targeted by interventions. The findings should encourage health-care providers to apply evidence-based parent training interventions.

**Keywords** Meta–meta-analysis · Parent training effectiveness · Externalizing behavior problems · Parents

## Introduction

Conduct disorder (CD), oppositional defiant disorder (ODD) and attention-deficit hyperactivity disorder (ADHD) belong to the most common group of externalizing disorders [1],

and are one of the major reasons for referral of children to mental health agencies [2]. The worldwide prevalence of externalizing disorders in children and adolescents is about 5.7% [1]. Etiological findings demonstrate complex models of pathogenesis including genetic, biological, psychological and environmental risk factors [e.g., 2, 3]. In this complex interplay, parents have a central role in child development. The most salient aspects of parenting with regard to externalizing child behavior problems are inconsistent discipline as well as positive and negative parenting behaviors [4]. Many studies have shown that negative parenting, such as hostile discipline, overreaction or harsh intrusiveness, predicts externalizing behavior problems in children [5, 6]. In contrast, positive parenting can serve as a protective factor for the developmental course of disruptive behavior disorders [7].

Another important factor is the parents' perception of their child as well as of their parenting competencies, as these influence parenting behavior. Parental self-efficacy

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(PSE), i.e., parents' expectations about their "ability to parent successfully" [8, p. 342], has been frequently reviewed with regard to parenting and child behavior. There is a strong relation between PSE and parenting competencies, and high PSE is associated with more positive and promotive parenting behavior [8, 9]. Furthermore, higher levels of PSE are related to better child adjustment, and hence lower levels of externalizing behavior problems [8, 10].

Besides parenting behaviors, other parental factors like parental mental health or couple satisfaction also have an impact on child development [11]. Parental mental health is strongly related to externalizing behavior problems as well as to child emotion regulation [4]. A distinction can be made between parenting-related mental health problems, such as parenting stress, and clinically relevant mental symptoms or disorders, such as depression. High levels of parenting stress are related to externalizing behavior problems [6]. The most studied topic in the field of parental mental health is the impact of maternal depression on children. Maternal depression is associated with less active emotion regulation and thereby more negative mood in their children [12]. With regard to externalizing behavior problems, a positive and bidirectional relation with maternal depression was found [7, 13].

Marital conflicts and disagreements about childrearing emerge as further influencing factors on child adjustment problems, either directly or indirectly [11, 14–16]. Interparental conflicts and disagreements are associated with internalizing as well as externalizing problems [14]. This relation is (partially) mediated by parenting behaviors such as hostile parenting, harsh punishment or psychological control [15, 16].

These findings highlight the importance of involving parents in the treatment of children with externalizing behavior problems. Through parent-based interventions, child problems are treated indirectly by improving parenting practices. These interventions aim at supporting parents in developing effective parenting skills (e.g., consistent discipline, praise, ignoring disruptive behaviors) and to teach parents to recognize and handle problem behaviors in appropriate ways [17]. Indeed, parent-based interventions have been identified as evidence based, effective and cost-effective in the treatment of externalizing behavior problems and disorders [17, 18] and are recommended as a first-line approach for young children with externalizing disorders [18, 19]. There are several interventions that have been extensively examined and empirically evaluated (e.g., Incredible Years, PCIT, Triple P; [20]). Results from meta-analyses show that parent-based interventions have positive effects on parental characteristics like parenting behavior, parental perceptions, parental mental health or parental relationship quality [e.g., 21–27]. However, the observed effects are heterogeneous, with small to large effect sizes [28]. Therefore, the "true" effectiveness

of parent-based interventions on parental characteristics remains unclear.

Due to the observed heterogeneity in the effectiveness of parent-based interventions on parental characteristics, the aim of the present study is to conduct a meta-meta-analysis to summarize all existing meta-analytic estimates on this topic to provide more clarity on the magnitude of effectiveness. Meta-meta-analyses (also called second-order meta-analysis, overview of overviews or umbrella review) are meta-analyses of meta-analyses and follow similar techniques to meta-analyses of primary outcome studies [29, 30]. Moreover, we take into account overlap of primary outcome studies in different meta-analyses to achieve an unbiased evaluation of the overall effectiveness of parent-based interventions. The advantage of this meta-meta-analytic approach is that it is based on a larger database than primary outcome studies. Furthermore, variability between meta-analyses can be assessed. In this review, we focus on the effects on parental characteristics (parenting, parental perceptions, parental mental health, parental relationship quality), whereas effects on child behavior will be reported elsewhere (Mingebach et al., submitted).

## Method

### Inclusion criteria

We included meta-analyses that measured the efficacy of parent-based interventions for infants, toddlers, preschool- and school-aged children with externalizing behavior problems. Externalizing behavior problems were defined either as a clinical diagnosis of a conduct disorder, oppositional defiant disorder or ADHD, or as disruptive behaviors that violate social norms (e.g., noncompliance, aggressive behavior). Meta-analyses were excluded when they were solely carried out in a preventive setting. Moreover, they had to report at least one parent outcome. Meta-analyses published in English and German were eligible.

