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The role of emotion recognition in the intergenerational transmission of child maltreatment: A multigenerational family study

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ABSTRACT

Background: Understanding how child maltreatment is passed down from one generation to the next is crucial for the development of intervention and prevention strategies that may break the cycle of child maltreatment. Changes in emotion recognition due to childhood maltreatment have repeatedly been found, and may underly the intergenerational transmission of child maltreatment.

Objective: In this study we, therefore, examined whether the ability to recognize emotions plays a role in the intergenerational transmission of child abuse and neglect.

Participants and setting: A total of 250 parents (104 males, 146 females) were included that participated in a three-generation family study.

Method: Participants completed an emotion recognition task in which they were presented with series of photographs that depicted the unfolding of facial expressions from neutrality to the peak emotions anger, fear, happiness, and sadness. Multi-informant measures were used to examine experienced and perpetrated child maltreatment.

Results: A history of abuse, but not neglect, predicted a shorter reaction time to identify fear and anger. In addition, parents who showed higher levels of neglectful behavior made more errors in identifying fear, whereas parents who showed higher levels of abusive behavior made more errors in identifying anger. Emotion recognition did not mediate the association between experienced and perpetrated child maltreatment.

Conclusions: Findings highlight the importance of distinguishing between abuse and neglect when investigating the precursors and sequelae of child maltreatment. In addition, the effectiveness of

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interventions that aim to break the cycle of abuse and neglect could be improved by better addressing the specific problems with emotion processing of abusive and neglectful parents.

1. Introduction

Parents who have been maltreated (abused or neglected) during their childhood are more than twice as likely to have children who also experience maltreatment (Assink et al., 2018; Madigan et al., 2019; Van IJzendoorn, Bakermans-Kranenburg, Coughlan, & Reijman, 2020). A deeper understanding of the mediating mechanisms that link the generations in this regard is crucial for the development of intervention and prevention strategies that may break the cycle of child maltreatment (Alink, Cyr, & Madigan, 2019). A potential mediating mechanism in the intergenerational transmission of child abuse and neglect is aberrant emotion recognition. The ability to perceive and identify emotions in others, which is a critical prerequisite for social interactions, may be compromised by experiences of maltreatment as a child (i.e., Bérubé, Turgeon, Blais, & Fiset, 2023). Compromised ability to recognize emotions in others may, later in life, pose a risk for maltreating one's own children (Crittenden, 1993; Milner, 2003). In this study we, therefore, examined whether the ability to recognize emotions plays a role in the intergenerational transmission of child maltreatment.

1.1. Intergenerational transmission of child maltreatment

Among the many factors that increase a parent's risk of maltreating a child are experiences of maltreatment. According to an umbrella review of meta-analyses, the factor with the largest predictive effect size for child maltreatment is having a parent with a history of maltreatment (Van IJzendoorn et al., 2020). Meta-analytic evidence shows that a history of child maltreatment increases, by the same odds, the risk of homotypic (e.g., abuse to abuse) and heterotypic (e.g., abuse to neglect) intergenerational transmission (Madigan et al., 2019). However, in the majority of studies included in the meta-analysis the unique effects of both types of maltreatment were not examined, making it unclear to what extent the other type of maltreatment may have accounted for this association. Using a multigenerational multi-informant approach, we found unique homotypic transmission for abuse and for neglect (i.e., effects controlled for the other type of maltreatment), although the evidence for the transmission of neglect tended to be more driven by reporter effects (Buisman et al., 2020). Unravelling the mechanisms behind this transmission of child maltreatment is crucial for designing effective preventive intervention programs. Using a multi-informant multi-generational family design, our study is the first to examine the mediating role of facial emotion recognition in the intergenerational transmission of abuse and neglect.

1.2. Emotion recognition after a history of childhood maltreatment

Studies investigating the effect of child maltreatment on the processing and recognition of emotional expression have primarily focused on children. In several experiments published in the beginning of this century, Pollak and his colleagues found that children exposed to physical abuse tend to overidentify anger and more accurately recognized anger and fear early in the formation of the facial expression, when few physiological cues were available (e.g., Pollak & Kistler, 2002; Pollak, Messner, Kistler, & Cohn, 2009). In the abundance of studies that followed, physical abuse has been the most frequently tested form of maltreatment and showed the most consistent results. Physically abused children required less perceptual information to recognize facial expressions of anger and showed heightened reactivity and shorter reaction times to anger and fear compared to non-abused children (da Silva Ferreira, Crippa, & de Lima Osório, 2014; Masten et al., 2008). As Pollak et al. (2009) pointed out, increased sensitivity to subtle variations in negative emotional expressions may be adaptive for children living in violent contexts. Although more limited than the literature on abuse, studies on neglect suggest that neglected children show a more limited understanding of emotions compared to non-maltreated and abused children (Pollak, Cicchetti, Hornung, & Reed, 2000; Shipman et al., 2005; Sullivan, Bennett, Carpenter, & Lewis, 2008). Being raised in less stimulating environments has, therefore, been suggested to compromise children's ability to recognize emotional facial expressions (Pollak et al., 2000). In addition, neglected children selected sad expressions preferentially in ambiguous contexts compared to non-maltreated children (Pollak et al., 2000). Hence, neglected children have been hypothesized to develop a perception bias towards sad expressions because neglecting mothers are more likely to be depressed - making sadness a salient emotion (Sullivan et al., 2008).

The short term possible adaptive alterations in emotion recognition as a consequence of childhood maltreatment, may extend into adulthood. These long-term consequences of childhood maltreatment on emotion recognition are increasingly investigated. Findings of a scoping review on emotion recognition after a history of childhood maltreatment in adults (Bérubé et al., 2023), reveal a differentiated reaction to happiness, anger, and fear. Happiness is less accurately detected, whereas negative emotions (similarly as in children) are recognized more rapidly and with more limited perceptual information compared to adults not exposed to childhood maltreatment. Results furthermore tentatively suggest that also in adults abuse and neglect may compromise emotion recognition differentially. Yet, the majority of the included studies in this review either combined different forms of maltreatment or examined some specific forms but not others.

