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Recognition of facial emotions among maltreated children with high rates of post-traumatic stress disorder☆

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Abstract

Objective: The purpose of this study is to examine processing of facial emotions in a sample of maltreated children showing high rates of post-traumatic stress disorder (PTSD). Maltreatment during childhood has been associated independently with both atypical processing of emotion and the development of PTSD. However, research has provided little evidence indicating how high rates of PTSD might relate to maltreated children's processing of emotions.

Method: Participants' reaction time and labeling of emotions were measured using a morphed facial emotion identification task. Participants included a diverse sample of maltreated children with and without PTSD and controls ranging in age from 8 to 15 years. Maltreated children had been removed from their homes and placed in state custody following experiences of maltreatment. Diagnoses of PTSD and other disorders were determined through combination of parent, child, and teacher reports.

Results: Maltreated children displayed faster reaction times than controls when labeling emotional facial expressions, and this result was most pronounced for fearful faces. Relative to children who were not maltreated, maltreated

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children both with and without PTSD showed enhanced response times when identifying fearful faces. There was no group difference in labeling of emotions when identifying different facial emotions.
Conclusions: Maltreated children show heightened ability to identify fearful faces, evidenced by faster reaction times relative to controls. This association between maltreatment and atypical processing of emotion is independent of PTSD diagnosis.

Keywords: Maltreatment; Emotional processing; PTSD; Children

Introduction

The ability to recognize emotional expressions is invaluable for successful social interaction and effective interpersonal communication. Children begin to develop this ability, which involves perceiving nonverbal cues and using these cues to determine which emotion is being expressed, very early. In particular, they are able to understand and categorize many facial expressions of emotion starting at a young age (Morton & Johnson, 1991; Nelson, 1987).

Judgments about how to categorize facial expressions require knowledge about emotional categories and boundaries that is dependent upon experience and learned expectations (Pollak & Sinha, 2002), as well as frequency of exposure to specific emotions (Beale & Keil, 1995). The development of normal ability to process emotional faces is thus largely dependent on normal experiences with emotions in daily social interactions. Relative to nonmaltreated peers, maltreated children experience an atypical range of emotional cues, including less positive emotion (e.g., Bugental, Blue, & Lewis, 1990) and more negative emotion (e.g., Herrenkohl, Herrenkohl, Egolf, & Wu, 1991). Thus, maltreated children are likely to form atypical boundaries between different types of emotions when categorizing the emotion expressed on a face, which can undermine their development of skills related to emotional recognition (Camras, Grow, & Ribordy, 1983; Camras et al., 1988; During & McMahon, 1991; Klimes-Dougan & Kistner, 1990).

In addition, maltreated children may associate certain expressions of emotion with traumatic experiences, which can in turn influence the meaning these youth ascribe to these expressions (Pollak, Cicchetti, & Klorman, 1998). Research has shown that victims of child maltreatment indeed process displays of facial emotion, particularly negative ones, abnormally (Pollak, Cicchetti, Hornung, & Reed, 2000; Weiss, Dodge, Bates, & Pettit, 1992). Specifically, maltreated children exhibit enhanced sensitivity to negative facial expressions, including a biased tendency to classify emotions as negative when categorizing emotional facial expressions (Pollak & Kistler, 2002), the ability to identify threatening faces with less sensory information than controls (Pollak & Sinha, 2002), and selective attention to threatening faces (Pollak & Tolley-Schell, 2003). These patterns are likely associated with atypical caregiving experiences involving increased exposure to negative facial emotions relative to nonmaltreated children.