### Search strategy

To retrieve relevant meta-analyses, we conducted a systematic search in different electronic databases (PsycINFO (EBSCO), Medline (OVID), PubMed) that was completed in March 2016. The full electronic search strategy is reported in Online Appendix.

### Screening of records and data extraction

Eligibility assessment was performed by two reviewers (LW, TM). Disagreements between reviewers were resolved by consensus. In a first step, all abstracts were

screened. The following aspects led to the exclusion of studies: no meta-analysis; no reference to topic of interest; children with disorders/problems other than externalizing behavior problems (e.g., autism spectrum disorders, physical impairment); preventive interventions; publication in a language other than English or German; full text not available; not the current version of the article. Furthermore, only published studies were included. In a next step, full texts of remaining articles were screened and the following additional aspects led to exclusion: a main focus other than the topic of interest; sample too specific (e.g., teenage parents) or topic too specific (e.g., home visitation); insufficient statistical information; no outcomes of parental characteristics. To achieve homogeneity, we set our focus on face-to-face parent training interventions. Studies on children with (developmental) disabilities were included if the primary outcome was the change in externalizing behavior.

A data extraction sheet was developed to collect relevant information from articles (see Table S2, Electronic Supplementary Material). The extracted data was checked by two reviewers (LW, TM). Disagreements were resolved by discussion between the two authors. In cases of ambiguous information in meta-analyses, primary outcome studies were checked. When relevant information was lacking, authors of meta-analyses were contacted for further information. If the sample size was not directly declared in the text, we calculated sample sizes as denoted in the available tables as precisely as possible. If only overall sample sizes were reported, those were divided into half to obtain approximated values for the intervention and control groups. Some meta-analyses examined the effectiveness of one specific parent-based intervention (i.e., Incredible Years, PCIT, Triple P). In the case of Triple P, we only extracted data for levels 4 and 5 (if possible), because these levels are more intense and target parents of children with more severe behavior problems [31]. Some meta-analyses also reported effect sizes for selected studies (e.g., only high-quality studies, without outliers, etc.). Nonetheless, we decided to include overall effect sizes to obtain a larger database. Furthermore, since synthesis of effects that are weighted for moderators or mediators can be very challenging [29], we only included non-weighted effect sizes.

Four outcome categories were defined: (1) parenting behavior, defined as use of positive (e.g., praise) and negative (e.g., criticism, spanking) parenting behaviors; (2) parental perceptions, defined as parents beliefs about and attitudes toward parenting (e.g., parental self-efficacy); (3) parental mental health, assessing parenting stress or general mental health problems (e.g., depressive symptoms, anxiety); and (4) parental relationship quality.

## Risk of bias in included studies and quality ratings

We assessed whether any risk of bias assessment was included in the meta-analyses (e.g., according to the Cochrane Collaboration's tool for assessing risk of bias [32]) and whether its influence on effect estimates was quantified (e.g., sensitivity analyses, moderator analyses).

The quality of every meta-analysis was assessed independently by two reviewers (LW, TM) according to the PRISMA statement using the PRISMA 2009 Checklist [33]. Each item was rated on a 3-point Likert scale with 0 ("item not fulfilled"), 1 ("item partially fulfilled") or 2 ("item completely fulfilled"). Therefore, quality ratings could range between 0 and 54. A quality index for each meta-analysis was built by the mean of the total scores of both raters. To ascertain inter-rater reliability, the intraclass correlation coefficient (ICC) was estimated for total scores using SPSS, version 22 [34]. ICC was 0.92 ( $p \leq 0.001$ ) and can thus be seen as excellent [35].

## Correction of primary study overlap

According to Munder et al. [30], overlap of primary outcome studies might lead to a distortion of results. We thus took overlap of primary outcome studies into account (see Online Appendix for formulae). When a primary study was included in multiple meta-analyses, an adjusted value for this primary study was calculated to contribute only once to the meta-meta-analysis. This was done by determining the number of meta-analyses in which each primary study was included. The inverse of this number was considered as the uniqueness of this study. For each meta-meta-analysis, the uniqueness values of each included "primary" meta-analysis were summed up to determine the adjusted number of primary outcome studies ( $k_{adj}$ ). If assignment of primary outcome studies to specific effect sizes in a meta-analysis was not clear, a conservative approach was used by correcting for all primary outcome studies included in the meta-analysis. Meta-analyses with  $k_{adj}$  less than or equal to three were subsequently excluded.

## Meta-analytic procedure

We applied random effects models using Comprehensive Meta-Analysis 2.0 (CMA) by Biostat [36] and R (version 3.2.4 revised) [37]) as well as the package *metafor* [38].

The effect estimates of each meta-analysis were transformed to standardized mean differences (SMD). Only effect sizes that were based on at least two primary outcome studies were included. Each meta-analysis contributed only one effect size to the meta-meta-analysis. If a meta-analysis provided multiple effect sizes for one outcome, estimates were aggregated into a single effect size. For each outcome,

an overall SMD was computed from meta-analyses. In line with Munder et al. [30], effect sizes of meta-analyses were weighted by the adjusted number of included primary outcome studies ( $k_{adj}$ ) to obtain an overall effect estimate. In accordance with Cohen [39], 0.2 was interpreted as a small effect size, 0.5 as a moderate effect size and 0.8 as a large effect size.