1.3. Emotion recognition in maltreating and at-risk parents

Alterations in processing and recognizing facial expressions resulting from adverse childhood experiences may increase the risk of

maltreating one's own children. The social information processing (SIP) model of abuse and neglect (Crittenden, 1993; Milner, 2003) suggests that abusive and at risk parents are more likely to have inaccurate and biased perceptions of their children's emotions. They are thought to make more errors in recognizing children's emotional expressions, especially if the emotions are negative or expressed at low intensities, and to have a negative attribution bias (Milner, 2003). For example, Francis and Wolfe (2008) found that maltreating fathers were more likely to label ambiguous emotions as negative and reflecting distress than non-maltreating fathers. Yet it has also been proposed that abusive parents may be quicker to recognize negative emotions as these emotions may trigger their own traumatic experiences and trigger trauma-related reactions (i.e., dissociation, physical arousal) that are considered as abusive or neglectful (Bérubé et al., 2023). For example, in a sample of non-abusive parents the associations between emotion recognition and sensitivity were found to differ according to mothers' history of childhood maltreatment. Mothers who were better at recognizing child's facial emotion expressions demonstrated less sensitive behaviors when interacting with their own child when they were exposed to high levels of childhood maltreatment, whereas emotion recognition and sensitivity were not associated in mothers exposed to low or moderate levels of maltreatment (Bérubé et al., 2020). Such processes may play a role in perpetuating the intergenerational cycle of maltreatment, but may again also depend on the different forms of maltreatment.

Not surprisingly, results of studies that examined emotion recognition in abusive and at-risk parents are contradictory. While some studies identified emotion recognition deficits in abusive/at-risk parents (Asla, de Paúl, & Pérez-Albéniz, 2011; Hildyard & Wolfe, 2007; Kropp & Haynes, 1987; Wagner et al., 2015) others were inconclusive (Balge & Milner, 2000) or found no effect (Camras et al., 1988; During & McMahon, 1991). A meta-analysis based on seven studies revealed that, overall, high-risk and abusive parents have more problems recognizing emotions compared to low-risk parents with a moderate effect size, but significant heterogeneity in the study effect sizes was found (Wagner et al., 2015). More research is, therefore, needed to clarify if and how emotion recognition is altered in abusive parents.

The SIP model applied to *neglect* proposes that neglectful parents fail to perceive their children's signals accurately due to psychological states of withdrawal and depression or cognitive impairments that may be associated with neglectful parenting (e.g., Azar et al., 2017; Crittenden, 1993). As a consequence, they might have more difficulties in recognizing their children's emotions. The few studies that applied the SIP model to neglectful parents (Camilo, Garrido, & Calheiros, 2020; Hildyard & Wolfe, 2007) revealed that neglectful parents overall exhibit more difficulties in recognizing children's emotions, but more studies on child neglect are needed to draw firm conclusions.

1.4. The current study

We examined the role of emotion recognition in the intergenerational transmission of child maltreatment using a multigenerational multi-informant family design. Previous results from our study revealed intergenerational transmission of abuse and neglect (Buisman et al., 2020). In the current study we tested the following: a) the association between a history of childhood abuse and neglect and emotion recognition, b) the association between emotion recognition and abusive and neglectful behavior, and c) the mediating role of emotion recognition in the intergenerational transmission of child abuse and neglect. We examined both reaction time to accurately recognize emotions and the amount of visual input needed to accurately label emotions as indicators of emotion recognition, as both have been shown to play a role in child maltreatment (Bérubé et al., 2023; Masten et al., 2008; Wagner et al., 2015) and may capture different aspects of emotion recognition, i.e., implicit (reaction time) versus explicit (labeling an emotion) aspects (Adolphs, 2002).

In concordance with results of earlier studies on emotion recognition and child maltreatment we hypothesized that (a) a history of childhood abuse and neglect would be associated with altered recognition of facial emotions. Specifically, we expect that higher levels of experienced childhood abuse and neglect would be associated with a shorter reaction time and less visual information needed to identify negative emotions, and more visual information needed to identify positive emotions. Moreover, we hypothesized that (b) abusive and neglectful behavior would be associated with the accuracy and speed to recognize emotions. No specific hypotheses were made regarding the direction of the association or regarding child neglect vs abuse, due to the scarcity and discrepancy of findings of previous studies. Lastly, we explored if (c) the association between having experienced childhood abuse and neglect and being abusive or neglectful towards your own children is (partially) mediated by the accuracy and speed at which parents recognize emotions.

2. Method

2.1. Sample

Participants in the present study were 250 parents who were part of a sample of 396 participants from 63 families in a Dutch three-generation (3G) parenting study on the intergenerational transmission of maltreatment (for details see Buisman et al., 2020).

For this multigenerational study, participants were recruited from three other studies that (partly) involved participants with an increased risk of being exposed to childhood maltreatment (Joosen, Mesman, Bakermans-Kranenburg, & Van IJzendoorn, 2013; Penninx et al., 2008; Scherpenzeel & Toepoel, 2012). From these studies, we identified individuals who had at least one child aged 7.5 years or older, and who had agreed to being invited for participation in future studies. We selected this age range as most measurements used in the 3G parenting study required an age of at least 8 years. Members of the research team invited them to participate in the current study and, after their consent, invited their family members (parents, partners, children, siblings, nephews, nieces, and family in law) to participate as well. This sampling strategy resulted in oversampling of individuals with reported childhood maltreatment experiences.

