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## Components associated with the effect of home visiting programs on child maltreatment: A meta-analytic review

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### ABSTRACT

**Background:** Home visiting programs are widely endorsed for preventing child maltreatment. Yet, knowledge is lacking on what and how individual program components are related to the effectiveness of these programs.

**Objective:** The aim of this meta-analysis was to increase this knowledge by summarizing findings on effects of home visiting programs on child maltreatment and by examining potential moderators of this effect, including a range of program components and delivery techniques.

**Methods:** A literature search yielded 77 studies ( $N=48,761$ ) examining the effectiveness of home visiting programs, producing 174 effect sizes. In total, 35 different program components and delivery techniques were coded.

**Results:** A small but significant overall effect was found ( $d=0.135$ , 95 % CI (0.084, 0.187),  $p<0.001$ ). Programs that focused on improving parental expectations of the child or parenthood in general ( $d = 0.308$  for programs with this component versus  $d = 0.112$  for programs without this component), programs targeting parental responsiveness or sensitivity to a child's needs ( $d = 0.238$  versus  $d = 0.064$ ), and programs using video-based feedback ( $d = 0.397$  versus  $d = 0.124$ ) yielded relatively larger effects. Providing practical and instrumental assistance was negatively associated with program effectiveness ( $d=0.044$  versus  $d = 0.168$ ). Further, program effects were larger when percentages of non-Caucasians/non-Whites in samples and follow-up durations increased.

**Conclusions:** In general, home visiting programs can prevent child maltreatment only to a small extent. However, implementing specific components and techniques can improve program effectiveness.

## 1. Introduction

Child maltreatment is a major public-health problem with long-lasting negative effects on the child's physical and mental health, leading to high costs for society (Alink, Cicchetti, Kim, & Rogosch, 2012; Cicchetti, 2016; Gilbert et al., 2009; Jonson-Reid, Kohl, &

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Drake, 2012). Worldwide prevalence rates of different types of child maltreatment range from 12.7 % for sexual maltreatment to 36.3 % for emotional maltreatment using self-report studies, and from 0.3 % for physical and emotional maltreatment to 0.4 % for sexual maltreatment for studies using reports of professionals (i.e. medical professionals, child protection workers, or teachers; Stoltenborgh, Bakermans-Kranenburg, Alink, & Van IJzendoorn, 2014). Previous research showed that the age of one third of all maltreated children ranges from birth to three years (Harden, Buhler, & Parra, 2016). Early childhood is crucial for the child's development (Cicchetti, 2016), and is therefore seen as a window of opportunity for preventive interventions (Guterman, 2001).

Home visiting is an increasingly popular method in delivering services to families with young children as a strategy for preventing child maltreatment. In general, home visiting programs aim to improve children's long term developmental trajectories by providing parents with knowledge and skills (e.g., coping and problem-solving skills), emotional support, access to community and health services, and direct instruction on parenting practices (Guterman, 2001; Howard & Brooks-Gunn, 2009). As home visiting can be considered a method of service delivery rather than a theoretical approach (Howard & Brooks-Gunn, 2009), there are great differences between available home visiting programs. These differences can relate to the range of services that are offered (e.g., providing information, delivering of direct instructions on parenting practices, providing emotional support, and facilitating access to community services), the type of professional providing the services to a family, the frequency and intensity of the home visits, alignment with the risk status of the family, and the content of the program curriculum.

One of the best known evidence-based home visiting program for preventing child maltreatment is the Nurse-Family Partnership program (NFP; Olds, Kitzman, Cole, & Robinson, 1997). In this program, home visits are organized by trained nurses for low-income first-time mothers. The program starts during pregnancy of these mothers and continues for two years after child-birth. The three main goals of NFP are to (1) improve pregnancy outcomes by addressing the mothers' prenatal health, for instance by reducing the use of cigarettes, alcohol, and illegal drugs; (2) improve the child's health and development by helping parents in providing more sensitive and competent care; and (3) improve the parental life course by helping parents in completing their education, finding work, and planning future pregnancies (Olds, 2006). The effectiveness of NFP was examined in three large-scale randomized controlled trials: The Elmira trial (Olds, Henderson, Chamberlin, & Tatelbaum, 1986; Olds, Henderson, & Kitzman, 1994; Olds, Eckenrode et al., 1997), the Memphis trial (Kitzman et al., 1997, 2000; Olds et al., 2007; Olds, Kitzman et al., 2004), and the Denver trial (Olds et al., 2002, 2013; Olds, Robinson et al., 2004). The results of these trials showed positive short-term and long-term (up to 20 years) effects of NFP on several outcomes, including maternal physical and mental health, number of pregnancies, maternal employment rates, use of welfare services, maternal and child mortality, child behavioral health, and child cognitive development. Moreover, the findings of the Elmira trial showed significantly fewer instances of verified child abuse and neglect in the NFP group compared to the control group, both at two year follow-up (Olds et al., 1986) and at 15-year follow-up (Olds, Eckenrode et al., 1997; Olds, Kitzman et al., 1997).

A number of systematic reviews and meta-analyses have synthesized results from primary research on the effects of home visiting programs in general on (the risk of) child maltreatment (Bilukha et al., 2005; Filene, Kaminski, Valle, & Cachet, 2013; MacLeod & Nelson, 2000; Sweet & Appelbaum, 2004). Overall, these studies show mixed results. Specifically, Sweet and Appelbaum (2004) meta-analytically examined the effect of 60 home visiting programs on several child and parent outcomes. They found positive effects on parenting attitudes ( $d = .11$ ), parenting behaviors ( $d = .14$ ), and child abuse potential ( $d = .24$ ), but did not find a significant effect on actual child abuse. However, Filene et al. (2013) also reviewed research on the effect of home visiting programs on child maltreatment, and they did find a significant effect ( $d = .20$ ), although small in magnitude. MacLeod and Nelson (2000) found a significant and somewhat larger significant effect ( $d = .41$ ) of home visitation programs in their review on programs for the promotion of family wellness and the prevention of child maltreatment.

To better understand why some home visiting programs are more effective than others, it is important to examine how specific intervention components and delivery techniques are associated with program effectiveness. Blase and Fixsen (2013) have labeled intervention components as core components, which they have defined as the essential principles and associated activities that are necessary to produce the desired program effect. Identifying these components is helpful when choosing an appropriate intervention, as knowledge on effective components is necessary to develop or select programs that produce the desired effects on child maltreatment. Moreover, the effectiveness of existing home visiting programs can be (further) increased by adding components associated with greater program effectiveness and/or by eliminating components associated with lower or insignificant program effectiveness (Kaminski, Valle, Filene, & Boyle, 2008).

In the past, several studies aimed to identify components and delivery techniques that are associated with effectiveness of a variety of programs addressing (the risk of) child maltreatment. Recently, Van der Put, Assink, Gubbels, and Boekhout van Solinge (2018) conducted a meta-analysis to determine how intervention components are related to program effectiveness of both interventions developed to reduce child maltreatment in maltreating families and interventions for preventing child maltreatment in at-risk families. They included several home visiting programs as well as other types of interventions. Larger effect sizes were found for preventive interventions that focus on increasing self-confidence of parents relative to preventive interventions in which this component was absent ( $d = .40$  versus  $d = .23$ ). For curative interventions, larger effect sizes were found for those focusing on the improvement of parenting skills ( $d = .43$  versus  $d = .19$ ), and for interventions that provide social and/or emotional support for parents ( $d = .65$  versus  $d = .30$ ). Gubbels, Van der Put, and Assink (2019) examined components of specifically parent training programs, and they coded components such as improving positive child disciplining skills, encouraging the use of the "time-out" technique, and improving the problem-solving skills of parents. The authors could not identify specific components that are associated with greater program effectiveness. However, their findings did indicate that most components were about equally effective in preventing or reducing child maltreatment, with effect sizes ranging from  $d = .32$  for encouraging parents to react in a consistent manner on certain child behaviors, to  $d = .57$  for encouraging parents to spend quality time with their child.

As for home visiting programs in specific, Filene et al. (2013) conducted a meta-analysis in which they examined how different

program content and service delivery components were associated with program effectiveness in light of various parent and child outcomes. They found an overall significant and positive effect of home visiting programs on maternal life course ( $d = .20$ ), child cognitive outcomes ( $d = .25$ ), and parent behaviors and skills ( $d = .23$ ). However, for negative birth outcomes (i.e., prematurity or low birth weight;  $d = .06$ ), child physical health ( $d = .11$ ), and child maltreatment ( $d = -.08$ ), no significant overall effects were found. For most of these outcomes, several components were associated with program effectiveness. For child maltreatment, they found that improving problem solving skills of parents and helping parents selecting alternative caregivers (i.e., respite care) were both associated with greater program effectiveness, suggesting that programs based on these components may be more effective in preventing or reducing child maltreatment than programs without these components. However, the review of Filene and colleagues did not allow drawing strong conclusions, as it was based on only nine studies reporting on the child maltreatment. This small number might be due to their relatively broad focus on the effect of home visiting programs on different types of parent and child outcomes instead of a more narrow focus on child maltreatment specifically, using combinations of specific keywords that increase the chance of finding studies that focus particularly on maltreatment. In the current meta-analysis most keywords were related to child maltreatment, whereas Filene and colleagues only used a few maltreatment related keywords in their search strategy, so studies eligible for inclusion may have been missed. [Kaye, Faber, Davenport, and Perkins \(2018\)](#) used common components analysis (CCA) in their study to identify common components of evidence-informed home visiting programs for the prevention of child maltreatment. They found that addressing problem-solving strategies, giving information on home cleanliness, addressing accident prevention and first aid, and providing social support were common components of these programs. However, the CCA analysis did not reveal to what extent specific program components contributed to the effectiveness of home visiting programs.