We assessed heterogeneity using the  $Q$  test and  $I^2$  statistics. With regard to  $I^2$ , heterogeneity can be interpreted as low (25%), moderate (50%) or high (75%) [40].

Further subgroup or sensitivity analyses were not conducted due to the small number of included studies and lack of information.

## Publication bias

Publication bias is defined as “[t]he publication or non-publication of research findings, depending on the nature and direction of the results” [31]. Since the number of unpublished negative results is unknown, we conducted a visual inspection of a funnel plot displaying all included studies looking for asymmetry. Further funnel plots were not generated, as effect sizes for each outcome were based on fewer than ten meta-analyses [32]. In accordance with Orwin [41], we calculated Fail-Safe  $N$  for each outcome category to control for publication bias. Thereby, the number of studies with null results that would reduce the observed results to a small effect size of 0.1 can be detected.

## Results

### Search results

Our database search yielded a total of 251 records, with 206 remaining after removal of duplicates. Of these, 142 were discarded after examination of abstracts, since they clearly did not meet the inclusion criteria. The full texts of the remaining 64 were examined in more detail. A further 52 studies were excluded due to not meeting the criteria formulated. Thus, data of 12 meta-analyses were included in the qualitative syntheses (see Fig. 1). The requirement of  $k_{adj} > 3$  led to the exclusion of 1 further meta-analysis [42], thus resulting in a final number of 11 meta-analyses included in our quantitative synthesis.

### Study characteristics

Characteristics of the included studies are presented in Online Appendix (Table 1). As meta-analyses included randomized controlled trials (RCT) as well as uncontrolled trials, effects were calculated as comparisons of intervention and control groups as well as within pre-post effects. All

studies presented data on effects immediately after completion of parent-based intervention (post-intervention). Six meta-analyses also provided data on short-term effects, with follow-up assessments ranging on average between 3 (SD 1.79) and 29 (SD 24.71) months after completion of the intervention (range 1–72 months). Individual meta-analyses included between 12 and 101 primary outcome studies (M 33.67; SD 27.64).

All studies examined behavioral parent interventions. Behavioral interventions are defined as actively teaching parents effective behavioral strategies and skills to manage child behavior. Differential reinforcement, including positive reinforcement of appropriate child behavior and ignoring unwanted behavior, along with the teaching of non-punitive consequences (e.g., time-out), represent the core elements of behavioral parent interventions.

Two studies additionally included non-behavioral interventions [21, 26]. Non-behavioral interventions refer to interventions other than behavioral ones (e.g., focus on parent–child communication or problem-solving strategies). All studies reported effect sizes on at least one of the four parental characteristics.

Five meta-analyses analyzed primary outcome studies solely based on Triple P or Stepping Stones Triple P, respectively [23, 27, 43–45]. Thomas and Zimmer-Gembeck [46] included studies on Triple P and PCIT.