Maltreated children also face an elevated risk of childhood mood and anxiety disorders, including PTSD and major depressive disorder (MDD) (Cicchetti, 1989; Lansford et al., 2002; MacMillan et al., 2001). Although these studies examined psychopathology among maltreated children, processing of emotion was not examined in these diagnosed samples. A parallel set of studies document associations between atypical processing of facial emotions and mood or anxiety disorders in children who have not experienced maltreatment (McClure et al., 2005; Monk et al., 2006; Vasey, Daldeiden, Williams, & Brown, 1995). These findings raise questions about whether abnormal processing of facial emotions in maltreated

children is a result of the maltreatment experience or is linked to psychopathology resulting from maltreatment. No known study has examined the relationships among maltreatment, psychopathology, and atypical processing of emotion in a sample diagnosed with high rates of abuse-related psychopathology.

The present study examined the association between childhood maltreatment and cognitive processing of emotional information in a clinically diagnosed maltreated sample. Maltreated children experienced severe levels of abuse and, as a result, the majority exhibited high rates of PTSD as a result of their maltreatment. It was hypothesized that maltreated children with PTSD would display abnormal patterns of emotional processing consistent with previous findings in nondiagnosed maltreated populations. Thus, it was expected that maltreated children would process emotional faces (happy, neutral, and fearful) differently than controls, as evidenced by reaction time and emotion labeling measures. This difference was expected to be most pronounced for fearful faces. Secondary analyses tested whether atypical processing of emotion following trauma was related to the presence or absence of PTSD. These analyses were exploratory, as previous research has provided little evidence indicating how the presence or absence of PTSD might differentiate maltreated children's emotional recognition abilities. It was hypothesized that abnormalities in processing of facial emotions might be more acute among maltreated children with PTSD compared to maltreated children without PTSD, based on: (a) the previously discussed findings linking psychopathology and atypical face processing and (b) the likelihood that a diagnosis of PTSD following maltreatment might indicate a particularly severe reaction to the maltreatment experience. Evidence in support of this hypothesis would suggest that atypical processing of emotion might be uniquely linked with PTSD symptomatology, beyond its association with childhood maltreatment.

In this study, there were three reasons for choosing fear as the negative emotion of interest, rather than a different threatening emotional state, such as anger. First, previous research has demonstrated that fearful and angry faces reflect equal levels of negative emotion and arousal (Johnsen, Thayer, & Hugdahl, 1995), as well as intensity (Ekman, Friesen, O'Sullivan, & Chan, 1987; Matsumoto, Kasri, & Kooken, 1999), according to subjective ratings for both types of faces; thus, both fear and anger are likely to be distressing emotional stimuli. Second, although anger may indicate imminent threat for maltreated children, fear also suggests the presence of a threat in the immediate environment (Whalen, 1998; Whalen et al., 2001), for example, when exhibited by a sibling or parent who is also a victim of abuse. Because fearful faces only indicate the presence of a threat, they are also more ambiguous than angry faces, which provide information about the specific source of a threat (Whalen, 1998). Third, the long-term aim of this line of research is to understand the neural dysfunction that relates to maltreatment and maltreatment-related psychopathology. To this end, a task compatible with functional neuroimaging was designed in order to measure responses to facial emotions in predicted neural structures. There is a highly replicated finding in the neuroimaging literature that exposure to fearful faces activates the amygdala (Hariri, Bookheimer, & Mazziotta, 2000; Monk et al., 2003; Thomas et al., 2001; Whalen et al., 1998), more so than other threatening faces, including angry ones (Whalen et al., 2001). Given this long-term goal, fear was of particular interest.

Method

Participants

Table 1 provides participant details. Participants included 46 children (29 maltreated and 17 controls), ranging in age from 8 to 15 years, from ethnically diverse backgrounds. Maltreated participants were