In the present meta-analytic study, we aimed to examine the effect of home visiting programs on child maltreatment, and to identify program characteristics that are associated with program effectiveness. These program characteristics were classified into contextual factors (i.e., the age of the child(ren) in the targeted family, whether or not all family members were targeted), structural elements (i.e., the type of home visiting professional, the duration of the program as well as the number and interval of home visits), content components related to parenting (i.e., whether or not a program focuses on stimulating responsive or nurturing parenting, improving the attachment between the parent and child, and improving parental expectations of the child), non-parenting components (i.e., whether or not a program focuses on improving the parental physical health, home cleanliness and safety, and the social network of the parent), and delivery techniques (i.e., using visual or written materials, modeling desired behaviors, or video-based feedback).

## 2. Method

### 2.1. Inclusion criteria

To be included in the current meta-analysis, studies had to meet the following inclusion criteria. First, studies had to report on the effects of home visiting programs on child maltreatment. Home visiting programs were defined as programs using prenatal and/or early-childhood home visits as a primary delivery strategy for at-risk families (i.e. families in which risk factors for child maltreatment or other negative child outcomes are present), aiming to improve child and family well-being. As for the concept of child maltreatment, we followed the definition as formulated by the Centers for Disease Control and Prevention: “[...] any acts of commission or omission by a parent or other caregiver that result in harm, potential for harm, or threat of harm to a child” ([Leeb, Paulozzzi, Melanson, Simon, & Arias, 2008](#)). Consequently, we included studies that reported on physical abuse, sexual abuse, and different forms of neglect. Studies examining the effect of home visiting programs on child abuse potential, harsh parenting (such as corporal/physical punishment or parental aggression toward children), and out-of-home placement were also included. Second, experimental studies as well as quasi-experimental studies (in which a treatment condition is compared to a control condition) were included. Third, studies had to report at least one effect size or sufficient information to calculate at least one effect size. Fourth, given that the components of programs for child maltreatment may be different in nature across cultural settings (see, for instance, [Cohen, Deblinger, Mannarino, & de Arellano, 2001](#); [Nadan, Spilsbury, & Korbin, 2015](#)), only studies performed in Western countries were included (i.e., European countries, Australia, New Zealand, Canada, and the US). Finally, all primary studies had to be written in English or Dutch to be included. There were no restrictions regarding the publication year of studies implying that all relevant published studies up to August 12th, 2019 could potentially be identified in the search procedure.

### 2.2. Selection of studies

To select relevant studies for this meta-analysis, we conducted multiple searches. First, the following electronic databases were searched for relevant articles, reports, dissertations, books, and book chapters: PsycINFO, Social Services Abstracts, MEDLINE, and Web of Science. For the full search strategy of this electronic search, see Appendix A. Second, the full reference list of [Van der Put et al. \(2018\)](#) was screened. They aimed to meta-analytically summarize literature on components of child maltreatment interventions in general. Therefore their reference list yielded relevant studies. Finally, the reference sections of all included primary studies, and other relevant review studies (i.e., [Filene et al., 2013](#); [Kaye et al., 2018](#); [Sweet & Appelbaum, 2004](#)) were screened for eligible studies. We contacted authors by email to request for unpublished and non-reported data on study characteristics or on statistical information for the calculation of effect sizes.

This search strategy resulted in 2,752 studies. After deduplication, 1,633 studies remained, which were screened for title and/or abstract by the first author using the web application Rayyan ([Ouzzani, Hammady, Fedorowicz, & Elmagarmid, 2016](#)). In this screening phase, 1,139 studies were excluded because of their irrelevance to the subject of this meta-analysis (e.g., studies examining

other types of programs or other outcomes). Of the remaining 494 the full text was evaluated. Finally, 77 studies met all inclusion criteria and were included in the current study. These studies reported on 65 independent samples. Fig. 1 presents a flow chart of the study search. An overview of the included studies and their characteristics are presented in Appendices B and C, respectively.

### 2.3. Coding the studies

Following the guidelines proposed by Lipsey and Wilson (2001), a coding form was developed to code all study and program characteristics that could moderate the effect of home visiting programs on child maltreatment. For the study characteristics, we coded publication year and publication status (unpublished, published). The other coded study characteristics were classified into sample, design, and outcome characteristics. The coded sample characteristics were sample size, type of sample (risk sample, maltreating families, both), whether or not a selection questionnaire was used to select the sample (yes/no), whether or not fathers were included in the sample (yes/no), percentage of fathers in the sample, age of the children (in years), age of the parents (in years), percentage of non-Caucasians/non-Whites in the sample and percentage of single parent families in the sample. The design characteristics included the research design (RCT, quasi-experimental with matching, quasi-experimental without matching), retrospective design (yes/no), intent-to-treat analysis (yes/no), whether or not the program fidelity was monitored or measured (not reported/monitored, only monitored, monitored and measured), whether or not the home visiting professionals were supervised (yes/no), type of care control group (care as usual, no care, waiting list, being referred to or received information about other services, other), whether or not group differences at baseline were measured (yes/no), and whether or not baseline differences were significant (no, significant and

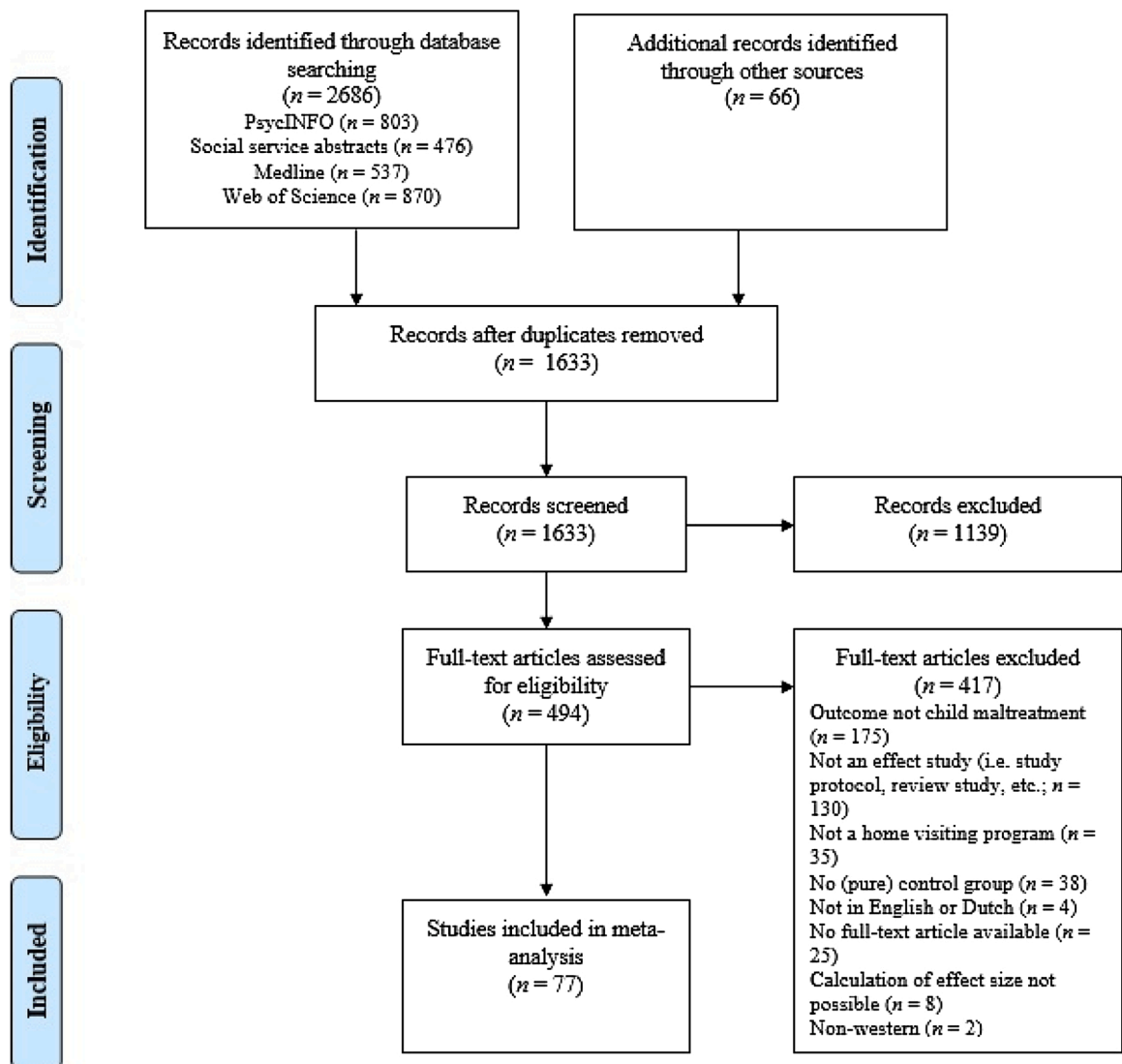


Fig. 1. Flowchart of the search procedure, according to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA).

controlled for in analyses, significant and not controlled for in analyses). Finally, the coded outcome characteristics were assessment type (self-report parents, official reports, other), the follow-up period (in months), and whether the follow-up was at/before 24 months or later than 24 months after the program ended.