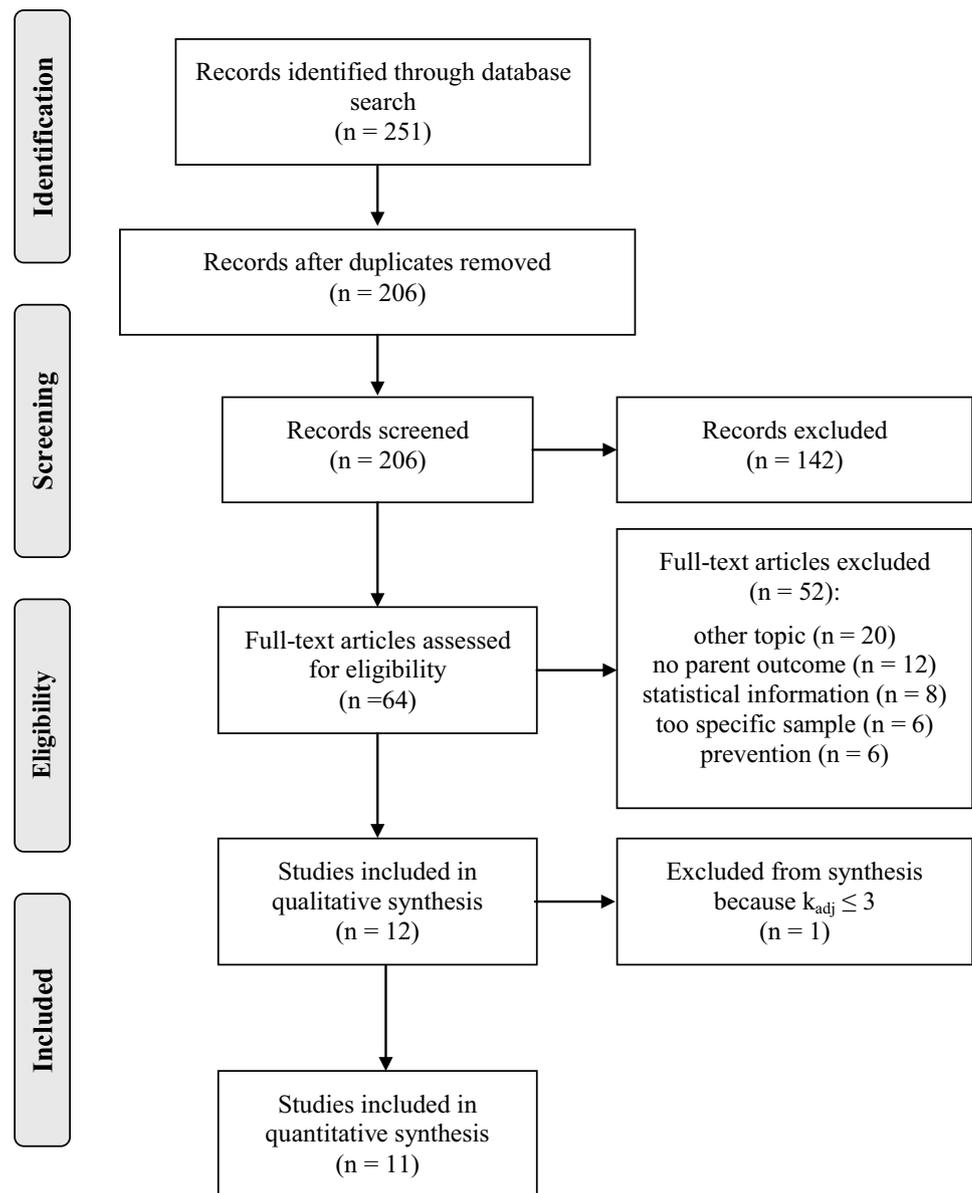
The total sample sizes were reported inconsistently in the included meta-analyses. Although parents' gender was not specified in all meta-analyses, it can be assumed that the majority of data were provided by mothers (see Table 1; Online Appendix). The age range of the children included in the studies is wide (birth to 18 years), but the majority of studies included parents of children under the age of 13 years. Children's mean age could not be calculated due to missing information in the primary meta-analyses.

Parenting behavior outcome was assessed through parent reports [e.g., Parenting Scale (PS)] or via observation of parent behavior [e.g., Dyadic Parent–Child Interactive Coding System (DPICS)]. Parental perceptions were assessed through parent report only [e.g., Parenting Sense of Competence (PSOC)], as were parental mental health [e.g., Parenting Stress Index (PSI), Depression–Anxiety–Stress Adjustment Scale (DASS)] and parental relationship quality [e.g., the Abbreviated Dyadic Adjustment Scale (ADAS)]. For more information see Table S3 in the Electronic Supplementary Material.

### Risk of bias in included studies and quality ratings

Nine out of the 12 meta-analyses made assessments of any potential risk of bias (see Table 1; Online Appendix). Of these, seven meta-analyses examined the influence on study results. An influence was detected in five studies. Quality

**Fig. 1** PRISMA flow diagram for studies included in and excluded from the meta-meta-analysis



indices based on the quality ratings of every meta-analysis employing the PRISMA 2009 Checklist are illustrated in Table 1 (Online Appendix). The mean quality index was 37.46 (SD 7.45). Two meta-analyses were found to have quality indices less than one standard deviation from the mean [46, 47], while one meta-analysis showed a high quality index above one standard deviation [25]. Overall, the quality of included meta-analyses can be viewed as satisfactory.

## Syntheses of results

Results are presented separately for each parental characteristic and are divided into post-intervention and follow-up

outcomes. Additional information is available in the Electronic Supplementary Material (Tables S4 and S5).

## Parenting

Nine meta-analyses provided data for post-intervention of parenting behavior based on parent report and observational data (overall effect). Meta-meta-analysis revealed a statistically significant moderate effect size for parent-based interventions (SMD 0.53, 95% CI 0.41–0.65,  $p \leq 0.0001$ ; see Fig. 2). Strong evidence of heterogeneity was observed ( $Q = 70.16$ ,  $p \leq 0.0001$ ,  $I^2 = 88.60\%$ ).

In a further step, we examined separate effect sizes for parent report and observational data. Meta-meta-analysis on parent report revealed a statistically significant moderate

effect size (SMD 0.60, 95% CI 0.44–0.76,  $p \leq 0.0001$ ; see Fig. 3), also evidencing significant heterogeneity ( $Q = 50.59$ ,  $p \leq 0.0001$ ,  $I^2 = 92.09\%$ ).