Table 1
Sample demographics

	Maltreated group ($n = 29$)	Control group ($n = 17$)
Gender (% female)	52%	59%
Age (mean/*SD*)	11.3 (1.4)	12.1 (2.0)
Full IQ score (mean/*SD*)	92.1 (11.3)	88.4 (12.7)
Ethnicity		
Caucasian	17%	0%
African-American	35%	41%
Latino	35%	41%
Bi-racial	14%	18%
SCARED (mean/*SD*)	28.00 (16.7)	24.56 (10.7)
MFQ (mean/*SD*)	17.03 (12.1)	12.00 (7.8)
Diagnoses		
PTSD (definite/probable)	72%	0%
Anxiety	7%	6%
Depression	31%	12%
Externalizing disorders (ADHD/ODD/CD)	31%	6%

recruited through Connecticut's largest child protective service agency, the Department of Children and Families (DCF). These children had been removed from their homes for reasons of severe neglect and/or physical or sexual abuse and placed in DCF custody. They remained at DCF headquarters for 96 hours, for assessment and treatment planning, prior to placement in foster homes. At the time of data collection, approximately three quarters of the maltreated children were in DCF custody (half were in foster homes and one quarter were still at DCF headquarters awaiting placement in foster homes), and one quarter had returned to their biological homes. Control participants were children from the same residential areas as the maltreated children, with no known history of neglect, physical or sexual abuse, or exposure to domestic violence, according to parent reports and absence of DCF reports.

Maltreated and control groups were demographically matched with respect to age range, gender, IQ range, and annual household income. No participant's household income totaled more than $30,000. *t* tests showed no group differences for any demographic variable.

Procedures

Participants for this study were part of a larger study examining children's experiences with foster care following experiences with abuse or neglect. At recruitment, which took place during the 6 months prior to data collection, families were told that this research was designed to study foster care and find ways to improve these services. The study was first introduced to the birth mothers of maltreated children by DCF caseworkers, who asked permission for members of the research staff to contact each mother at a later date. Of the families approached by DCF, 95% agreed to participate in the study. Controls were recruited using targeted mailings and advertisements from the same residential areas in which the maltreated children lived prior to being removed from their homes. The Connecticut DCF's Institutional Review Board and Yale University's Human Investigations Committee approved all aspects of this study.

After agreeing to participate, potential subjects and their parents or legal guardians were given a detailed verbal and written explanation of the study by a member of the research staff. Children's legal guardians then signed consent forms and children signed assent forms. When the legal guardian was not the birth parent, written assent also was obtained from the birth parent if available. For children who were in DCF custody at the time of enrollment, DCF caseworkers provided consent for participation. Consent and assent were obtained for every participant.

Parents of both maltreated and control children were interviewed in their homes when possible, except for one mother of a maltreated child who was interviewed in prison. As part of this initial interview, parents underwent a psychiatric interview and completed questionnaires regarding their children. Parents were given $25 as compensation. Children's teachers also completed questionnaires.

Approximately 2–4 weeks following this interview, all participating children attended a day camp for 1 week during the summer, during which data collection and all measures were completed. Only maltreated children recruited through DCF caseworkers and demographically matched control children who responded to fliers were eligible to participate in the camp.

All children participated in "research time" for 2 hours each day during camp. During this time, children underwent a psychiatric interview and completed several self-report questionnaires, including a measure of IQ, and mood rating measures. These measures assessed global psychopathology and screened for a range of specific psychiatric conditions. During research time, children also completed the 'identification of facial emotions task' on laptops. When not engaged in research activities, children engaged in outdoor games, crafts, and theater.

Measurement of IQ and psychopathology

IQ assessment. IQ scores for each child were obtained using the Wechsler Intelligence Scale for Children-Revised (WISC-R; Wechsler, 1974), which shows excellent internal consistency (ICC = .96) for children ages 6–16 years. One DCF and two control subjects with IQ scores below 70 were excluded from analyses and are not included in the total *N*.

Global measures of psychopathology. The Schedule for Affective Disorders and Schizophrenia for School Aged Children-Present and Lifetime Version (K-SADS-PL; Kaufman et al., 1997) was administered to all participating children and at least one of their biological parents. This version of the K-SADS provides global and diagnosis-specific impairment ratings, and has excellent test-retest reliability for major depression, generalized anxiety disorder, conduct disorder (CD), and oppositional defiant disorder (ODD) (α = .77–1.00), and good test-retest reliability for PTSD and attention deficit/hyperactivity disorder (ADHD) (α = .63–.67).