The program characteristics were classified into contextual factors, structural elements, program components, and delivery

**Table 1**  
Description of the Coded Program Components and Delivery Techniques and Their Prevalence.

Program components	%	Description
<b>Parenting program components</b>		
(1) Knowledge child and/or parenting	82.8	Improving parental knowledge about developmental stages and their child's behavior and needs (Gubbels et al., 2019)
(2) Expectations child and/or parenting	11.5	Improving parental realistic expectations/beliefs regarding their child and/or parenthood (Gubbels et al., 2019)
(3) Responsiveness or sensitivity to cues	35.6	Responding sensitively to child's emotional and psychological needs, such as physical contact and affection (Filene et al., 2013; Kaminski et al., 2008)
(4) Developmentally appropriate care and routines	31.0	Using developmentally appropriate behaviors related to satisfying a child's primary needs (e.g., diapering, dressing, bathing; Filene et al., 2013)
(5) Parent-child interaction	83.9	Improving the communicative skills of parents in interaction with their child and learning parents to interact in a positive way with their child (Gubbels et al., 2019; Kaminski et al., 2008).
(6) Parent-child attachment	22.4	Promoting a safe parent-child attachment (Gubbels et al., 2019).
(7) Disciplining skills	37.4	Directions on using age appropriate discipline or management techniques, including discipline-related communication skills (Filene et al., 2013; Gubbels et al., 2019)
(8) Parental self-esteem	19.5	Empowering parents and increasing their sense of self-esteem and competence regarding parenting (Gubbels et al., 2019)
(9) Child's socioemotional development	17.8	Fostering children's positive adjustment and well-being, such as positive self-esteem, adaptability, creativity, and interpersonal comfort (Filene et al., 2013)
(10) Child's cognitive development	23.6	Promoting child language or knowledge, for example by describing aspects of the child's activity or environment and asking questions (Filene et al., 2013)
(11) Child's physical development	74.7	Improving the child's physical health, development and well-being through for example developmental screening or promoting the use of preventive child health care (e.g. nutritional services)
<b>Non-parenting program components</b>		
(12) Parental education or employment	34.5	Providing referrals, information or services for training or education and/or encourage parental workforce participation
(13) Parental physical health	50.6	Information or activities to promote prenatal health and behavior (e.g., diet, nutrition, prenatal care; Filene et al., 2013)
(14) Parental mental health	59.2	Addressing mental health issues or providing or referring to mental health services (Filene et al., 2013)
(15) Parental substance abuse	52.3	Providing education, direct services or service referrals for substance use (Filene et al., 2013)
(16) Stress management	25.9	Reducing parental stress by using stress management techniques (Gubbels et al., 2019)
(17) Anger management	2.9	Increasing parental self-control and/or proving anger management techniques (Gubbels et al., 2019)
(18) Self-management	19.0	Promoting parental skills related to self-sufficiency (Filene et al., 2013)
(19) Problem solving skills	66.7	Improving parental problem-solving skills by the use of problem-solving strategies (Filene et al., 2013; Gubbels et al., 2019)
(20) Parental relationship	31.6	Improving the relationship and cooperation between parents (Filene et al., 2013; Gubbels et al., 2019)
(21) Domestic violence	43.1	Addressing or referring to services for domestic violence
(22) Social network	52.9	Information and activities on the importance of and how to access social support and develop a support network (Filene et al., 2013)
(23) Support group	8.6	Directly providing a support group (Filene et al., 2013)
(24) Practical or instrumental assistance	27.0	Providing resources to address basic needs, including transportation services, respite or child care, grocery certificates, or medical services (Filene et al., 2013)
(25) Public assistance	41.4	Information on obtaining or directly providing housing or food assistance (e.g. food stamps, welfare; Filene et al., 2013)
(26) Home cleanliness and/or safety	42.0	Information or activities focused on home cleanliness, safety, accident prevention, and first aid (Filene et al., 2013)
(27) Stimulating home environment	4.6	Organizing an environment to promote the child's development (Filene et al., 2013)
(28) Family planning	21.8	Information or activities to promote family planning, such as encouraged contraceptive use and the prevention of unwanted pregnancies (Filene et al., 2013)
(29) Case management	82.2	Identifying and linking families to other services and resources (i.e. hands-on assistance with contacting, making appointments, helping with forms or eligibility criteria, advocacy; Filene et al., 2013)
<b>Delivery techniques</b>		
(1) Visual or written materials	24.1	Using visual or written materials
(2) Modelling	52.9	Giving live demonstrations of desired parenting behaviors or other behaviors (Gubbels et al., 2019)
(3) Practice, rehearsal, role-playing	14.9	Using rehearsal, practice, or role-playing of techniques during home visits (Filene et al., 2013; Gubbels et al., 2019)
(4) Play activities	4.6	Improving skills through parent-child play
(5) Video-based feedback	3.4	Using video-recordings of parent-child interactions, so that the home-visitor and parents can reflect on the recorded interactions (Gubbels et al., 2019)
(6) Discussion (in group or with parent)	21.8	Discussing behaviors or skills with parents

Note. % = the percentage of effect sizes based on the specific component or technique.



techniques. The coded contextual factors included the names of the specific individual programs examined in at least two studies (Child Parent Enrichment Project, Early Head Start, Healthy Start Program, Healthy Families [HF] Alaska, HF Oregon, HF Arizona, Project 12-ways, SafeCare, Nurse Family Partnership/VoorZorg, Parents as Teachers, and Steps Towards Effective & Enjoyable Parenting), age of the child at time of program enrolment (in years), age of the child at the end of the program (in years; the latter two variables indicate the program's targeted age range of children), the moment at which the program started (prenatally, postnatally), whether or not telephonic consultation was provided (yes/no), and whether or not all family members were targeted in the program. The coded structural elements included the type of home visiting professional (professional, paraprofessional, both, other), training for home visitors (no training at all, a specific program training, broader training), whether or not home visitors were matched to families (yes/no), type of program curriculum that was used (no curriculum at all, standardized curriculum, curriculum adapted to family needs), program duration (0–6 months, 7–12 months, 13–24 months, more than 24 months), the minimum and maximum program duration (in months), total number of home visits, average duration of home visits (in minutes), and home visit intensity (weekly, every other week or monthly, decreasing, first increasing than decreasing, other).

Table 1 shows descriptions and prevalences of the coded program components and delivery techniques. The components and techniques were coded as present or absent depending on whether or not they were applied in a home visit program. This was determined by carefully reading both the information about a program as described in a primary study and factsheets, manuals, or protocols of the home visiting program, which were written by program developers and could most often be found online. The list of components and techniques was based on both the descriptions of the programs and the information reported in prior research on components for home visiting programs or other child maltreatment interventions (i.e., Filene et al., 2013; Gubbels et al., 2019; Kaminski et al., 2008). The program components were classified into components directly related to parenting (such as stimulating responsive or nurturing parenting or improving the attachment between the parent and child) and other non-parenting components (such as improving the parental physical health or addressing the home cleanliness and safety). The number of parenting components, non-parenting components, and delivery techniques that were used in the program was also coded. These numbers were included in the overview of the characteristics of the included studies (see Appendix C).

In coding all included studies, two coding rounds were completed. First, 10 studies that were eligible for inclusion (reporting on a total of 18 effect sizes) were randomly selected and coded by the first and last author of this study. The independent codings were compared and percentages of agreement were calculated. For the study characteristics, the contextual factors, and the structural elements, the interrater agreement was 92 %. The agreement was 95 % for the double-coded program components and delivery techniques, and 82 % for the double-coded effect sizes. All inconsistencies in the independent codings were discussed and resolved until the authors fully agreed on all final coding decisions. In the second coding round, the first author coded the remaining 67 studies. Whenever the first author doubted about the presence of a certain component or technique, the other two authors were consulted.

#### 2.4. Calculation of effect sizes

To quantify the effect of home visiting programs on child maltreatment, the standardized difference between two means (also referred to as Cohen's  $d$ ) was calculated as the common effect size for the outcomes reported in each primary study. Most studies reported on means and standard deviations, proportions, and odd ratios. In order to transform these outcomes into Cohen's  $d$ 's, methods and formulas of Ferguson (1966), Lipsey and Wilson (2001), and Rosenthal (1994) were used. In addition, it was necessary that each effect size reflected the effect of home visiting programs in the proper direction. Therefore, positive signs were given to  $d$  values when lower levels of child maltreatment (or other assessed outcomes, such as child abuse potential, harsh parenting, or out-of-home placement) were found in the home visiting group compared to the control group, whereas negative signs were given to  $d$  values when higher levels child maltreatment were found in the home visiting group compared to the control group.

#### 2.5. Statistical analyses

Because most studies reported on more than one effect size, a traditional random effects (two-level) model was extended to a three-level random effects model (Cheung, 2014; Houben, Van den Noortgate, & Kuppens, 2015; Van den Noortgate, López-López, Marin-Martínez, & Sánchez-Meca, 2013; Van den Noortgate, López-López, Marin-Martínez, & Sánchez-Meca, 2014). With this three-level approach to meta-analysis, it is possible to include all relevant effects reported in each primary study, implying that all relevant information is preserved. As a result, no information is lost and (moderator) effects can be estimated more precisely and with maximum power in the statistical analyses (Assink & Wibbelink, 2016). In a three-level random effects meta-analytic model, three sources of variance are taken into account: sampling variance of the observed effect sizes (Level 1), variance between effect sizes extracted from the same study (Level 2), and variance between studies (Level 3). Estimating the overall effects was done in separate three level intercept-only models. Effect sizes were weighted by the inverse of their variance (i.e., sampling error), so that effect sizes derived from studies using larger sample sizes contributed more to the overall effect size estimate than effect sizes derived from studies using smaller sample sizes. To determine the significance of the level 2 and level 3 variance, the full model was compared to a model excluding one of these variance parameters in two separate log-likelihood ratio tests. If significant level-2 and/or level-3 variance was detected, the distribution of effect sizes was considered to be heterogeneous. This indicated that effect sizes could not be treated as estimates of one common effect size, and thus, moderator analyses could be performed to test variables that may explain variance in effect sizes. In testing individual regression coefficients and calculating corresponding confidence intervals, a  $t$ -distribution was used (Knapp & Hartung, 2003). All coded variables and calculated effect sizes were entered in SPSS version 24 (SPSS Inc., Chicago, IL, USA). Next, continuous variables were mean-centered, and categorical variables were recoded into dummy variables.

In the statistical environment R (version 3.6.1; R Core Team, 2019), the function “rma.mv” of the metafor-package (Viechtbauer, 2010) was used to conduct the statistical analyses. The R syntaxes were written so that the three sources of variance were modeled (Assink & Wibbelink, 2016). In all analyses, a 5 % significance level was used.

## 2.6. Assessment Bias

Despite an extensive search for studies on home visiting programs for child maltreatment, it is possible that relevant studies were missed due to different forms of bias, such as publication bias or subjective reporting bias. In order to examine the degree to which our results were affected by bias, a nonparametric funnel plot-based trim-and-fill analysis was conducted (Duval & Tweedie, 2000a, 2000b). This means that in case of an asymmetrical distribution of effect sizes (i.e., an asymmetrical funnel plot), the symmetry of the distribution was restored by imputing effect size estimates from “missing” studies. Effect sizes imputed to the left of the estimated mean effect imply that below average effect sizes were underrepresented and that the mean effect may be an overestimation of the true effect. On the other hand, imputation of effect sizes to the right of the estimated mean effect indicates that above average effect sizes were underrepresented and that the estimated mean effect may be an underestimation of the true effect. The trim-and-fill analyses were conducted using the “trimfill” function of the “metafor” package in the program R (version 3.6.1; R Core Team, 2019).