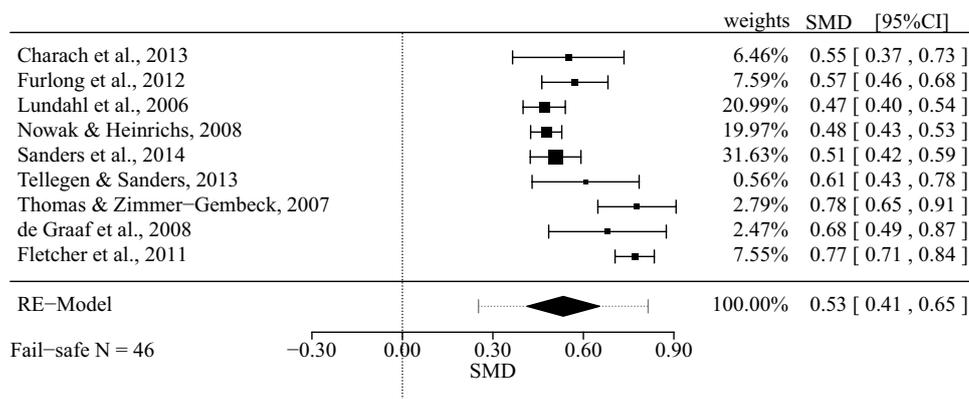
Analysis of observational data revealed a non-significant small effect size (SMD 0.39, 95% CI – 0.03 to 0.81,  $p = 0.07$ ; see Fig. 4), but again with significant heterogeneity ( $Q = 41.32$ ,  $p \leq 0.0001$ ,  $I^2 = 95.16\%$ ).

Meta-meta-analysis of follow-up effects revealed a statistically significant moderate effect size for overall parenting outcomes (SMD 0.51, 95% CI 0.37–0.64,  $p \leq 0.0001$ ; see Fig. 1 in Online Appendix) with evidence of significant heterogeneity ( $Q = 12.76$ ,  $p = 0.005$ ,  $I^2 = 76.49\%$ ).

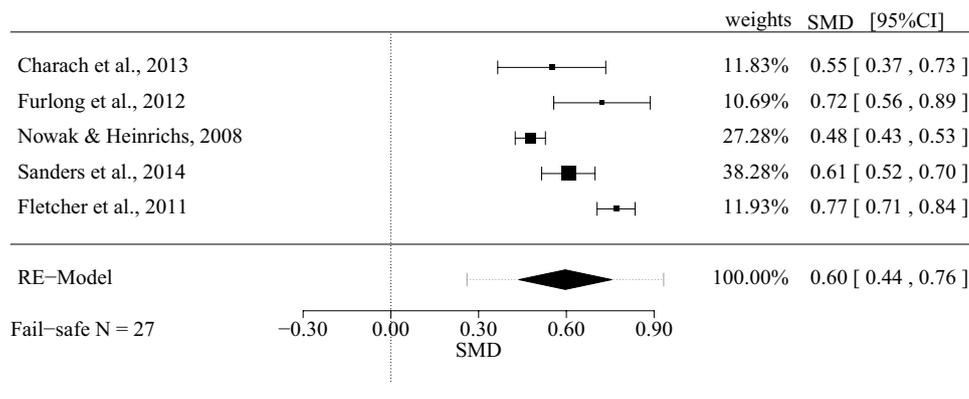
Follow-up data on parent report of parenting revealed a statistically significant moderate effect size (SMD 0.56, 95% CI 0.43–0.69,  $p \leq 0.0001$ ; see Fig. 2 in Online Appendix). Although there was evidence of moderate heterogeneity ( $I^2 = 50.31\%$ ), this did not reach statistical significance ( $Q = 4.02$ ,  $p = 0.13$ ).

Since only one study provided statistically sufficient data on the observation of parenting at follow-up, no meta-meta-analysis was conducted.

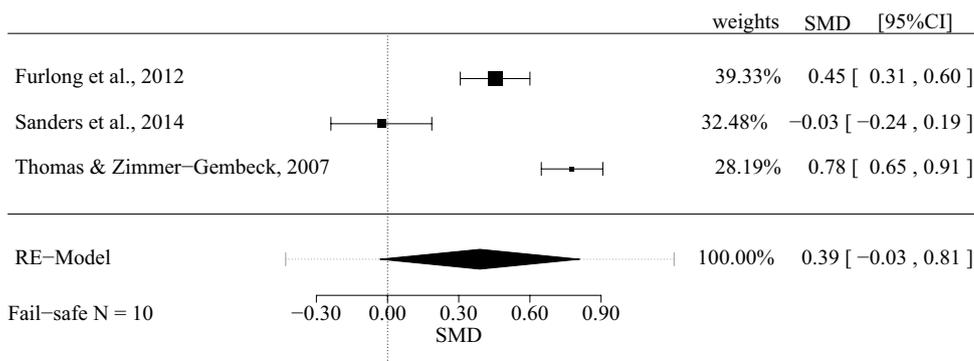
**Fig. 2** Meta-meta-analysis of overall parenting (post-intervention)



**Fig. 3** Meta-meta-analysis of parent report of parenting (post-intervention)



**Fig. 4** Meta-meta-analysis of observational data of parenting (post-intervention)



### Parental perceptions

Meta-meta-analysis of parent report data on parental perceptions at post-intervention revealed a statistically significant moderate effect size (SMD 0.52, 95% CI 0.43–0.61,  $p \leq 0.0001$ ; see Fig. 5). Heterogeneity was found to be non-significant ( $Q = 5.49, p = 0.14, I^2 = 45.38\%$ ).