Parents who reported on maltreatment towards their child(ren) and experienced childhood maltreatment were selected, resulting

in a sample of 250 parents (104 males, 146 females) included in the current study. The average age of the parents was 50.8 years ($SD = 13.3$, age range: 25–86 years). The vast majority of them (93 %) were Caucasian, 1 % were of mixed descent and 1 % of Latin-American descent. Five participants (2 %) were of unknown ethnicity. A small percentage of participants (7 %) had completed only elementary school or a short track of secondary school, 64 % had an advanced secondary school or vocational school diploma, 19 % held a college degree and 6 % held a university degree or a postgraduate diploma. Education of 3 % of participants was unknown.

Whenever possible, we included both parent and child information on experienced childhood maltreatment and maltreating behavior. Experienced childhood maltreatment was assessed by combining the information from two informants: participants (experienced childhood maltreatment) and their parents (perpetrated child maltreatment during their child's childhood). Perpetrated maltreatment was assessed by combining information from participants (perpetrated child maltreatment) and their children (experienced childhood maltreatment). For 78 out of 250 participants two or more informants (participants and their parents) reported on experienced childhood maltreatment and for the other 172 participants we had only self-report information on experienced childhood maltreatment. For 215 participants two or more informants (participants and their children) reported on perpetrated maltreatment, while for the remaining 35 participants one informant reported on perpetrated maltreatment. Parent reported perpetrated child maltreatment correlated significantly with offspring reported child maltreatment: $r = 0.32$; $p < .001$ for neglect and $r = 0.28$; $p < .001$ for abuse. These correlations are in line with meta-analytic evidence showing a low to moderate correspondence ($r = 0.28$) between informants that report on same person at the same moment in time in mental health research (Cohen, 1988) and in research in family relations (De Los Reyes, Ohannessian, & Racz, 2019).

2.2. Procedure

Depending on family composition, participants and their families visited the research lab once or twice. Adult participants visited the lab once with their core family – with their partner and child(ren), and once with their family of origin – with their sibling(s) and parent(s). Participants completed questionnaires, computer tasks, interaction tasks, and, if eligible, participated in a functional magnetic resonance imaging (fMRI) session. Furthermore, biological data was collected (e.g., saliva samples). Questionnaires on child maltreatment and the emotion recognition task were completed during the first visit. Since all parents completed at least two of these questionnaires (one on experienced and another on perpetrated maltreatment), these questionnaires were scheduled as far apart as possible. The study was approved by the ethics committee of the Leiden University Medical Centre (reference number: P11.134). Written informed consent was obtained from all participants before participation. For participants under 18 years of age, parents cosigned informed consent. As a compensation for participation, adults received 50 Euros for one lab visit and up to 100 Euros (depending on time investment) for two lab visits, as well as travelling expenses. Data was collected between March 2013 and May 2016. Information on how we acted in cases of disclosure of abusive and neglectful behavior that might still be ongoing is included in the supplemental material (S1).

2.3. Measures

2.3.1. Maltreatment

We measured child maltreatment with a combination of two validated translations of self-report questionnaires: the Parent-Child Conflict Tactics Scales (CTSPC; Straus, Hamby, Finkelhor, Moore, & Runyan, 1998) and the Childhood Trauma Questionnaire (CTQ-SF; Bernstein et al., 2003). Four maltreatment subtypes were assessed: 1) physical abuse (13 items; CTSPC), 2) emotional abuse (five items; CTSPC), 3) physical neglect (four items; CTSPC), and 4) emotional neglect (six items; CTSPC and CTQ). The CTSPC and the CTQ use different rating scales to assess frequencies. To match the response categories of the CTS-PC and CTQ, we used a 5-point scale ranging from “never” (1) to “(almost) always” (5) for all items. The emotional neglect items from the CTQ were reverse coded.

To measure maltreatment, we used a multi-informant approach in which we combined child and parent reports. First, for maltreatment history, four scale scores (*Emotional Abuse*, *Physical Abuse*, *Emotional Neglect*, and *Physical Neglect*) were calculated from children's self-reported experienced childhood maltreatment by their parents. Scale scores were comprised of the highest score for father or mother (e.g., *Emotional Abuse by father* and *Emotional Abuse by mother* were calculated, and the highest of the two was used to comprise the scale *Emotional Abuse*). Next, an overall *Neglect*-score was calculated by averaging Emotional and Physical Neglect, and an overall *Abuse*-score by averaging Emotional and Physical Abuse. In the same way, scale scores were calculated for their parents' self-reported maltreating behavior. Finally, we calculated an *Abuse History* and a *Neglect History* score by averaging parent report and child reports of abuse and neglect. Internal consistencies of the scales for experienced childhood maltreatment were as follows: for experienced abuse $\alpha_{\text{mother}} = 0.92$ and $\alpha_{\text{father}} = 0.92$, for experienced neglect $\alpha_{\text{mother}} = 0.88$ and $\alpha_{\text{father}} = 0.87$. A similar procedure was followed for maltreating behavior (*Parent-to-child maltreatment*), with scale scores for parent-reported maltreating behavior determined by the highest score for any one of the children. Child-reported maltreating behavior concerned only the parent in question. Internal consistencies of the scales for perpetrated maltreatment, for different children (only described for two children as only a few participants had 3 children or more) were as follows: for abusive behavior $\alpha_{\text{child 1}} = 0.82$ and $\alpha_{\text{child 2}} = 0.81$, for neglectful behavior $\alpha_{\text{child 1}} = 0.75$ and $\alpha_{\text{child 2}} = 0.76$.