## 3. Results

The current meta-analysis consisted of 77 studies, with  $k = 65$  non-overlapping samples, that were published between 1977 and 2019. These studies reported on 174 effect sizes and a total sample size of  $N = 48,761$  participants, of whom  $n = 24,349$  participated in a home visiting program and  $n = 24,412$  in a control group. Studies were conducted in the USA ( $k = 53$ ), Europe ( $k = 5$ ), Australia or New Zealand ( $k = 3$ ), and Canada ( $k = 4$ ).

### 3.1. Overall effect and sensitivity analyses

Table 2 presents the estimated overall effect of home visiting programs on child maltreatment. A significant overall effect was found with a Cohen’s  $d$  of 0.135; 95 % CI (0.084, 0.187),  $t(173) = 5.158$ ,  $p < 0.001$ . According to the guidelines formulated by Cohen (1988) to interpret the magnitude of effect sizes, with effect sizes of  $d = 0.20$  considered small,  $d = 0.50$  medium, and  $d = 0.80$  large, this effect is small in magnitude. The two log-likelihood ratio tests showed that significant variance was present both at level 2 ( $\chi^2(1) = 2.780$ ,  $p = .048$ ; one-sided) and level 3 ( $\chi^2(1) = 36.536$ ,  $p < .001$ ; one-sided) of the meta-analytic model. Of the total variance, 13.7 %, 9.3 %, and 77 % was distributed at level 1, 2 and 3, respectively.

The results of the trim-and-fill analysis showed that bias may be present in the data, as the distribution of all effect sizes was asymmetrical. Fig. 2 shows that effect sizes were missing to the left of the estimated mean effect, meaning that in particular small and negative effect sizes were missing in the dataset. In specific, 27 effect sizes (illustrated with white dots in Fig. 2) from 22 independent studies had to be imputed to the left of the estimated mean effect to restore the symmetry of the funnel. These “missing” effect sizes were added to the dataset and after re-estimating the overall effect, a lower ( $\Delta d = 0.121$ ) non-significant effect was found ( $d = 0.014$  [95 % CI  $-0.065, 0.093$ ],  $t(200) = 0.350$ ,  $p = .727$ ).

Besides asymmetry in the distribution of effect sizes, there was one effect size that seemed to be an outlier compared with the other effect sizes (i.e., the effect in the most right part of Fig. 2). To determine whether and how this outlying effect size influenced our estimated overall effect, we performed a sensitivity analysis in which we re-estimated an overall effect after excluding this effect size from the data. The results produced a significant overall effect of  $d = 0.115$ ; 95 % CI [0.075, 0.155],  $t(172) = 5.655$ ,  $p < .001$ , which is slightly below our initial estimated overall effect ( $\Delta d = 0.020$ ). In addition, we reperformed the trim-and-fill analysis using the dataset without this outlying effect size to test whether bias was still present. Again, this trim-and-fill analysis showed an asymmetrical

**Table 2**  
Overall Effects Before and After Trim-and-Fill Analyses.

	# Studies	# ES	Mean $d$ (SE)	95 % CI	Sig. mean $d$ ( $p$ )	% Var. at level 1	Level 2 variance	% Var. at level 2	Level 3 variance	% Var. at level 3
Overall effect before trim-and-fill	65	174	0.135 (0.026)***	(0.084, 0.187)	<.001***	13.5	.004*	10.9	.030***	75.6
Overall effect after trim-and-fill	87	201	0.014 (0.040)	(-0.065, 0.093)	.727	4.8	.005*	4.0	.114***	91.2
Overall effect without outlier, before trim-and-fill	65	173	0.115 (0.020)***	(0.075, 0.155)	<.001***	24.8	.000	2.2	.016***	73.0
Overall effect without outlier, after trim-and-fill	86	199	0.033 (0.026)	(-0.020, 0.086)	.216	11.9	.000	0.9	.043***	87.1

Note. #Studies = number of studies; #ES = number of effect sizes; Mean  $d$  = mean effect size (Cohen’s  $d$ ); SE = standard error; CI = confidence interval; Sig. = significance; % Var. = percentage of distributed variance; level 1 variance = sampling variance; level 2 variance = variance within studies; level 3 variance = variance between studies.

\*  $p < .05$ ; \*\*\*  $p < .001$ .

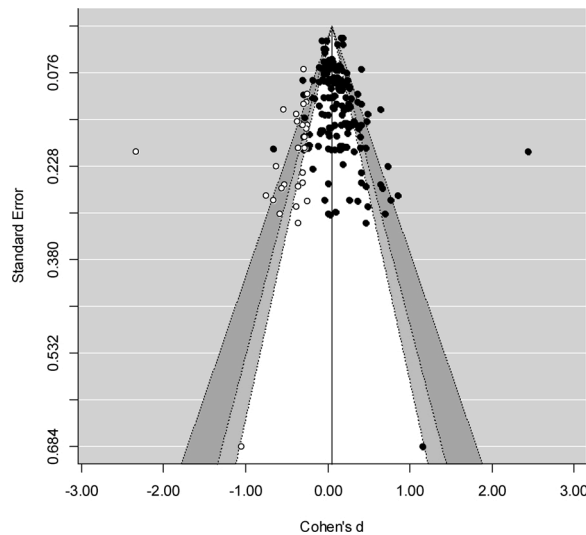


Fig. 2. Funnel plot of the trim-and-fill analysis.

distribution of the effect sizes (Fig. 3). A total of 26 effect sizes (i.e. the white dots in Fig. 3) from 21 independent studies were added to the data and again, a lower non-significant effect was found ( $d = 0.033$  [95 % CI  $-0.020, 0.086$ ],  $t(198) = 1.240$ ,  $p = .216$ ) compared to the estimated overall effect of the dataset without the outlying effect size ( $\Delta d = 0.082$ ).

### 3.2. Moderator analyses

Table 3 shows the results of the moderator analyses. The potential moderators were classified into study characteristics (specifically sample, design, and outcome characteristics) and program characteristics. The latter was further classified into contextual factors, structural elements, program components, and delivery techniques.

#### 3.2.1. Study characteristics

For the sample characteristics we found a significant moderating effect of the percentage of non-Caucasians/non-Whites in the sample. Samples with a higher percentage of non-Caucasians/non-Whites (e.g., African-American, Latin-American) yielded larger effect sizes. For the outcome characteristics we found a moderating effect for the follow-up period, meaning effect sizes increased as the follow-up duration increased.

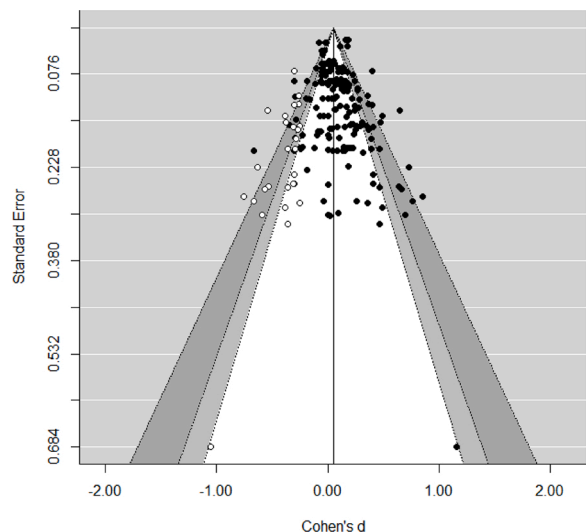


Fig. 3. Funnel plot of the trim-and-fill analysis of the dataset without the outlying effect size.