Follow-up data on parental perceptions revealed a statistically significant moderate effect size (SMD 0.54, 95% CI 0.41–0.68,  $p \leq 0.0001$ ; see Fig. 3 in Online Appendix) with no significant heterogeneity ( $Q = 3.31, p = 0.35, I^2 = 9.48\%$ ).

### Parental mental health

Meta-meta-analysis of parent report data on parental mental health at post-intervention revealed a statistically significant small effect size (SMD 0.34, 95% CI 0.21–0.47,  $p \leq 0.0001$ ; see Fig. 6). Heterogeneity was found to be non-significant ( $Q = 7.10, p = 0.21, I^2 = 29.61\%$ ).

Follow-up data on parental mental health revealed a non-significant small effect size (SMD 0.31, 95% CI – 0.02 to 0.63,  $p = 0.07$ ; see Fig. 4 in Online Appendix). Strong evidence of heterogeneity was observed ( $Q = 58.1, p \leq 0.0001, I^2 = 96.56\%$ ).

### Relationship quality

Meta-meta-analysis of parent report data on parental relationship quality at post-intervention revealed a statistically significant small effect size (SMD 0.21, 95% CI 0.09–0.33,  $p = 0.0006$ ; see Fig. 7), but with evidence of significant heterogeneity ( $Q = 8.43, p = 0.01, I^2 = 76.28\%$ ).

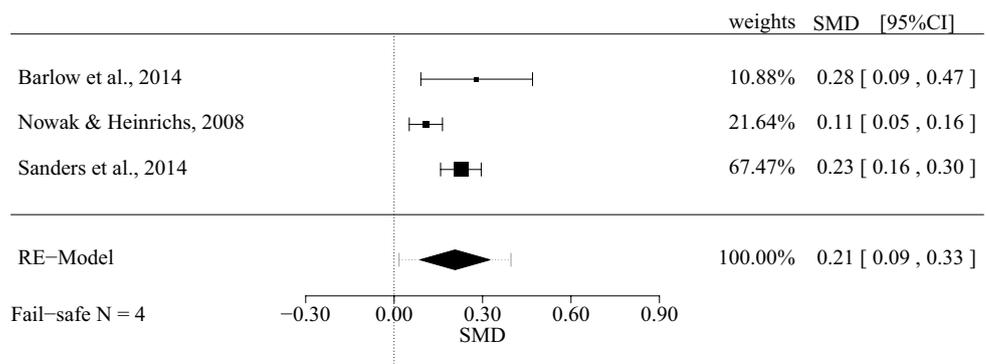
Follow-up data on relationship quality revealed a significant small effect size (SMD 0.19, 95% CI 0.06–0.33,  $p = 0.0043$ ; see Fig. 5 in Online Appendix). Although there was evidence of moderate heterogeneity ( $I^2 = 70.88\%$ ), this did not reach statistical significance ( $p = 0.06$ ).

### Risk of bias across studies

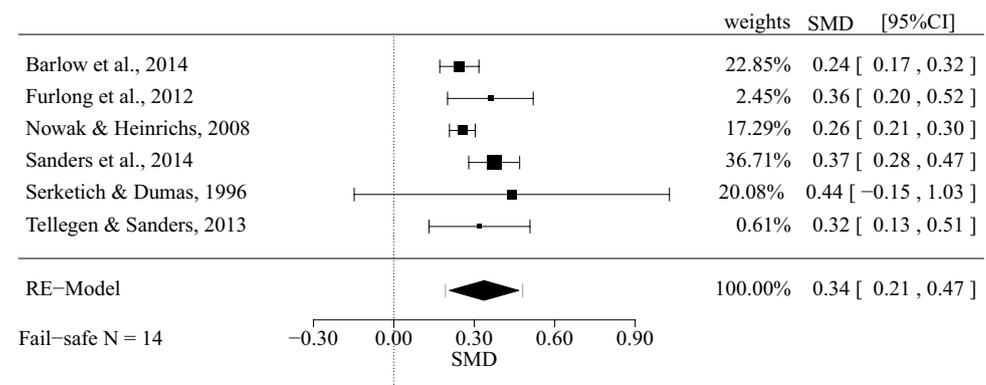
As we included only published studies because of poor availability of unpublished studies (e.g., dissertations), a bias certainly exists and has to be considered in the interpretation of the results. Otherwise, the inclusion of unpublished studies could also be a threat to validity, e.g., due to poor methodological quality [32].

With regard to publication bias, visual inspection of the funnel plot of all included studies (post-intervention; see Fig. 6 in Online Appendix) demonstrated some asymmetry, thus suggesting publication bias.