It is worthy of note that we slightly adjusted the procedure for younger participants. For participants under 12 years of age, experienced childhood maltreatment was assessed in an interview and questions about very severe physical abuse were omitted. Participants aged 12–18 years who living with their parents at the time of the study indicated whether they had experienced maltreatment within the last year or in the years before. Per item, the higher score of these two was included. For the full questionnaire and further details, see the supplementary material, S2.

2.3.2. Emotion Recognition

We administered an emotion recognition task (Pollak et al., 2009) in which participants were presented with 20 series of 10 photographs of people posing a specific emotion (anger, fear, happiness, sadness, and surprise). Each emotion was presented as a series of ten photographs starting from a neutral expression through peak emotional expression (see Fig. 1). Each participant responded to 200 photographs in total (5 emotions $\times$ 4 series per emotion $\times$ 10 photographs per poser). Presentation of emotions was randomized across participants. Participants made forced-choice responses after each photograph, choosing from: nothing yet (neutral), happy, sad, angry, afraid, or surprised. For a detailed description of the task, see Pollak et al. (2009). As we explicitly focused on correct labeling of emotions and not on mislabeling ambiguous emotions, ‘surprise’ was left out of the analyses as this emotion is ambiguous in the sense that it can be a positive as well as a negative emotion.

The number of correct responses per emotion were summed (minimum: 0, maximum: 40) to examine the amount of visual information needed to correctly label emotions. In addition, for every emotion we examined reaction time to correctly identify the emotion by calculating the reaction time in milliseconds for accurately recognized emotions.

2.3.3. Covariates

Based on previous findings and suggestions with regard to the inclusion of covariates in studies on the cycle of maltreatment and emotion recognition we have included age, gender, SES (Asla et al., 2011; Buisman et al., 2020) and IQ (Masten et al., 2008) as covariates in the current study. Demographic information (age, gender, and household social economic status (SES)) was assessed using questionnaires. Yearly household income was measured on a 7-point scale ranging from (1) less than € 15,000 to (7) more than € 65,000. Education was rated on a 5-point scale: (1) primary school, (2) vocational education, (3) secondary education, (4) higher professional education and (5) university education. Based on standardized household income and standardized completed educational level a composite SES score was calculated. Non-verbal intelligence (IQ) was tested using Raven’s Standardized Progressive Matrices (RPM; Raven, 2000).

2.4. Data analysis

Emotion recognition scores and maltreatment subscales were inspected for outliers. Because the distributions of maltreatment scores and reaction times were skewed, these data were logarithmically transformed. The log-transformed data of the maltreatment measure were multiplied by 10 to scale up the variance. Remaining outliers, meaning values more extreme than a standardized value of ± 3.29 , were winsorized to the most extreme value within the normal range plus or minus the difference between the two most extreme values within the normal range. Outliers were found for abusive behavior ($n = 1$), accurate identification of angry faces ($n = 1$), accurate identification of happy faces ($n = 1$), reaction time for happy faces ($n = 1$), reaction time for fearful faces ($n = 2$) and reaction time for sad faces ($n = 1$).

Next, missing values were imputed by means of multiple imputation (MI) with the package ‘mice’ (Van Buuren & Groothuis-Oudshoorn, 2010) in R (R Core Team, 2021). The data were imputed 50 times incorporating all variables included in the main analyses. Two percent of all values were missing (range: 0 to 3 %) due to technical problems. Predictive mean matching (PMM; Little, 1988) was used as multiple-imputation method. Autocorrelation function (ACF) plots revealed that imputations converged (Azur et al., 2011). In addition, correlations between variables were approximately the same in the imputed datasets compared to the non-imputed dataset (see Supplementary Material Table S1).

Using the multiply imputed data, we tested the associations between maltreatment (abuse/neglect) history, emotion recognition, and maltreating (abusive/neglectful) behavior with a series of stepwise multilevel models to match the hierarchical structure of the data: mother and father of the same child nested within a nuclear family that are nested within extended families. For every outcome we started with an unconditional means model (Model 1) – which decomposed the variance in the outcome measures into four independent components: the unique component of each individual, i.e., level 1 random effect σ_{u0^2} , the unique component of each nuclear family, i.e., level 2 random effect σ_{uo0^2} , the unique component of each extended family, i.e., level 3 random effect σ_{v0^2} , and the



Fig. 1. Examples from the stimulus array for (top to bottom) models creating scared, sad, happy, surprised, and angry facial expressions.

residual component σ_{ϵ^2} . Age, gender, SES and IQ were then added as covariates to the unconditional means model (Model 2). Covariates were kept in the model, regardless of significance, as they can still explain some of the variance and thus help the model, without necessarily explaining an amount beyond a threshold. Next, we added the predictor(s) of interest in the third step (Model 3). The linear mixed models were fitted using the 'lmer' function in the lme4 package (Bates, Maechler, Bolker, & Walker, 2015) in R (R Core Team, 2021) and the MITML package (Grund, Robitzsch, & Luedtke, 2021) was used to pool the results across the 50 imputed datasets. Model fit was compared using an F reference distribution (Li, Raghunathan, & Rubin, 1991). Continuous predictors were centered on their mean. Finally, we ran multiple mediation analyses using SEMtools (Jorgensen et al., 2022) to explore whether the number of correctly identified emotions or reaction time to correctly identify emotions mediated the relation between maltreatment (abuse/neglect) history and maltreating (abusive/neglecting) behavior.

The procedure described by Benjamini-Hochberg was used to correct p -values for multiple testing (Benjamini & Hochberg, 1995). The False Discovery Rate (FDR) was set at 0.15 and analyses on childhood maltreatment and maltreating behavior and type of emotion recognition (accuracy versus reaction time) were considered as a family of tests. There are no clear rules for which value of FDR to use. An FDR of 0.05 is considered too low for many experiments and using a FDR of 0.15 to 0.20 has been suggested if the cost of a false negative (missing a potentially important discovery) is high (Lee & Lee, 2018). Since research on mechanisms in the cycle of child maltreatment is rather limited and few interventions are available that are effective in reducing the incidence of child maltreatment (Euser et al., 2015; Whitcombe-Dobbs & Tarren-Sweeney, 2019), we considered the costs of missing mechanisms, which are important targets for interventions, as relatively high.