**Table 3**  
Results for the Moderator Analysis.

Moderator variables	# Studies	# ES	Intercept/mean <i>d</i> (95% BI)	$\beta_1$ (95% CI)	<i>F</i> (df1, df2) <sup>a</sup>	<i>p</i> <sup>b</sup>	Level 2 variance	Level 3 variance
<b>Overall Effect</b>	65	174	0.135 (0.084, 0.187) <sup>***</sup>			<.001 ***	.004*	.030 <sup>***</sup>
<b>Study characteristics</b>								
Publication year	65	174	0.137 (0.084, 0.189) <sup>***</sup>	0.004 (−0.001, 0.008)	2.421 (1, 172)	.122	.004*	.030 <sup>***</sup>
Publication status					1.216 (1, 172)	.272	.005*	.029 <sup>***</sup>
Not published (RC)	4	16	0.096 (0.008, 0.183)*					
Published	61	158	0.138 (0.086, 0.190) <sup>***</sup>	0.042 (−0.033, 0.117)				
<b>Sample characteristics</b>								
Sample size	65	174	0.139 (0.086, 0.192) <sup>***</sup>	−0.000 (−0.000, 0.000)	1.714 (1, 172)	.192	.004*	.031 <sup>***</sup>
Type of sample					1.132 (2, 171)	.258	.004*	.032 <sup>***</sup>
Risk sample (RC)	51	123	0.121 (0.061, 0.181) <sup>***</sup>					
Maltreating families	8	16	0.243 (0.093, 0.393) <sup>**</sup>	0.122 (−0.039, 0.283)				
Both	7	35	0.147 (0.006, 0.288)*	0.026 (−0.128, 0.179)				
Selection questionnaire					0.015 (1, 156)	.903	.003	.033 <sup>***</sup>
No (RC)	34	72	0.128 (0.050, 0.207) <sup>**</sup>					
Yes	24	86	0.136 (0.053, 0.218) <sup>**</sup>	0.007 (−0.107, 0.121)				
Fathers in sample					0.084 (1, 172)	.772	.004*	.030 <sup>***</sup>
No (RC)	49	129	0.132 (0.072, 0.191) <sup>***</sup>					
Yes	16	45	0.150 (0.042, 0.258) <sup>**</sup>	0.018 (−0.105, 0.142)				
Percentage fathers	59	157	0.123 (0.069, 0.178) <sup>***</sup>	−0.030 (−0.403, 0.342)	0.025 (1, 155)	.873	.006 <sup>**</sup>	.029 <sup>***</sup>
Average age of child (start study)	32	81	0.120 (0.061, 0.180) <sup>***</sup>	−0.002 (−0.005, 0.001)	1.439 (1, 79)	.234	.017 <sup>***</sup>	.009*
Average age of parents (start study)	51	147	0.160 (0.097, 0.224) <sup>***</sup>	−0.010 (−0.021, 0.002) <sup>†</sup>	2.850 (1, 146)	.094 <sup>†</sup>	.000	.037 <sup>***</sup>
Percentage non-Caucasians/non-whites	52	145	0.131 (0.072, 0.191) <sup>***</sup>	0.190 (0.003, 0.377)*	4.025 (1, 143)	.047*	.008 <sup>***</sup>	.030 <sup>***</sup>
Percentage single parent families	28	78	0.106 (0.044, 0.167) <sup>**</sup>	0.135 (−0.056, 0.326)	1.991 (1, 76)	.162	.000	.016 <sup>***</sup>
<b>Design characteristics</b>								
Research design					0.219 (2, 171)	.803	.004*	.031 <sup>***</sup>
RCT (RC)	46	144	0.129 (0.067, 0.191) <sup>***</sup>					
Quasi-experimental, matched	8	9	0.187 (0.025, 0.348)*	0.058 (−0.115, 0.231)				
Quasi-experimental, not matched	11	21	0.137 (0.004, 0.258)*	0.008 (−0.138, 0.154)				
Retrospective design					1.336 (1, 172)	.249	.004 <sup>†</sup>	.031 <sup>***</sup>
No (RC)	53	151	0.150 (0.092, 0.207) <sup>***</sup>					
Yes	13	23	0.085 (−0.016, 0.186) <sup>†</sup>	−0.064 (−0.175, 0.046)				
Intent-to-treat analysis					1.167 (1, 170)	.282	.005*	.032 <sup>***</sup>
No (RC)	28	52	0.107 (0.029, 0.184) <sup>**</sup>					
Yes	38	120	0.157 (0.093, 0.222) <sup>***</sup>	0.050 (−0.042, 0.141)				
Program fidelity					1.644 (2, 171)	.196	.004 <sup>†</sup>	.030 <sup>***</sup>
Only monitored (RC)	34	100	0.164 (0.094, 0.234) <sup>***</sup>					
Monitored and measured	16	36	0.138 (0.045, 0.231) <sup>**</sup>	−0.027 (−0.143, 0.090)				
Not reported/monitored	17	38	0.058 (−0.040, 0.157)	−0.106 (−0.227, 0.015) <sup>†</sup>				
Supervision home visitors					0.674 (1, 170)	.413	.005*	.031 <sup>***</sup>
No (RC)	21	48	0.102 (0.004, 0.200)*					
Yes	43	124	0.151 (0.087, 0.215) <sup>***</sup>	0.049 (−0.068, 0.165)				
Type of control group					0.136 (4, 151)	.969	.000	.037 <sup>***</sup>
Care as usual (CAU; RC)	26	59	0.117 (0.026, 0.208)*					
No care	6	15	0.142 (−0.059, 0.343)	0.025 (−0.196, 0.246)				
Waiting list	1	4	0.105 (−0.326, 0.535)	−0.012 (−0.452, 0.428)				
Referral/information other services	8	36	0.148 (−0.010, 0.305) <sup>†</sup>	0.031 (−0.151, 0.212)				
Other	22	42	0.163 (0.072, 0.255) <sup>***</sup>	0.046 (−0.082, 0.174)				
Group differences at baseline					0.121 (1, 172)	.729	.004*	.030 <sup>***</sup>

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Table 3 (continued)

Moderator variables	# Studies	# ES	Intercept/mean <i>d</i> (95% BI)	$\beta_1$ (95% CI)	<i>F</i> (df1, df2) <sup>a</sup>	<i>P</i> <sup>b</sup>	Level 2 variance	Level 3 variance
No (RC)	12	18	0.157 (0.027, 0.287)*					
Yes	53	156	0.132 (0.074, 0.189)***	-0.025 (-0.167, 0.117)				
Were differences significant?					1.426 (2, 153)	.244	.006**	.030***
No (RC)	28	76	0.119 (0.046, 0.192)**					
Significant and controlled for	16	48	0.179 (0.097, 0.261)***	0.060 (-0.031, 0.151)				
Significant and not controlled for	12	32	0.094 (-0.012, 0.201) <sup>†</sup>	-0.025 (-0.147, 0.098)				
<b>Outcome characteristics</b>								
Assessment type					0.247 (2, 171)	.781	.005*	.029***
Self-report parents (RC)	33	92	0.147 (0.085, 0.209)***					
Official reports	40	73	0.125 (0.065, 0.185)***	-0.022 (-0.086, 0.042)				
Other	4	9	0.134 (0.025, 0.243)*	-0.013 (-0.112, 0.086)				
Follow-up period (in months)	23	52	0.088 (0.024, 0.152)	0.002 (0.001, 0.003)***	12.753 (1, 50)	<.001***	.005*	.010*
Follow-up period					3.776 (1, 50)	.058 <sup>†</sup>	.008**	.009
≤ 24 months (RC)	19	39	0.054 (-0.018, 0.126)					
> 24 months	7	13	0.174 (0.062, 0.286)**	0.120 (-0.004, 0.244) <sup>†</sup>				
<b>Program characteristics</b>								
<b>Contextual factors</b>								
Specific individual program (examined in at least two studies)					1.684 (10, 52)	.110	.053***	.018
Child Parent Enrichment Project	2	5	0.082 (-0.256, 0.420)					
Early Head Start	3	6	0.109 (-0.148, 0.366)	0.027 (-0.398, 0.452)				
Healthy Start Program	3	11	0.100 (-0.150, 0.351)	0.018 (-0.403, 0.440)				
Healthy Families Alaska	2	8	0.005 (-0.263, 0.272)	-0.077 (-0.509, 0.354)				
Healthy Families Oregon	2	3	0.011 (-0.328, 0.349)	-0.071 (-0.550, 0.407)				
Healthy Families Arizona	2	5	0.678 (0.358, 0.999)***	0.596 (0.131, 1.062)*				
Project 12-ways	2	2	0.218 (-0.216, 0.652)	0.136 (-0.414, 0.686)				
SafeCare	4	9	0.234 (-0.023, 0.492) <sup>†</sup>	0.152 (-0.273, 0.578)				
Nurse Family Partnership/VoorZorg	2	7	0.256 (-0.042, 0.553) <sup>†</sup>	0.174 (-0.277, 0.624)				
Parents as Teachers	3	5	0.140 (-0.158, 0.438)	0.058 (-0.393, 0.509)				
Steps Towards Effective & Enjoyable Parenting	2	2	0.617 (0.091, 1.142)*	0.535 (-0.090, 1.160) <sup>†</sup>				
Age child enrollment program	30	94	0.154 (0.088, 0.220)***	0.005 (-0.010, 0.019)	0.419 (1, 92)	.519	.004	.017***
Age child end program	54	148	0.112 (0.065, 0.159)***	-0.000 (-0.002, 0.001)	0.422 (1, 146)	.517	.001	.018***
Start program					0.036 (1, 172)	.851	.004*	.031***
Prenatally (RC)	40	110	0.140 (0.074, 0.206)***					
Postnatally	26	64	0.129 (0.043, 0.216)**	-0.010 (-0.119, 0.098)				
Telephonic consultation					1.876 (1, 72)	.173	.004*	.030***
No (RC)	51	141	0.154 (0.096, 0.213)***					
Yes	14	33	0.066 (-0.046, 0.179)	-0.088 (-0.214, 0.039)				
Including the whole family (i.e. grandparents, fathers, etc.)					1.602 (1, 172)	.207	.004*	.030***
No (RC)	53	144	0.120 (0.062, 0.177)***					
Yes	12	30	0.205 (0.085, 0.325)***	0.085 (-0.048, 0.219)				
<b>Structural elements</b>								
Type of home visitor					0.361 (3, 159)	.781	.004*	.033***
Paraprofessional (RC)	22	79	0.117 (0.030, 0.204)**					
Professionals	25	63	0.175 (0.084, 0.266)***	0.058 (-0.067, 0.184)				
Both	7	11	0.156 (-0.017, 0.328) <sup>†</sup>	0.039 (-0.155, 0.232)				
Other (i.e. volunteers or students)	5	10	0.097 (-0.094, 0.289)	-0.019 (-0.230, 0.191)				
Training home visitors					1.806 (2, 170)	.167	.004*	.027***
No (RC)	10	17	0.134 (-0.022, 0.290) <sup>†</sup>					
Yes, specific about program	49	145	0.145 (0.089, 0.201)***	0.010 (-0.155, 0.176)				

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Table 3 (continued)