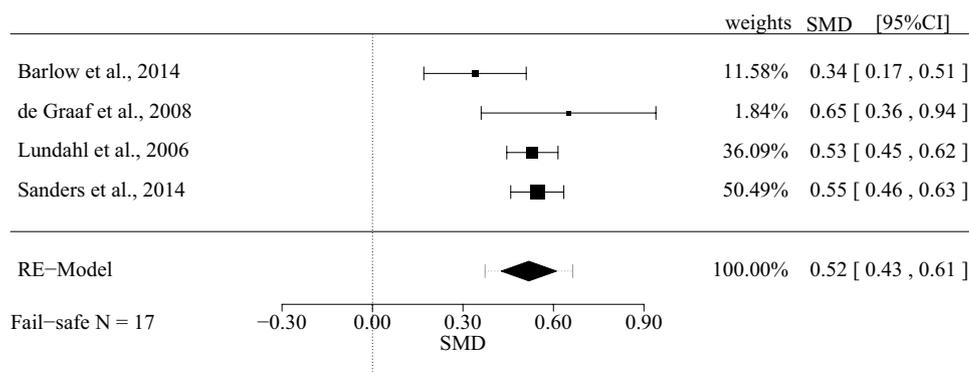
**Fig. 5** Meta-meta-analysis of parental perceptions (post-intervention)



**Fig. 6** Meta-meta-analysis of parental mental health (post-intervention)



**Fig. 7** Meta-meta-analysis of parental relationship quality (post-intervention)



The fail-safe  $N$  ranged between 2 and 46 (see Figs. 2, 3, 4, 5, 6, 7; Figs. 1, 2, 3, 4, 5 in Online Appendix). For parenting behavior and parental perceptions, the calculated Fail-safe  $N$  indicates that about triple to quintuple studies with null results are needed to bring the effect size to a small level of 0.1, indicating robustness of findings. Robustness of findings on parental mental health seems to be somewhat smaller (about twice as many negative studies are needed). Fail-safe  $N$  calculation for parental relationship quality indicates a probable influence of publication bias. This result reflects the observed small effect sizes for relationship quality.

## Discussion

### Summary of evidence

To our knowledge, this is the first meta-meta-analysis of the effectiveness of parent-based interventions on parental characteristics. According to our findings, these interventions enhance parenting behavior and the overall effect was found to be of moderate size and stable over time. Improvement of parenting includes reductions in negative and increases in positive parenting behaviors [25]. This result is in line with the majority of meta-analytic results on the effects of parent training interventions on parenting. Meta-analyses that found large effects were mainly based on a small number of studies [e.g., 27, 45, 46]. As small sample sizes reduce the probability of detecting the true effect [48], our results that are based on 140 primary outcome studies (including more than 32,500 participants), provide a strong evidence base for this smaller effect size. If effect sizes are based solely on parent reports, again, a moderate and stable effect was found. One critical point is that ratings are mostly made by mothers, who are also most often the main participants in parent training interventions. Self-ratings of their parenting behavior may thus be less accurate and prone to biases like social desirability [49]. Moreover, fathers report fewer benefits of parent training. On the other hand, the inclusion of fathers in parent training interventions further improves

externalizing child behavior and parenting, and thus larger effects can be expected [50]. Therefore, more objective assessments are required to evaluate intervention effects. The most suitable practice of objectively assessing parenting behavior is observation by professionals. We were able to calculate effect sizes for observational data regarding parenting behaviors. This estimation revealed a small, though non-significant effect. This result may restrict the positive finding mentioned above, but the small number of studies included (three meta-analyses based on 25 primary outcome studies) may have limited the power to detect effects. Furthermore, observational data that are collected in laboratory settings may not be representative of real parenting behavior [51]. Overall, this reflects the lack of objective evaluations in recent research on the effectiveness of parent-based interventions, and highlights the need for empirically validated independent measures.

Parental perceptions can be positively influenced by parent-based interventions as well. Our results revealed a moderate and stable effect. A change in cognitions might be due to the acquisition of knowledge about child behavior and parenting and to parents' increased confidence in dealing with problem behavior [52]. Moreover, it can be assumed that improved parental self-efficacy will foster the use of effective parenting behaviors, which in turn might have a positive influence on child behavior [8, 53].

Parental mental health was found to improve significantly through parent-based interventions at post-intervention, but the effect was small and did not reach significance at follow-up. This contrasts meta-analyses that found moderate or large effect sizes for parental mental health domains [21, 27]. However, our findings are based on a larger database, increasing reliability and pointing to a possible overestimation of the effect in previous analyses. Nevertheless, the construct of mental health in our analysis is heterogeneous, as it includes parenting-related mental health problems, primarily parenting stress, as well as clinically relevant mental health symptoms or disorders, that could not be calculated separately (e.g., depression, anxiety). Parenting-related strain could be reduced by improving parental competencies, but

this might not be sufficient for the improvement of clinically relevant mental disorders. It remains unclear whether improvements in mental health are due to the strategies taught, or to reductions of child problem behavior [21].