3. Results

3.1. Preliminary analyses

Table 1 displays cumulative scores of experienced childhood maltreatment and maltreating behavior based on concrete parenting behaviors to give an impression of the occurrence of maltreatment in the current sample. See Buisman et al. (2020) for a detailed description of the co-occurrence of different forms of maltreatment and the strength of the association between childhood maltreatment and maltreating behavior. Means, standard deviations, and correlations of the independent and dependent variables included in the main analyses are listed in Table 2.

3.2. Maltreatment history and emotion recognition

3.2.1. Correct identification of emotions

Stepwise multilevel models were run to test whether a history of abuse and neglect predicted *correct identification of emotions*. The unconditional means model revealed that the intra-class correlation (ICC) was 0.00 at the extended family level for *sadness*, *fear* and *anger*, whereas the ICC was 0.00 at the nuclear family level for *happiness*, indicating no dependency between measurements of members from the same extended and the nuclear family, respectively. As models including levels with 0 % of explained variance yield convergence problems, levels that explained no variance were removed from the model. The unconditional mean model revealed that the proportion of explained variance (ICC) at the nuclear family level was 0.22 for *sadness*, 0.23 for *fear* and 0.09 for *anger*. This implies that parents from the same nuclear family are more alike when it comes to correctly identifying sadness, fear and anger than parents from different nuclear families. For *happiness*, the ICC at the extended family level was 0.02, indicating some dependency at this level.

Controlling for age, gender, SES, IQ, and childhood neglect, a history of childhood abuse was unrelated to correct recognition of *happiness* ($\beta = 0.08$, $p = .29$), *sadness* ($\beta = 0.02$, $p = .78$), *fear* ($\beta = 0.05$, $p = .51$) or *anger* ($\beta = -0.00$, $p = .98$). Similar (non-)results were found for the relation between neglect history and the correct recognition of *happiness* ($\beta = -0.01$, $p = .88$), *sadness* ($\beta = -0.04$, $p = .58$), *fear* ($\beta = -0.07$, $p = .33$) and *anger* ($\beta = -0.01$, $p = .88$).

3.2.2. Reaction time

Next, we conducted stepwise multilevel models to test whether a history of abuse and neglect predicted *reaction time* to correctly

Table 1

Occurrence of a history of childhood abuse and neglect and abusive and neglectful behavior.

	Never	Once	More than once
History of childhood maltreatment			
Physical abuse	34 (14 %)	43 (17 %)	173 (69 %)
Emotional abuse	18 (7 %)	26 (10 %)	206 (82 %)
Physical neglect	155 (62 %)	42 (17 %)	53 (21 %)
Emotional neglect	9 (4 %)	4 (2 %)	237 (95 %)
Maltreating behavior			
Physical abuse	61 (24 %)	43 (17 %)	146 (58 %)
Emotional abuse	19 (8 %)	34 (13 %)	197 (79 %)
Physical neglect	172 (69 %)	57 (23 %)	21 (8 %)
Emotional neglect	31 (12 %)	34 (14 %)	185 (74 %)

Note. Occurrences are based on items describing concrete parenting behaviors rather than the overall scales.

Table 2

Pooled Means, Standard Deviations, and partial correlations (corrected for age, gender, SES and IQ) of the multiply imputed data.

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	M	SD
1. Maltreated: abuse	–												1.97	1.21
2. Maltreated: neglect	0.54**	–											2.73	1.38
3. Maltreating: abuse	0.40**	0.17**	–										1.60	0.84
4. Maltreating: neglect	–0.01	0.16*	0.32**	–									1.92	0.98
5. ER correct: happy	0.08	0.03	0.11	–0.01	–								27.21	4.09
6. ER correct: sad	–0.00	–0.03	–0.03	–0.05	0.27**	–							20.43	6.81
7. ER correct: fear	0.00	–0.05	0.02	–0.14*	–0.04	0.08	–						17.06	5.12
8. ER correct: anger	–0.01	–0.01	–0.12	–0.10	0.11	0.22**	0.05	–					18.23	5.17
9. ER reaction time: happy	–0.09	–0.06	–0.04	0.07	–0.17**	0.05	0.01	0.03	–				3.00	0.23
10. ER reaction time: sad	–0.05	0.01	0.03	0.14	–0.04	–0.11	–0.10	–0.07	0.56**	–			3.18	0.26
11. ER reaction time: fear	–0.21**	–0.16*	–0.03	0.04	–0.15	–0.01	–0.12	–0.12	0.54**	0.44**	–		3.24	0.22
12. ER reaction time: anger	–0.17**	–0.04	0.00	0.08	–0.10	0.02	–0.08	–0.25**	0.57**	0.56**	0.53**	–	3.25	0.25

ER: Emotion Recognition. Reaction time was calculated in milliseconds and logarithmically transformed. Scores for maltreatment were logarithmically transformed and then multiplied by ten to scale up the variance.

* $p < .05$.

** $p < .01$.

identify emotions. For all emotions the ICC was 0.00 at the extended family level, hence this level was removed from the model. The unconditional mean model revealed that the ICC for the nuclear family level ranged from 0.11 (*fear*) to 0.42 (*sadness*). For fear, this implies a relatively high amount of variance in reaction time within a nuclear family (variation between members within a nuclear family) compared to the variance in reaction time between nuclear families. For sadness, this implies that the variance in reaction time within a nuclear family and the variance in reaction time between nuclear families approaches each other, indicating a relatively high similarity between two members of the same nuclear family.