For two maltreated children, no biological parent was available to be interviewed; in these cases, a foster parent or residential care staff member who had known the child for more than 1 month completed the Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1983; Achenbach & Rescorla, 2001), from which DSM-based diagnoses can be generated. The CBCL includes 118 items scored from 0 to 2, and has high test-retest reliability (α = .84–.97) and internal consistency (ICC = .90).

In addition, children's teachers completed the Teacher-Report Form (TRF; Achenbach, 1991), which is a teacher-report version of the CBCL that includes 118 items (93 have counterparts on the CBCL) assessing a range of problem behaviors at school, with good test-retest reliability (α = .62–.96), and internal consistency (ICC = .72–.95).

PTSD. Children completed the Child Post-traumatic Stress Disorder Checklist (Amaya-Jackson et al., 1995; Amaya-Jackson et al., 2000), a 28-item measure that has demonstrated high internal consistency (ICC = .82–.95), and high test-retest reliability ($\alpha = .91$) across diverse clinical samples of children and adolescents.

Anxiety. Children completed the Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al., 1997), which assesses severity of anxiety symptoms. The SCARED has 38 items scored from 0 to 76, with high internal consistency (ICC = .70–.90) and test-retest reliability ($\alpha = .74$–.93). Scores above 25 indicate presence of an anxiety disorder.

Depression. Participants completed the Mood and Feelings Questionnaire (MFQ; Angold et al., 1987), a 33-item self-report measuring depressive symptoms in children ages 8–18, with high internal consistency (ICC = .94) and test-retest reliability ($\alpha = .78$) (Wood, Kroll, Moore, & Harrington, 1995). Each item is scored from 0 to 2 giving an overall score range of 1–66; scores above 27 indicate presence of depression.

Assignment of final diagnoses

Global and specific measures of psychopathology completed by children and parents were combined to determine DSM-IV diagnoses using best estimate diagnostic procedures (Leckman, Sholomskas, Thompson, Belanger, & Weissman, 1982). In addition, all clinical materials (i.e., children's and parents' self-reports, teachers' reports, psychiatric interviews) were reviewed at a multidisciplinary team meeting led by an expert in assessing maltreatment and psychopathology (JK), and final diagnoses were assigned by consensus agreement.

In the maltreated group, 21 children out of the total 29 (76%) met criteria for a definite ($n = 16$) or a probable ($n = 5$) diagnosis of PTSD. The criteria for a probable diagnosis included presence of impairment and at least 75% of the symptoms required for a definite diagnosis of PTSD. In addition, 77% of these children with PTSD also met criteria for at least one comorbid diagnosis (depression, anxiety or externalizing disorders). Four control subjects had a current or past history of psychiatric diagnosis, although none met criteria for PTSD. Maltreated children with PTSD and maltreated children without PTSD did not differ significantly on any of the demographic variables used in matching maltreated and control children (gender, age, IQ), and neither group differed from controls.

Criteria for maltreatment

Maltreated children. Presence and severity of maltreatment were confirmed using the assessment procedures outlined in Guyer et al. (2006) and Kaufman et al. (2004). Maltreated children experienced at least one of the following five subtypes of maltreatment: neglect, emotional abuse, physical abuse, sexual abuse, and exposure to domestic violence, and received a severity score of at least 2 (the official level of severity required by the state to warrant a child's removal from his/her home and placement in foster care) on a scale from 0 (no evidence of maltreatment) to 4 (extreme maltreatment evident). Frequencies of each subtype and maltreatment severity within the maltreated group are outlined in Table 2.