The effect of parent-based interventions on parental relationship quality was found to be small, but significant at follow-up. It is difficult to generalize this finding to parent-based interventions as a whole, as only meta-analyses on Triple P have examined the effect of parent training on relationship quality [27, 44, 45]. Since Triple P teaches parents effective parenting strategies, disagreements about childrearing might be reduced. Unfortunately, parent training programs were mainly attended by mothers. For this reason, it can be assumed that disagreements were not or only partially resolved [43, 54].

### Limitations and implications for future research

As our results demonstrate a high degree of statistically significant heterogeneity ( $Q$  test,  $I^2$  statistics), they need to be interpreted with caution [40]. On the other hand, the combination of various, independent studies inevitably increases the risk of heterogeneity due to the heterogeneous design of the different studies [32]. Upon closer inspection of the included meta-analyses, heterogeneity was mainly found for effects that were based on larger databases [e.g., 23, 27, 43]. In included meta-analyses, heterogeneity is decreased by the exclusion of outliers or the inclusion of moderator variables [e.g., 23, 44], indicating that methodological and clinical aspects (e.g., study quality, sample or intervention characteristics) exert an influence on findings regarding treatment effectiveness [32]. Our meta-meta-analysis was based not only on differing meta-analyses, but also on a wide array of primary outcome studies (in sum 217 at post-intervention). Although we tried to obtain homogeneity by applying strict inclusion criteria, there is still considerable heterogeneity among primary outcome studies per se (e.g., participants, interventions). For instance, we excluded studies that merely examined parent-based interventions in preventive contexts, but some meta-analyses also included prevention studies, or children with symptoms in the non-clinical range (see Table 1; Online Appendix). This may have negatively affected the magnitude of effect sizes, as research shows that effects of parent training in preventive settings are smaller, probably due to lower initial problem intensity, which decreases the scope for change [55]. Therefore, for future research, it is important to distinguish more strictly between preventive and clinical settings.

In the recent study, we defined four outcome categories: parenting behavior, parental perceptions, parental mental health and parental relationship quality. Upon closer inspection of the included meta-analyses, an inconsistent operationalization of outcomes emerges (e.g., the same

questionnaire was used to measure different constructs). For future research, common definitions of outcome categories are required.

We were unable to calculate the differential effectiveness of parent-based interventions compared to different comparison groups (e.g., waitlist, no treatment, treatment as usual, active control group), since most studies aggregated these groups. Moreover, in some meta-analyses, effect sizes were estimated by summarizing results of studies with and without control groups (pre- to post-measures). Effect sizes are expected to be smaller when comparing parent training to active control groups [10, 17]. However, we included studies with active control groups in our analysis to obtain a more precise impression of the effectiveness of parent-based interventions [21–23, 44]. Thus, future research is needed regarding the comparative effectiveness between different interventions for children with externalizing behavior problems.

The risk of bias was increased by the incomplete retrieval of unpublished studies. Moreover, funnel plot inspection showed evidence for publication bias. On the other hand, Fail-safe  $N$  calculations indicate robustness of findings against publication bias, at least for parenting and parental perceptions. However, the inclusion of unpublished studies may also weaken the quality of results [32]. Due to the lack of or insufficiently reported data in primary meta-analyses, extracted data might be imprecise in some cases. Nonetheless, we derived data conservatively (e.g., study overlap) to avoid overestimating effects. We advise authors to provide all relevant information precisely and to adhere to high quality standards when reporting on meta-analyses (e.g., PRISMA statement [33]).

Meta-meta-analyses are still novel and in their infancy. Existing studies come for example from the fields of educational psychology or medicine [56, 57]. As yet, no guidelines or quality standards for meta-meta-analyses exist. Nevertheless, we drew on Cochrane recommendations and the PRISMA statement formulated for meta-analyses and applied these as well as possible [32, 33].

### Conclusions

Overall, parent-based interventions have proved to be effective in improving externalizing behavior problems in children (Mingebach et al., submitted), but this meta-meta-analysis demonstrates that the effects of these interventions spread to various parental characteristics. Effectiveness is stronger regarding characteristics that are explicitly targeted by interventions (parenting behaviors, parental perceptions), but also extends to more distal characteristics (parental mental health, relationship quality). Therefore, this meta-meta-analysis supports the classification of parent-based interventions as an evidence-based intervention in the treatment of

children with externalizing behavior problems and disorders. Behavioral parent training interventions are marked by strong empirical evidence [26, 58], and some particular interventions are based on a broad empirical database (e.g., Incredible Years, PCIT, Triple P). However, so far, it is not possible to state whether one behavioral intervention is better than another. Future research should examine the differential effectiveness of parent training interventions and confirm the effects found using objective data (observation, independent ratings).

Unfortunately, there is still a gap between research findings and clinical practice [59]. As parents play a major role in the development of their children and in the genesis of externalizing disorders, it is essential to include caregivers in the treatment of child disorders [59]. We appeal to health-care providers to make use of evidence-based parent-based interventions to ameliorate mental health care for children with externalizing behavior problems and disorders.

### Compliance with ethical standards

**Conflict of interest** On behalf of all authors, the corresponding author states that there is no conflict of interest.

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