Controlling for age, gender, SES, IQ and childhood neglect, a history of childhood abuse was unrelated to the reaction time to correctly identify *happiness* ($\beta = -0.06, p = .30$) and *sadness* ($\beta = -0.06, p = .30$). However, a history of childhood abuse predicted shorter (i.e., faster) reaction times to correctly identify facial expressions of *fear* ($\beta = -0.16, p = .02$) and *anger* ($\beta = -0.18, p < .01$), indicating that adults who experienced higher levels of childhood abuse needed less time to correctly recognize facial expressions of *fear* and *anger*. Results remained significant after controlling for multiple testing. A history of childhood neglect, on the other hand, was not associated with reaction times to correctly recognize any of the emotions that were tested in the current study ($ps > 0.37$).

3.2.3. Summary

In sum, a history of abuse, but not neglect, predicted shorter reaction times to correctly identify facial expressions of fear and anger. A history of abuse and neglect, however, did not play a role in correctly identifying facial emotions.

3.3. Emotion recognition and maltreating behavior

3.3.1. Correct identification of emotion

Stepwise multilevel models were conducted for abusive and neglectful behavior separately, to examine whether correct identification of emotions predicted abusive and neglectful behavior. Results are summarized in Table 3. For abuse, the unconditional means model revealed that the proportion of explained variance (ICC) was 0.11 at the extended level and 0.41 at the nuclear family level, indicating that parents from the same nuclear family are more alike when it comes to abusive behavior than family members from the same extended family level (e.g., nephew and niece). Controlling for age, gender, SES and IQ, and the other types of emotions, *correct identification of anger* was significantly negatively related to abusive behavior ($\beta = -0.13, p = .04$), meaning that parents who were more abusive towards their children made more errors in identifying anger. Correct identification of the other emotions was not related to abusive behavior (*happiness*: $\beta = 0.09, p = .11$, *sadness*: $\beta = 0.02, p = .69$, *fear*: $\beta = 0.03, p = .63$).

Table 3

Summary of regression analyses for the associations between emotion recognition and maltreating behavior.

Fixed effects		Model 1	Model 2	Model 3a	Model 3b
		Coef (se)	Coef (se)	Coef (se)	Coef (se)
Dependent variable: Abusive behavior					
Intercept		1.60 (0.07)**	1.52 (0.09)**	1.50 (0.09)**	1.53 (0.09)**
Gender			0.12 (0.09)	0.16 (0.09)	0.11 (0.09)
Age			0.01 (0.01)*	0.01 (0.01)*	0.01 (0.01)*
SES			0.00 (0.08)	-0.00 (0.08)	-0.01 (0.08)
IQ			-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Happy				0.02 (0.01)	-0.23 (0.34)
Sad				0.00 (0.01)	0.07 (0.32)
Fear				0.00 (0.01)	-0.31 (0.29)
Anger				-0.02 (0.01)*	0.22 (0.29)
Variance c.					
Nuclear fam.	Intercept	0.30	0.26	0.27	0.25
Extended fam.	Intercept	0.08	0.11	0.10	0.12
Dependent variable: Neglectful behavior					
Intercept		1.89 (0.08)**	2.11 (0.09)**	2.10 (0.09)**	2.13 (0.09)**
Gender			-0.37 (0.09)**	-0.35 (0.09)**	-0.39 (0.09)*
Age			0.01 (0.01)*	0.01 (0.01)	0.01 (0.01)*
SES			0.10 (0.09)	0.14 (0.09)	0.10 (0.09)
IQ			-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Happy				-0.00 (0.01)	-0.53 (0.38)
Sad				-0.01 (0.01)	0.73 (0.36)*
Fear				-0.02 (0.01)*	-0.05 (0.31)
Anger				-0.01 (0.01)	0.09 (0.31)
Variance C.					
Nuclear fam.	Intercept	0.47	0.49	0.49	0.50
Extended fam.	Intercept	0.05	0.05	0.04	0.04

Note. Model 3a depict the number of correctly identified emotions for the different emotions and Model 3b depicts reactions times for correctly identified emotions. C = components. Fam = family level Gender: 0 = male, 1 = female.

* $p < .05$.

** $p < .01$.

For neglect, the unconditional means model revealed that the proportion of explained variance (ICC) was 0.05 at the extended level and 0.48 at the nuclear family level, indicating that parents of the same children are more alike when it comes to neglectful behavior than family members from the same extended family level. Controlling for covariates and the other types of emotions, *correct identification of fear* was significantly negatively related to neglectful behavior ($\beta = -0.12$, $p = .04$), indicating that parents who were more neglectful towards their children made more errors in identifying fear. Correct identification of the other emotions was not related to neglectful behavior (*happiness*: $\beta = -0.01$, $p = .90$, *sadness*: $\beta = -0.07$, $p = .30$, *anger*: $\beta = -0.04$, $p = .49$).

3.3.2. Reaction time

Controlling for covariates, the reaction time to correctly identify facial expressions of *happiness*, *sadness*, *fear* and *anger* was not associated with abusive behavior ($p \geq .29$). In addition, reaction time to correctly identify *happiness*, *fear* and *anger* did not associate with neglectful behavior ($ps > 0.17$). Reaction time to correctly identify *sadness* was positively associated with neglectful behavior ($\beta = 0.19$, $p = .043$), however this result was not significant after Benjamini-Hochberg correction for multiple testing. Results are depicted in Table 3, Model 3b.

3.3.3. Summary

In sum, parents who were more abusive towards their children made more errors in identifying anger and parents who were more neglectful towards their children made more errors in identifying fear. The reaction time to correctly identify emotions was not associated with abusive or neglectful behavior.