Moderator variables	# Studies	# ES	Intercept/mean <i>d</i> (95% BI)	$\beta_1$ (95% CI)	<i>F</i> (df1, df2) <sup>a</sup>	<i>P</i> <sup>b</sup>	Level 2 variance	Level 3 variance
Yes, broader training	5	11	-0.041 (-0.226, 0.144)	-0.175 (-0.417, 0.066)				
Matched home visitors					0.092 (1, 171)	.762	.004 <sup>+</sup>	.029 <sup>***</sup>
No (RC)	53	143	0.127 (0.070, 0.183) <sup>***</sup>					
Yes	11	30	0.147 (0.025, 0.270) <sup>*</sup>	0.021 (-0.114, 0.156)				
Curriculum					2.062 (2, 165)	.130	.000	.016 <sup>***</sup>
Adapted to family needs (RC)	25	89	0.096 (0.039, 0.153) <sup>**</sup>					
Standardized	24	59	0.159 (0.089, 0.229) <sup>***</sup>	0.063 (-0.027, 0.154)				
No curriculum	12	20	0.029 (-0.084, 0.142)	-0.067 (-0.193, 0.060)				
Program duration					2.190 (3, 161)	.091 <sup>+</sup>	.001	.015 <sup>***</sup>
>24 months (RC)	13	64	0.123 (0.045, 0.201) <sup>**</sup>					
0 – 6 months	17	35	0.152 (0.070, 0.234) <sup>***</sup>	0.029 (-0.084, 0.142)				
7 – 12 months	8	16	-0.022 (-0.136, 0.091)	-0.145 (-0.283, -0.008) <sup>†</sup>				
13 – 24 months	24	50	0.122 (0.057, 0.187) <sup>***</sup>	-0.001 (-0.102, 0.100)				
Minimum duration (in months)	15	40	0.019 (-0.024, 0.061)	0.001 (-0.002, 0.003)	0.186 (1, 38)	.668	.006 <sup>*</sup>	.001
Maximum duration (in months)	48	129	0.105 (0.056, 0.154) <sup>***</sup>	-0.001 (-0.002, 0.001)	0.366 (1, 127)	.546	.001	.017 <sup>***</sup>
Average number of home visits	38	91	0.102 (0.048, 0.157) <sup>***</sup>	0.001 (-0.003, 0.006)	0.310 (1, 89)	.579	.013 <sup>***</sup>	.011 <sup>*</sup>
Average duration home visit (in minutes)	23	56	0.165 (0.097, 0.233) <sup>***</sup>	-0.001 (-0.003, 0.002)	0.347 (1, 54)	.558	.000	.014 <sup>***</sup>
Intensity home visits					0.402 (4, 147)	.807	.001	.017 <sup>***</sup>
Decreasing intensity (RC)	18	50	0.129 (0.055, 0.202) <sup>***</sup>					
Weekly	21	36	0.119 (0.043, 0.195) <sup>**</sup>	-0.010 (-0.115, 0.095)				
Every other week/monthly	11	22	0.096 (-0.007, 0.198) <sup>†</sup>	-0.033 (-0.152, 0.085)				
First increasing, than decreasing	4	31	0.045 (-0.100, 0.190)	-0.084 (-0.247, 0.078)				
Other	5	13	0.158 (0.017, 0.299) <sup>*</sup>	0.029 (-0.130, 0.189)				
<b>Program components</b>								
<i>Parenting program components</i>								
(1) Knowledge child and/or parenting					0.263 (1, 172)	.609	.004 <sup>*</sup>	.030 <sup>***</sup>
No (RC)	13	30	0.107 (-0.016, 0.230) <sup>†</sup>					
Yes	53	144	0.142 (0.085, 0.199) <sup>***</sup>	0.035 (-0.099, 0.169)				
(2) Expectations child and/or parenting					5.937 (1, 172)	.016 <sup>*</sup>	.004 <sup>*</sup>	.027 <sup>***</sup>
No (RC)	57	154	0.112 (0.059, 0.166) <sup>***</sup>					
Yes	8	20	0.308 (0.159, 0.458) <sup>***</sup>	0.196 (0.037, 0.355) <sup>*</sup>				
(3) Responsiveness or sensitivity to cues					12.824 (1, 172)	<.001 <sup>***</sup>	.004 <sup>*</sup>	.022 <sup>***</sup>
No (RC)	40	112	0.064 (0.005, 0.124) <sup>*</sup>					
Yes	25	62	0.238 (0.163, 0.313) <sup>****</sup>	0.174 (0.078, 0.270) <sup>***</sup>				
(4) Developmentally appropriate care and routines					0.221 (1, 172)	.639	.004 <sup>*</sup>	.030 <sup>***</sup>
No (RC)	38	120	0.126 (0.060, 0.193) <sup>***</sup>					
Yes	27	54	0.152 (0.067, 0.237) <sup>***</sup>	0.026 (-0.082, 0.134)				
(5) Parent-child interaction					2.077 (1, 172)	.151	.004 <sup>*</sup>	.029 <sup>***</sup>
No (RC)	13	28	0.056 (-0.064, 0.175)					
Yes	52	134	0.153 (0.096, 0.209) <sup>***</sup>	0.097 (-0.036, 0.230)				
(6) Parent-child attachment					1.401 (1, 172)	.238	.004 <sup>*</sup>	.030 <sup>***</sup>
No (RC)	45	135	0.114 (0.051, 0.177) <sup>***</sup>					
Yes	19	39	0.181 (0.089, 0.273) <sup>***</sup>	0.067 (-0.045, 0.178)				
(7) Disciplining skills					0.008 (1, 172)	.930	.004 <sup>*</sup>	.031 <sup>***</sup>
No (RC)	52	109	0.137 (0.077, 0.197) <sup>***</sup>					
Yes	13	65	0.132 (0.024, 0.240) <sup>*</sup>	-0.006 (-0.129, 0.118)				
(8) Parental self-esteem					0.307 (1, 172)	.580	.004 <sup>*</sup>	.031 <sup>***</sup>
No (RC)	51	140	0.128 (0.069, 0.188) <sup>***</sup>					
Yes	15	34	0.163 (0.052, 0.275) <sup>**</sup>	0.035 (-0.091, 0.161)				

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Table 3 (continued)

Moderator variables	# Studies	# ES	Intercept/mean <i>d</i> (95% BI)	$\beta_1$ (95% CI)	<i>F</i> (df1, df2) <sup>a</sup>	<i>P</i> <sup>b</sup>	Level 2 variance	Level 3 variance
(9) Child's socioemotional development					2.236 (1, 172)	.137	.004*	.029***
No (RC)	53	143	0.115 (0.057, 0.173)***					
Yes	12	31	0.211 (0.098, 0.324)***	0.096 (−0.031, 0.223)				
(10) Child's cognitive development					0.604 (1, 172)	.438	.004*	.030***
No (RC)	47	133	0.122 (0.060, 0.185)***					
Yes	18	41	0.167 (0.071, 0.263)***	0.045 (−0.069, 0.160)				
(11) Child's physical development					0.002 (1, 172)	.966	.004*	.031***
No (RC)	23	44	0.134 (0.037, 0.231)**					
Yes	42	130	0.137 (0.074, 0.199)***	0.002 (−0.113, 0.118)				
Number of parenting components addressed	65	174	0.130 (0.080, 0.180)***	0.031 (0.007, 0.055)*	6.314 (1, 172)	.013*	.004*	.026***
<i>Non-parenting program components</i>								
(12) Parental education or employment					1.015 (1, 172)	.315	.004*	.030***
No (RC)	47	114	0.118 (0.056, 0.180)***					
Yes	19	60	0.174 (0.083, 0.265)***	0.055 (−0.053, 0.164)				
(13) Parental physical health					0.186 (1, 172)	.667	.004*	.030***
No (RC)	38	86	0.146 (0.076, 0.215)***					
Yes	28	88	0.123 (0.046, 0.200)**	−0.022 (−0.124, 0.080)				
(14) Parental mental health					0.476 (1, 172)	.491	.004*	.031***
No (RC)	38	71	0.119 (0.047, 0.190)**					
Yes	28	103	0.154 (0.080, 0.229)***	0.036 (−0.066, 0.138)				
(15) Parental substance abuse					0.002 (1, 172)	.966	.004*	.031***
No (RC)	43	83	0.135 (0.068, 0.202)***					
Yes	22	91	0.137 (0.053, 0.221)**	0.002 (−0.105, 0.110)				
(16) Stress management					2.995 (1, 172)	.085 <sup>†</sup>	.004*	.029***
No (RC)	51	129	0.161 (0.102, 0.220)***					
Yes	12	45	0.057 (−0.046, 0.160)	−0.104 (−0.223, 0.015) <sup>†</sup>				
(17) Anger management					0.000 (1, 172)	.986	.004*	.030***
No (RC)	61	169	0.136 (0.082, 0.189)***					
Yes	4	5	0.138 (−0.112, 0.388)	0.002 (−0.253, 0.258)				
(18) Self-management					1.677 (1, 172)	.197	.004*	.029***
No (RC)	58	141	0.149 (0.093, 0.205)***					
Yes	7	33	0.052 (−0.085, 0.189)	−0.097 (−0.245, 0.051)				
(19) Problem solving skills					0.635 (1, 172)	.427	.004*	.030***
No (RC)	34	58	0.113 (0.036, 0.190)**					
Yes	31	116	0.155 (0.084, 0.227)***	0.042 (−0.063, 0.148)				
(20) Parental relationship					0.082 (1, 172)	.776	.004*	.030***
No (RC)	45	119	0.131 (0.068, 0.194)***					
Yes	20	55	0.147 (0.053, 0.242)**	0.016 (−0.097, 0.130)				
(21) Domestic violence					1.008 (1, 172)	.317	.004*	.030***
No (RC)	47	99	0.117 (0.054, 0.181)***					
Yes	18	75	0.174 (0.082, 0.266)***	0.057 (−0.055, 0.168)				
(22) Social network					0.780 (1, 172)	.378	.004*	.029***
No (RC)	33	82	0.158 (0.086, 0.231)***					
Yes	32	92	0.112 (0.038, 0.186)**	−0.046 (−0.150, 0.057)				
(23) Support group					0.001 (1, 172)	.972	.004*	.030***
No (RC)	58	159	0.136 (0.081, 0.191)***					
Yes	7	15	0.133 (−0.038, 0.303)	−0.003 (−0.182, 0.176)				
(24) Practical or instrumental assistance					4.155 (1, 172)	.043*	.004*	.027***
No (RC)	48	127	0.164 (0.106, 0.221)***					
Yes	17	47	0.044 (−0.056, 0.145)	−0.119 (−0.235, −0.004)*				

(continued on next page)

Table 3 (continued)