Control children. All control children met the following criteria to ensure absence of maltreatment: (a) no evidence of current or past maltreatment or exposure to domestic violence according to the same measures

Table 2
Maltreatment subtypes and severity

	% with severity score ≥ 2 ($n = 29$)
Maltreatment subtypes	
Neglect	83
Emotional abuse	62
Physical abuse	66
Sexual abuse	38
Exposure to domestic violence	66
Number of subtypes experienced	
One	7
Two	24
Three	28
Four	31
Five	10

used to diagnose maltreated children, (b) an absence of DCF reports, past or present, as confirmed by the DCF computerized case record system; and (c) an absence of parent or child reports of any traumatic experiences at any time during the course of the study.

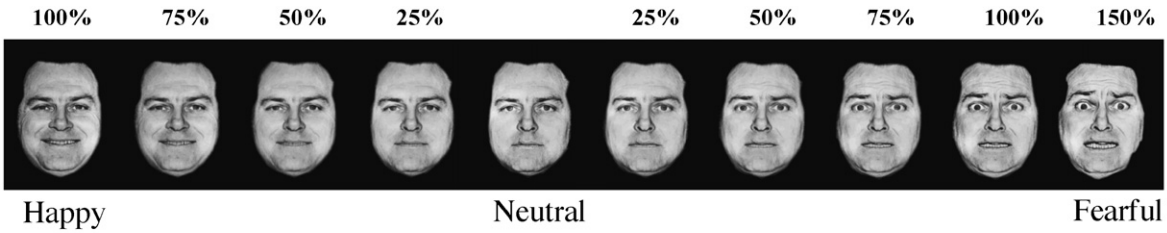
Identification of facial emotions task

Reaction time and emotion labeling were measured during a task in which facial emotions were identified, in order to determine children's ability to identify a range of facial emotions. Facial stimuli were chosen from an established set of photographs of faces exhibiting specific emotional expressions (Ekman & Friesen, 1976). Standardized happy, neutral and fearful faces from eight different models (four males, four females) were used. For each model a series of 10 variants of each emotional expression was created using morphing techniques (Blair, Morris, Frith, Perrett, & Dolan, 1999). The 80 stimuli used in the study ranged in intensity from 100% happy to neutral and from neutral to 100% fearful (see Figure 1); faces varied in intensity by intervals of 25%. An exaggerated fearful face (150% fear) also was included in order to examine more closely children's behavioral responses to facial expressions depicting an extreme level of negative emotion.

During this task, subjects were asked to identify each of the 80 stimuli as happy, neutral, or fearful by pressing the 1, 2, or 3 button as quickly as possible after each face was presented. Subjects were presented with the faces in eight blocks of 10 stimuli, so that each subject rated each of the 80 face stimuli once. Stimulus order was randomized across blocks and subjects. Instruction screens were presented at the beginning of the task and after each block of 10 stimuli. Instructions read: "What is the emotion? 1. Happy 2. Neutral 3. Fearful."

Data analysis

To assess how emotional recognition ability was related to maltreatment status, repeated measures analyses of covariance (ANCOVA) were performed to compare groups' reaction times and emotion labeling choices across the range of face types. Comparisons were made between control and mal-



Note. Facial expressions ranged from happy to neutral to fearful. Images morphed happy with neutral and neutral with fearful in the following order: 100% happy, 75% happy 25% neutral, 50% happy 50% neutral, 25% happy 75% neutral, 100% neutral, 75% neutral 25% fearful, 50% neutral 50% fearful, 25% neutral 75% fearful, 100% fearful and 150% fearful.

Figure 1. Sample array of facial stimuli.

treated groups, and secondary comparisons were made across three groups: maltreated with PTSD, maltreated without PTSD, and controls. Age was included as a covariate in order to account for developmental differences in reaction time, and IQ was included as a covariate because of previous research linking processing of faces and IQ (Anderson & Miller, 1998). No significant gender differences were found.

Post-hoc analyses were performed using Bonferroni corrections. The Greenhouse-Geisser technique was used to correct for violations of sphericity when necessary (McCall & Appelbaum, 1973). Reaction times below 200 ms or more than two standard deviations above the mean were excluded (Mogg & Bradley, 1999; Mogg, Philippot, & Bradley, 2004; Ratcliff, 1993). The number of excluded values (4.6%) did not differ between groups.