3.4. Indirect effects through emotion recognition

To explore possible indirect effects of maltreatment history on parent-to-child maltreatment through emotion recognition, we tested whether emotion recognition mediated the association between maltreatment history and maltreating behavior. Since the number of correctly identified emotions and reaction time to correctly identify emotions were differentially associated with maltreatment history and maltreating behavior, no indirect effects were found for the relation between maltreatment history (neglect and abuse) and maltreating (abusive and neglectful) behavior through the *number of correctly identified emotions* (B 's $[-0.00, 0.01]$, SE 's $[0.00, 0.01]$, $ps > 0.36$) nor through *reaction time to correctly identify emotions* (B 's $[-0.00, 0.00]$, SE 's $[0.00, 0.01]$, $ps > 0.14$). P -values of the mediation analyses were not corrected for hierarchical structure of the data, since they indicated non-significant results and would only increase by correction.

4. Discussion

We examined the role of facial emotion recognition in the intergenerational transmission of child maltreatment using a multi-generational multi-informant family design including 250 parents. A history of childhood abuse, but not neglect, was associated with shorter reaction times to correctly identify facial expressions of fear and anger. Childhood experiences of abuse and neglect were not associated with correct identification of emotions. The (in-)ability to recognize emotions was related to both abusive and neglectful behavior. More specifically, we found that parents who were more abusive towards their children made more errors in identifying anger, whereas parents who were more neglectful towards their children made more errors in identifying fear. The reaction time to correctly identify emotions was not associated with abusive nor neglectful behavior.

4.1. A history of childhood maltreatment and emotion recognition

In line with our hypothesis, a history of childhood maltreatment was related to faster emotion recognition. A history of childhood abuse, but not neglect, predicted a shorter reaction time to correctly identify facial expressions of fear and anger. Results are in line with previous findings that revealed that children with a history of physical abuse were quicker to recognize anger (Pollak et al., 2009), and children with maltreatment experiences in general were quicker to recognize fearful faces (Masten et al., 2008). Results of the current study also replicate meta-analytic evidence showing that adults with a history of childhood maltreatment display faster reaction times to anger and fear (Bérubé et al., 2023). Abused children have been proposed to be hypersensitive to fear and anger, which may be helpful in quickly assessing their environment and to accommodate their behaviors in order to prevent further abuse. For example, enhanced capacity to recognize fear on a sibling's face, which could indicate a threat in the immediate environment, may be adaptive in abusive households. Yet, even though this hypervigilance to fear and anger may be detrimental in non-threatening contexts (Bérubé et al., 2023; Pollak et al., 2009) this remains present into adulthood, when the abuse by parents is (supposedly) no longer ongoing.

Contrary to the shorter reaction times needed to accurately identify specific emotions, a history of abuse and neglect did not play a role in the number of accurately labeled emotions. Similar results were found in the study of Masten et al. (2008). The researchers hypothesized that the lack of difference in correctly labeling the emotion was because the task was less sensitive than those used in previous studies. In their study a morphed face continuum of happy, fearful, sad, and angry faces was used with emotions varying in 25 % increments as opposed to the study of Pollak and Kistler (2002) in which facial emotions varied in 10 % increments. However, our task used facial emotions with 10 % increments in line with the studies by Pollak and colleagues. Nevertheless, reaction time, which measures more implicit aspects of emotion recognition (Adolphs, 2002), is a more sensitive measure than the number of correctly identified emotions, and consequently, may still detect subtle interindividual differences when maltreated children reach adulthood.

Alternatively, reaction time may also be influenced by levels of impulsivity, rather than emotion recognition skills. However, in all analyses we controlled for age, SES and IQ, which are moderately to strongly related to impulsivity (Paulsen & Johnson, 1980; Steinberg et al., 2008). In addition, even though reaction time in response to the different emotions were interrelated, if reaction time would be substantially influenced by impulsivity, one would expect to see similar results across different emotions instead of divergent reactions to fear and anger only, as has been found in previous studies (Assed et al., 2020; Bérubé et al., 2023).

4.2. Emotion recognition and maltreating behavior

From a parenting perspective, emotional cues are crucial to elicit nurturing behavior from parents. Changes in the ability to recognize emotions, either in the form of a low ability (Wagner et al., 2015) or in the form of an enhanced ability (which may trigger trauma related responses) to recognize emotions has been associated with negative parenting (Bérubé et al., 2023). We found that more abusive parents had more difficulty identifying anger, as evidenced by a lower number of correctly identified emotions. Our results are congruent with the Social Information Processing (SIP) model of abuse and neglect, that postulates that abusive parents make more errors in recognizing children's emotional expression, especially if the emotions are expressed at low intensities (Milner, 2003). Yet, the SIP model and previous studies do not point to impaired recognition of anger in abusive parents in particular. Although this finding needs replication, it is tempting to speculate that abusive parents specifically have problems in managing their own anger and those of others. Recognizing emotions in oneself and others as part of emotional intelligence (Mayer, Caruso, & Salovey, 2016) is a prerequisite to manage emotions, which is key to preventing reactive aggression (Henwood, Chou, & Browne, 2015). To test this proposition, future research could examine whether maltreating parents also have trouble recognizing their own anger.

The current study also revealed that parents who showed higher levels of neglectful behavior had more difficulty identifying fear. Problems with emotion processing have been found in neglecting parents before (Camilo et al., 2020; Hildyard & Wolfe, 2007), although previous results did not point to impaired recognition of fear in particular. Our finding of impaired recognition of fear, however, is consistent with emotional neglectful parenting behavior. Fear signals the need for protection, and neglecting parents fail in just that: offering protection to their child. Parents struggling with recognizing fear may not be able to appropriately respond to their child on moments when the child's attachment system is activated (Bowlby, 1969–1982) and the child needs them the most.