Moderator variables	# Studies	# ES	Intercept/mean <i>d</i> (95% BI)	$\beta_1$ (95% CI)	<i>F</i> (df1, df2) <sup>a</sup>	<i>P</i> <sup>b</sup>	Level 2 variance	Level 3 variance
(25) Public assistance					3.427 (1, 172)	.066 <sup>+</sup>	.004*	.029***
No (RC)	46	102	0.168 (0.106, 0.230)***					
Yes	19	72	0.064 (−0.027, 0.156)	−0.103 (−0.214, 0.007) <sup>+</sup>				
(26) Home cleanliness and safety					0.798 (1, 172)	.373	.004*	.030***
No (RC)	36	101	0.115 (0.047, 0.184)**					
Yes	29	73	0.163 (0.083, 0.243)***	0.048 (−0.058, 0.153)				
(27) Stimulating home environment					1.628 (1, 172)	.204	.004*	.029***
No (RC)	61	166	0.126 (0.074, 0.179)***					
Yes	4	8	0.263 (0.058, 0.468)*	0.137 (−0.075, 0.349)				
(28) Family planning					0.8682 (1, 172)	.349	.004*	.029***
No (RC)	56	136	0.146 (0.090, 0.203)***					
Yes	10	38	0.084 (−0.037, 0.204)	−0.062 (−0.194, 0.069)				
(29) Case-management					0.021 (1, 172)	.886	.004*	.031***
No (RC)	12	31	0.144 (0.016, 0.273)*					
Yes	53	143	0.134 (0.077, 0.192)***	−0.010 (−0.151, 0.131)				
Number of non-parenting components addressed	65	174	0.132 (0.078, 0.187)	−0.004 (−0.022, 0.014)	0.215 (1, 172)	.643	.004*	.030***
<b>Delivery techniques</b>								
(1) Visual or written materials					0.712 (1, 172)	.400	.004*	.030***
No (RC)	49	132	0.148 (0.088, 0.208)***					
Yes	16	42	0.096 (−0.011, 0.203) <sup>+</sup>	−0.052 (−0.175, 0.070)				
(2) Modelling					0.424 (1, 172)	.516	.004*	.031***
No (RC)	36	82	0.120 (0.049, 0.191)**					
Yes	29	92	0.155 (0.077, 0.233)***	0.035 (−0.071, 0.141)				
(3) Practice, rehearsal, role-playing					0.560 (1, 172)	.455	.004*	.030***
No (RC)	55	148	0.128 (0.071, 0.184)***					
Yes	10	26	0.184(0.047, 0.320)**	0.056 (−0.092, 0.204)				
(4) Play activities					1.120 (1, 172)	.291	.004*	.029***
No (RC)	62	166	0.129 (0.076, 0.182)***					
Yes	3	8	0.255 (0.026, 0.485)*	0.126 (−0.109, 0.362)				
(5) Video-based feedback					4.391 (1, 172)	.038*	.004*	.029***
No (RC)	60	168	0.124 (0.071, 0.176)***					
Yes	5	6	0.397 (0.145, 0.648)**	0.273 (0.016, 0.530)*				
(6) Discussion (in group or with parent)					0.186 (1, 172)	.667	.004*	.030***
No (RC)	48	136	0.143 (0.081, 0.204)***					
Yes	18	38	0.117 (0.017, 0.217)*	−0.026 (−0.143, 0.092)				
Number of techniques used	65	174	0.136 (0.084, 0.189)***	0.014 (−0.032, 0.059)	0.353 (1, 172)	.553	.004*	.031***

Note. # Studies = number of studies; # ES = number of effect sizes; mean *d* = mean effect size Cohen's *d*; CI = confidence interval;  $\beta_1$  = estimated regression coefficient; df = degrees of freedom; Level 2 variance = variance of effect sizes within studies; Level 3 variance = variance between studies.

<sup>a</sup> Omnibus test of all regression coefficients of the model.

<sup>b</sup> *p*-value of the omnibus test.

<sup>+</sup> *p* < .1.

\* *p* < .05.

\*\* *p* < .01.

\*\*\* *p* < .001.

### 3.2.2. Program characteristics

None of the coded contextual factors (i.e., the specific individual program, age of the child, whether the program starts prenatally or postnatally, whether or not telephonic consultation was provided, and whether or not all family members were targeted) or structural elements (i.e., the type of home visiting professional, whether or not home visitors received training, whether or not home visitors were matched to families, whether or not a curriculum was used, program duration, average number of home visits, average duration of home visits, and home visit intensity) significantly moderated the overall effect of home visiting programs.

Several program components and techniques moderated the overall effect. For the parenting program components, we found larger effect sizes for programs that focused on improving realistic expectations of parents regarding their child and/or parenthood compared to programs without this focus ( $d = 0.308$  versus  $d = 0.112$ ). Larger effects were also found for programs focusing on parental responsiveness and sensitivity to cues of the child compared to programs without this component ( $d = 0.238$  versus  $d = 0.064$ ). Further, a significant moderating effect was found for the number of parenting program components addressed in a home visit program. Programs with more parenting program components yielded higher effect sizes. For the non-parenting program components, we found a negative moderating effect for providing practical or instrumental assistance. Programs with this component showed smaller effects than programs without this component ( $d = 0.044$  versus  $d = 0.164$ ). Finally, we found a significant moderating effect for the delivery technique video-based feedback. Programs using video-recordings of parent-child interactions showed larger effect sizes than programs not using this technique ( $d = 0.397$  versus  $d = 0.124$ ).

## 4. Discussion

In the present study, we aimed to gain insight into what and how program components and delivery techniques were associated with the effect of home visiting programs on child maltreatment. A small but significant overall effect of  $d = 0.136$  was found. Despite the small magnitude (Cohen, 1988), this effect is important as child maltreatment is a severe and complex problem, which could lead to long-lasting negative outcomes for both individual children and society. Therefore, even a minimal reduction in an outcome like child maltreatment has great clinical and societal significance. Additionally, as the focus of this meta-analysis was more on preventive than curative interventions, the small overall effect was not surprising since some participants could be expected to develop well without receiving a home visiting program (Pinquart & Teubert, 2010). This is in line with outcomes of prevention programs for children in general (e.g., Rapsosa et al., 2019; Tanner-Smith, Durlak, & Marx, 2018).

The small overall effect that was found here is in line with the small overall effects reported in previously conducted meta-analyses ( $d = 0.08$ , Filene et al., 2013;  $d = 0.41$ , MacLeod & Nelson, 2000;  $d = 0.32$ , Sweet & Appelbaum, 2004;  $d = 0.21$  for preventive interventions and  $d = 0.34$  for curative interventions, Van der Put et al., 2018). As for publication bias, the results of the trim-and-fill analysis suggested that bias may have been present in the data. Therefore, a “corrected” overall effect was estimated, resulting in an even smaller and non-significant effect size of  $d = 0.041$ . This effect questions the effectiveness of home visiting programs for child maltreatment. However, the performance of the trim-and-fill method is limited when effect sizes prove to be interdependent and heterogeneous (Nakagawa & Santos, 2012; Peters, Sutton, Jones, Abrams, & Rushton, 2007). Because of these methodological shortcomings, this “corrected” overall effect size should not be interpreted as an estimate of the true effect size, but only as an indicator of (possible) bias in the data.

### 4.1. Study characteristics

The findings of the moderator analyses showed that studies with ethnical diverse samples (i.e., higher percentages of non-Caucasians or non-whites) yielded larger effect sizes. This suggests that home visiting programs are more effective in preventing child maltreatment in families with an ethnical minority status. Literature suggests that ethnic minorities are generally at higher risk for adverse outcomes (see, for instance, Duncan, Ziol-Guest, & Kalil, 2010; Neal, 2006; Williams, Hovmand, & Bright, 2007), including child maltreatment (Elliott & Urquiza, 2006). Home visiting programs are developed to provide services to these high-risk populations, and are most often highly sensitive to ethnical and cultural differences. The latter is reflected by, for example, the recruitment of home visitors with diverse ethnic backgrounds, matching participants to home visitors on the basis of cultural background and ethnicity, delivering services in a participant’s primary language, and incorporating traditional child rearing practices into a program’s curriculum (Azzi-Lessing, 2011; Guterman, 2001; Howard & Brooks-Gunn, 2009). Given our finding, an approach of cultural and ethnic sensitivity to home-visit programs seems to work well for families with an ethnical minority status. This approach might also explain the findings of previous research in the sense that ethnical diverse samples are more engaged in home visiting programs for child maltreatment, and that retention rates of ethnic/cultural minority families are higher compared to Caucasian or European American families (Alonso-Marsden et al., 2013; McCurdy, Gannon, & Daro, 2003, 2006; McGuigan, Katzev, & Pratt, 2003; Wagner, Spiker, Linn, Gerlach-Downie, & Hernandez, 2003). However, little is known about what causes this greater engagement, and why home visiting programs are more effective in preventing or reducing child maltreatment in ethnical diverse samples. This can be an important focus in future research. Finally, our finding might be supported by previous research, and a more general believe that using corporal punishment as a child rearing practice is associated with specific cultures of families with an ethnical minority status, such as African-American and Hispanic families (Berlin et al., 2009; (Hawkins et al., 2010); Lansford, Deater-Deckard, Dodge, Bates, & Pettit, 2004; MacKenzie, Nicklas, Brooks-Gunn, & Waldfogel, 2011). Moreover, research showed that the effects of harsh physical punishment depend on the extent to which parents and children in these ethnic groups perceive physical punishment as cultural acceptable (Horn, Cheng, & Joseph, 2004; McLoyd, Kaplan, Hardaway, & Wood, 2007). Therefore, physical punishment may particularly be considered as child maltreatment in Caucasian families compared to families with an ethnical minority status.



We also found larger program effects when follow-up durations increased. This is in line with the findings of Van der Put et al. (2018), who also found larger positive effects at later follow-up for preventive child maltreatment interventions. They argued that this could be explained by the sleeper effect of interventions (Maurer, Mondloch, & Lewis, 2007), which implies that (at least part of) the positive effect of child maltreatment programs needs a substantial amount of time to materialize. Applying this reasoning to home visit programs, it may take some time for parents to effectively implement newly learned parenting skills or care routines in their daily parenting practices, as parents need time to practice these skills and routines and gain confidence in applying them.