Results

The results revealed that maltreated children displayed faster reaction times than control children for identification of facial emotions, $F(9, 378) = 3.09$, $p = .001$ (Figure 2). Across all face types, the mean reaction time for maltreated children was 1,557 ms ($SD = 344.8$), compared to 1,685 ms ($SD = 299.1$) for controls. Post-hoc comparisons for each of the 10 face types revealed significant group differences at 50% and 100% fearful faces, indicating that maltreated children were faster than controls when identifying faces with specific degrees of fearfulness.

The difference between groups remained significant when considering effects of externalizing disorders. Particular attention was given to externalizing disorders because of the possibility of faster reaction times due to impulsivity (Sartory, Heine, Muller, & Elvermann-Hallner, 2002). After removing both normal and maltreated children who had a current or past diagnosis of an externalizing disorder, reaction times for the maltreated group remained significantly faster than those for the control group, $F(9, 243) = 2.26$, $p < .05$. Thus, heightened response time resulting from externalizing disorders does not explain these group differences.

A secondary set of analyses was performed to examine more closely the associations between PTSD and the faster reaction times in the maltreated sample. First, a repeated measure ANCOVA was performed to compare three groups on reaction time to identify the emotion: maltreated children with PTSD (defi-

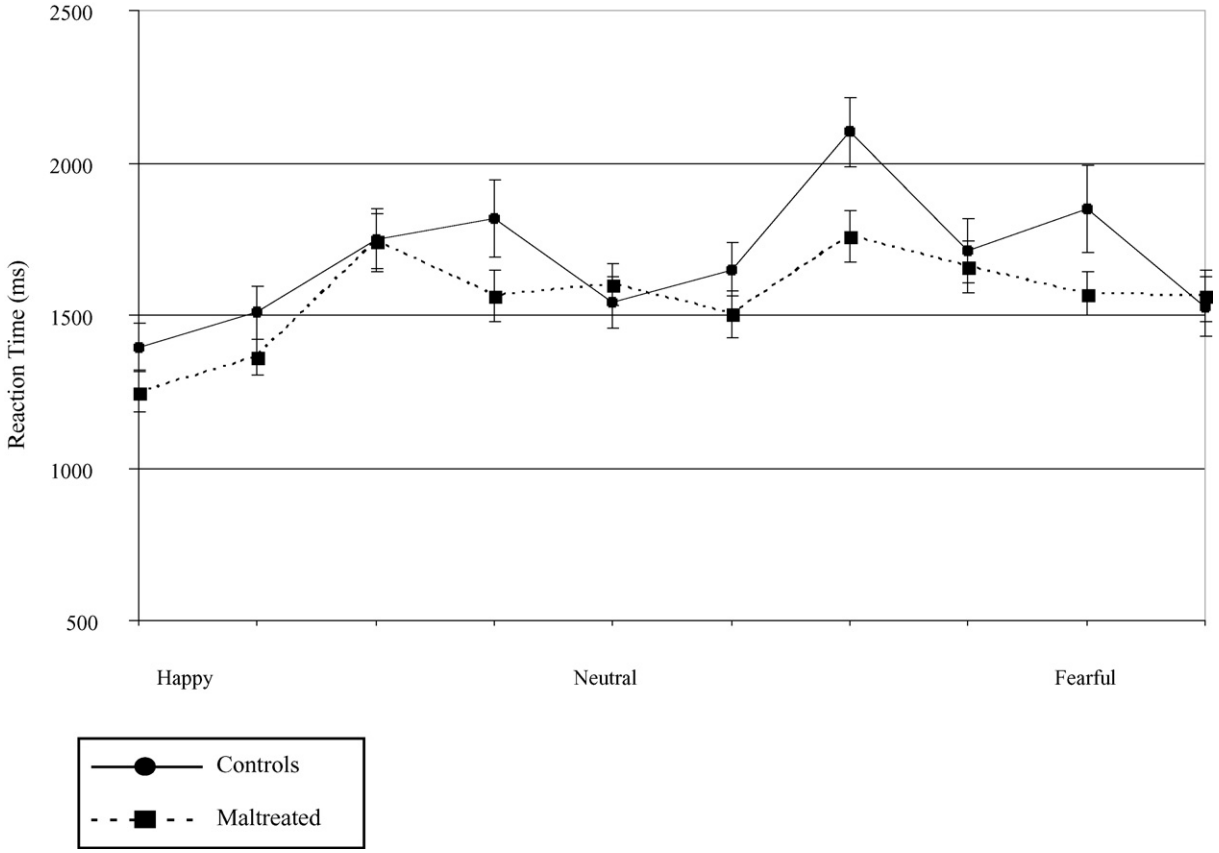


Figure 2. Emotional identification reaction times: maltreated vs. controls.

nite/probable), maltreated children without PTSD, and controls. Findings indicated that these three groups were significantly different, $F(18, 315) = 1.75$, $p < .05$; mean reaction times for each group were as follows: maltreated with PTSD = 1,530 ms ($SD = 248.8$), maltreated without PTSD = 1,627 ms ($SD = 539.3$), and controls = 1,685 ms ($SD = 299.1$). As illustrated in Figure 3, controls appeared slower than both maltreated groups, suggesting that the difference between these three groups may have been driven by a difference between maltreated children and nonmaltreated children in recognizing fearful emotions, independent of whether the maltreatment resulted in PTSD.

In order to test the possibility that differences across the three groups are attributable to a difference between maltreated children (with or without PTSD) and nonmaltreated children, three additional two-way ANCOVAs were conducted comparing: (a) maltreated children with PTSD to controls, $F(9, 261) = 2.14$, $p < .05$; (b) maltreated children without PTSD to controls, $F(9, 135) = 2.15$, $p < .05$; and (c) maltreated children with PTSD to maltreated children without PTSD, $F(9, 216) = .89$, $p = .54$. This final comparison revealed no difference between the two maltreated groups, indicating that compared to controls, maltreated children more quickly recognize facial emotions, particularly fear, independent of their clinical diagnosis.