4.3. Implicit versus explicit aspects of emotion recognition

Remarkably, reaction time and the amount of visual input needed to correctly label emotions were differentially associated with experienced and perpetrated maltreatment: A history of childhood abuse was related to shorter reaction times, whereas the amount of visual input needed to correctly label facial expressions was associated with abusive and neglectful behavior. Hence, the specific patterns of emotion recognition, such as quicker recognition of fear and anger, did not play a mediating role in the transmission of child maltreatment and seem to tap into different aspects of emotion recognition skills. Pearson correlations between reaction time and the number of correctly labeled emotions were small to moderate ($-0.39 < r < -0.16$). Reaction time to accurately identify emotional expressions may represent more implicit aspects of emotion recognition, as it measures the speed with which individuals reach an accurate decision, whereas correctly labeling an emotion may be considered an explicit aspect of emotion recognition that requires comparison between current exposure and prior knowledge (Adolphs, 2002). There is some evidence that implicit and explicit processes of emotion recognition are distinct and independent. For example, different underlying neural structures for these two processes are involved: subcortical limbic activity for implicit processes and prefrontal cortex activity for explicit processes (i.e., Adolphs, 2002; Lange et al., 2003). As complex social information involves both implicit and explicit processes (Kliemann, Rosenblau, Bölte, Heekeren, & Dziobek, 2013), future studies may further examine the role of implicit and explicit aspects of emotion recognition in the intergenerational transmission of child maltreatment.

4.4. Practical relevance of the findings

One could question the practical relevance of the findings in the current study as the effect sizes (Ess) were small; i.e., the standardized coefficients (β) varied between 0.13 and 0.18 (Cohen, 1988). It should be noted, however, that Cohen (1988) clarified that “the terms ‘small,’ ‘medium,’ and ‘large’ are relative, not only to each other but also relative to the area of behavioral science and to the specific content and research method being employed in any given investigation” (p. 25). A recent review obtained ESs benchmarks for family violence research by reviewing all of the articles ($n = 351$) published in 2021 in the journal *Child Abuse & Neglect*. Results showed that ESs benchmarks of family violence research are much lower than Cohen's ESs benchmarks (Milner, Crouch, Ammar, & Jensen, 2023). Thus, although the amount of variance explained by the predictors in the current study was relatively small, conclusions on the meaningfulness of the results should also be drawn in light of the ESs found in research in the field of family violence.

4.5. Limitations and future directions

Our study is not without limitations. First, we used retrospective reports to assess child maltreatment which may be subject to reporter bias, and agreement between prospective and retrospective measures of child maltreatment tends to be low (Baldwin, Reuben, Newbury, & Danese, 2019). However, it has been argued that prospective and retrospective measures both have predictive power (Baldwin et al., 2019). Although retrospective reports may capture more true cases, prospective reports such as official records show only the tip of the proverbial iceberg, hence underestimate the incidence of maltreatment. In addition, we combined parent (both

father and mother) and child reports to assess maltreatment to minimize reporter bias.

A second limitation is the correlational design of the study which precludes causal inferences. Future studies with prospective experimental intervention designs are needed to investigate emotion recognition as a causal mediating mechanism in the intergenerational transmission of child maltreatment.

Third, we used photographs of emotional faces of *unknown* people as pictures of familiar persons poses threats to the internal validity of the experiment. In addition to these standard facial adult expressions, pictures of the participants' own children displaying emotional expressions or videos of people making facial expression might be used to increase the ecological validity of the study. The heightened ecological validity would, however, be at the cost of standardization.

Fourth, the current study was conducted in a Western country and included mainly Caucasian parents. Future studies should strive to replicate findings of the current study in samples including minority groups and in non-Western populations.

4.6. Conclusion and implications

In conclusion, results of the present study revealed that experienced childhood maltreatment was associated with more implicit aspect of emotion recognition (i.e., reaction time), whereas abusive and neglectful behavior was associated with more explicit aspects of emotion recognition (i.e., labeling the emotion). Hence, emotion recognition did not explain the intergenerational transmission of child maltreatment. In addition, our data revealed that abusive parents had difficulties with recognizing angry expressions, whereas neglectful parents had difficulties with recognizing fearful expressions. Since parenting interventions in general are not effective or only slightly effective in reducing the incidence of further child maltreatment (Van IJzendoorn et al., 2020; Whitcombe-Dobbs & Tarren-Sweeney, 2019), addressing specific deficits in abusive and neglectful parents could help improve the lives of many children. In order to break the cycle of abuse and neglect, future studies could examine the effectiveness of parent-focused interventions that include training components targeting the specific emotion recognition abilities of abusive and neglectful parents, and/or treatment for parents to reduce childhood trauma symptoms.

CRedit authorship contribution statement

Renate S.M. Buisman: Data curation, Formal analysis, Investigation, Methodology, Project administration, Visualization, Writing – original draft, Writing – review & editing. **Laura H.C.G. Compier-de Block:** Data curation, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. **Marian J. Bakermans-Kranenburg:** Conceptualization, Funding acquisition, Supervision, Writing – review & editing. **Katharina Pittner:** Data curation, Investigation, Project administration, Writing – review & editing. **Lisa J.M. van den Berg:** Data curation, Investigation, Writing – review & editing. **Marieke S. Tollenaar:** Project administration, Supervision, Writing – review & editing. **Bernet M. Elzinga:** Conceptualization, Funding acquisition, Supervision, Writing – review & editing. **Alexandra Voorthuis:** Investigation, Project administration, Supervision, Writing – review & editing. **Mariëtte Linting:** Formal analysis, Writing – review & editing. **Lenneke R.A. Alink:** Conceptualization, Funding acquisition, Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.chiabu.2024.106699>.

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