For primary studies assessing official reports of child maltreatment, a possible explanation for the larger program effects at later follow-up might be that a longer follow-up period extends the time window in which child maltreatment could emerge and can be assessed. A longer follow-up period may cause larger differences in child maltreatment incidents or reports between intervention families and control families, and therefore larger program effects. Additionally, we found significantly larger effects of home visiting programs when the follow-up duration was more than two years ( $d = 0.174$ ) compared to a follow-up duration of two years or less ( $d = 0.054$ ). As only a small number of studies ( $k = 7$ ) were included that performed follow-up assessment more than two years after a program was ended, it is important in primary research to investigate the long-term effectiveness of home visitation programs. However, when significant effects of home visiting programs only emerge after two years, the preventive aim of these programs and the supposed positive influence on child development could be questioned.

#### 4.2. Program characteristics

We found no significant moderating effects of any of the investigated contextual factors and structural elements, indicating that these program features were not associated with program effectiveness. This is in line with Gubbels et al. (2019), who neither found moderating effects of quite similar contextual factors and structural elements on the overall effect of parent training programs on child maltreatment. They argued that this could be explained by the discrepancy between the way a program was delivered to a study's intervention group, and what is stated in the available curriculum or program information that was used to code the contextual factors and structural elements. It is likely that this also holds for home visiting programs, in which a program curriculum is often adapted to the specific needs of the families that are being served (Russell, Britner, & Woolard, 2007). Consequently, this makes it difficult to determine whether a contextual factor or structural element of a program was implemented as described.

For the parenting related program components, we found that a focus on improving realistic expectations or beliefs of parents about their child and/or parenthood in general yielded larger program effects. Having unrealistic expectations of child development or parenting substantially contributes to the potential for child maltreatment (Lee et al., 2014; Slack et al., 2011). It therefore can be expected that addressing these unrealistic expectations in intervention programs effectively reduces the risk of child maltreatment. Filene et al. (2013), who examined components associated with a broader range of home visiting program outcomes, found that components related to the improvement of parental expectations of their child's development were associated with larger program effects on parenting behavior and skills. However, this was not found when child maltreatment was the outcome. It must be noted that Filene and colleagues could only include a rather small number of studies with child maltreatment as the outcome, which may explain the contrast with our findings. Parental attitudes and expectations toward parenting were also not identified by Van der Put et al. (2018) as an effective component for child maltreatment interventions. However, in their meta-analysis, the focus was on a wide variety of child maltreatment interventions, including cognitive behaviors therapy and substance abuse programs, which are all very different in nature compared to home visiting programs. On the other hand, Kaye et al. (2018) did identify the improvement of parental expectations of a child's development as a common component across evidence informed home visiting program for child maltreatment through a technique referred to as common components analyses (CCA). They suggest that this component is considered important by program developers in preventing child maltreatment.

Further, we found larger effect sizes for home visiting programs addressing parental responsiveness and sensitivity to a child's emotional needs. Previous review studies showed that low levels of responsive parenting or parental affection are important risk factors for various types of child maltreatment, such as sexual abuse (Assink et al., 2019) and neglect (Dubowitz, 1999; Mulder, Kuiper, Van der Put, Stams, & Assink, 2018). Programs aimed at improving parental sensitivity and responsivity show promising results for the prevention of child maltreatment (e.g., Casonato, Nazzari, & Frigerio, 2017; Moss et al., 2011). As home visiting programs are often associated with improving parental responsivity and sensitivity (Howard & Brooks-Gunn, 2009), it could thus be assumed that this component plays an important role in preventing child maltreatment. However, improving responsive and sensitive parenting practices was not previously identified as an effective or common component for the prevention of child maltreatment (Filene et al., 2013; Kaye et al., 2018).

We found no significant moderating effect of the non-parenting program components that were coded, which suggests that these components are about equally effective in preventing child maltreatment. However, the results did show that providing practical or instrumental assistance was negatively associated with the overall effect of home visiting programs on child maltreatment, meaning that programs providing this type of assistance showed smaller effects compared to programs that did not provide this. We defined practical or instrumental assistance as providing resources to address the family's basic needs, such as transportation services, respite or child care, and medical services. Possibly, some aspects of the total range of instrumental assistance services, such as transportation services, do not provide sustainable changes, as these services end as soon as the home visiting program ends. But even more importantly, providing practical or instrumental assistance may not meet the primary care needs of children and families that are associated with child maltreatment, even though families may profit from this type of assistance in a more general sense.

Further, providing merely instrumental assistance seems insufficient in reducing the variety of serious problems that high-risk families often deal with. As a result, home visiting programs with a (strong) focus on providing assistance may not be able to

sufficiently reduce the risk of child maltreatment. Additionally, home visiting programs are particularly provided during the first years of a child's life. In this period, a lot of changes occur in the lives of all members of a family. Assisting vulnerable families in fulfilling their basic needs in this period without addressing other problems may imply that families insufficiently learn to fulfill these needs on their own. This may negatively affect the family's wellbeing after the home visiting program has ended, and may therefore even increase the risk of child maltreatment.

Finally, for the delivery techniques, we found that using video-based feedback yielded larger program effects. Viewing videotaped parent-child interactions is becoming an increasingly popular component of family-based interventions for young children (Smith, Dishion, Moore, Shaw, & Wilson, 2013). Previous review studies showed that interventions using video feedback were effective in improving child attachment security, parental sensitivity, parental attitudes toward the child and the development of the child in various samples (Bakermans-Kranenburg, Van IJzendoorn, & Juffer, 2003; Fukkink, 2008), including high-risk samples and maltreating samples (Juffer, Bakermans-Kranenburg, & Van IJzendoorn, 2018; Moss et al., 2011). However, no research is yet available on the direct effectiveness of video-based feedback as an intervention or program component of interventions that target child maltreatment.

#### 4.3. Limitations

Several limitations of the current meta-analysis need to be discussed. First, despite an extensive search procedure, it cannot be assured that all studies on the effect of home visiting programs on child maltreatment were analyzed. However, given the current extensive dataset of 77 studies and 174 effect sizes, it may be assumed that the included studies were sufficiently representative of all primary studies available on this subject.

A second limitation is related to the difficulties in determining what components and delivery techniques a home visiting program is based on. This was particularly due to limited information on content components and techniques that was reported in the primary studies or in online factsheets or protocols. Additionally, the way in which a home visiting program was delivered in practice to families may differ from prescribed procedures described in program protocols. For many programs, there is flexibility in the way a program is delivered to families, and in many instances, a program is adapted to the needs and circumstances of the families that are served (Russell et al., 2007). However, in order to reduce subjectivity in the coding process, components and techniques were only coded as present whenever it was explicitly stated that a component or technique was part of a program.

Third, the included primary studies examined outcomes such as official child maltreatment reports, child maltreatment investigations, or relapses in child protection services, which were assumed to be indicative of child maltreatment. However, it is known that a large proportion of maltreatment is not reported to the child protection authorities (see, for instance, Cyr et al., 2013; Finkelhor, Ormrod, & Turner, 2005; Finkelhor, Ormrod, & Turner, 2009). Therefore, these outcome measures may not be fully indicative of all child maltreatment instances. In line with this, harsh parenting, corporal punishment, and parental aggression directed to the child were also included in the current meta-analysis, which cannot be regarded as true child maltreatment according to strict definitions of child maltreatment. However the way these outcomes are defined shows overlap with the definition of child maltreatment used in the current meta-analysis (Knox, 2010; Straus, 2000).

#### 4.4. Implications for clinical practice and future research

Despite these limitations, our study provides important knowledge for science and practice. Although we found that most of the components and delivery techniques were about equally effective in preventing child maltreatment, our findings provide important implications for the improvement of currently available home visiting programs. We found that home visiting programs with a focus on improving parental expectation of their child or parenthood, and programs with a focus on improving parental responsiveness or sensitivity to a child's needs yielded larger effects. Programs using video-based feedback also produced larger effects. Therefore, the effectiveness of home visiting programs could possibly be improved by integrating these components and technique in these programs. This is especially important since these components and techniques were often not the focus of the home visiting programs included in this meta-analysis. Table 1 shows that, for example, addressing parental expectations was coded for only 11.5 % of the effect sizes, and using video-based feedback for only 3.4 %. On the other hand, practical or instrumental assistance was coded for 27 % of the effect sizes, although this component was negatively associated with the overall effect of home visiting programs on child maltreatment. Therefore, the effectiveness of home visiting programs could also be improved by eliminating ineffective program components, such as providing practical or instrumental assistance. The results of this meta-analysis can also be used in developing new promising home visiting programs that comprise the most effective components.

Our findings indicate that home visiting programs show larger effects at later follow-up evaluations, and that effects on child maltreatment may emerge after two years. Therefore, future research should focus on follow-up evaluations of considerable length, as the true effects of home visiting programs on child maltreatment may be particularly found in later follow-up evaluations rather than in post-treatment or short-term evaluations. Furthermore, we found that the home visiting programs were more effective in preventing or reducing child maltreatment for families with an ethnical minority status. However, little is known about what causes possible differences in this effectiveness of home visiting programs between different ethnic families. As knowledge on this topic could provide important implications for clinical practice, this should be examined in future studies. Additionally, as all the study and program characteristics were only tested in bivariate models, no conclusions can be drawn about the interactions between components or other characteristics, and the potential effects of these interactions on child maltreatment. Future research should therefore investigate combinations of components or characteristics and their potential cumulative effects, for example by using network meta-analysis

models. Finally, experimental research is needed in order to examine whether or not home visiting programs are actually more effective in preventing or reducing child maltreatment when adding or leaving out the components and technique we found to be associated with the effectiveness of home visiting programs.

#### 4.5. Conclusions

The results of this meta-analysis showed that home visiting programs can prevent child maltreatment only to a small extent. Larger effects were found when programs focused on improving parental expectations of the child or parenthood, and when programs focused on improving parental responsiveness or sensitivity to a child's needs. Programs using video-based feedback also produced larger effects. Providing practical and instrumental assistance was negatively associated with program effectiveness. These results can be used to improve existing interventions or to develop new promising interventions. Finally, our findings showed that ethnical diverse samples might benefit more from home visiting programs than Caucasian samples, and the effect of home visiting programs might be greater at later follow-up.

#### Declaration of Competing Interest

None

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#### Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.chiabu.2021.104981>.

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