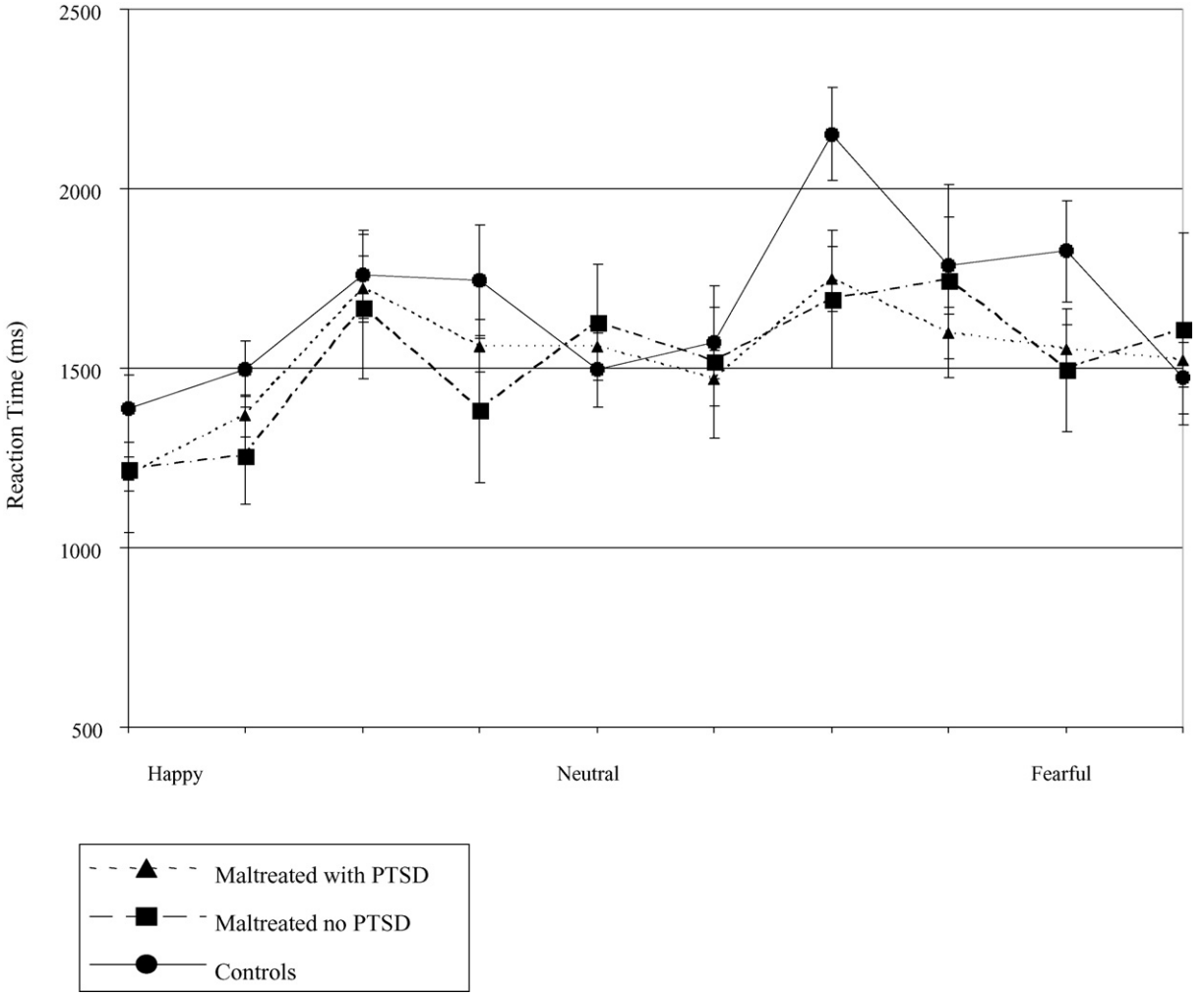


Figure 3. Emotional identification reaction times: maltreated with PTSD vs. maltreated without PTSD vs. controls.

Maltreated children and controls did not differ in the emotional labels that they assigned to each of the 10 face types, $F(9, 378) = 1.66$, $p = .19$. Moreover, the mean responses for both groups accurately reflected the degree of emotion present in each face stimuli. For example, for both groups mean responses for 50% happy faces (morphed with equal amounts happy and neutral), were between 1 and 2, the numerical responses used to indicate "happy" and "neutral," respectively. The presence of a psychiatric diagnosis did not affect this result.

Discussion

In this study, maltreated children were faster than demographically matched controls at identifying facial emotions, and this difference was significantly pronounced in response to fearful faces at specific

levels of intensity. This finding supports previous work indicating that maltreated children show enhanced sensitivity to negative faces, and extends this finding to a psychiatrically diagnosed population of severely traumatized children with high rates of PTSD.

These findings suggest that maltreated children may become hypervigilant when processing emotions associated with their abuse. Maltreated children are likely to have more detailed representations of negative emotion, including fear, and thus require less information for recognition. This heightened sensitivity might refine the ability to identify threatening situations and potentially shield against additional abuse. For example, heightened ability to identify fear on a parent or sibling's face, which may often indicate a threat in the immediate environment, may be particularly adaptive in abusive homes.

These findings further suggest that there may be differences in children's cognitive functioning resulting from maltreatment. Children who are raised in environments in which they are exposed to violence and witness more fearful faces may dedicate greater cognitive resources to rapidly identifying these expressions, as evidenced by maltreated children's faster reaction times when identifying fearful faces. It is possible that this improved ability to identify fearful faces may relate to an overall bias in cognitive processing toward threatening or negative stimuli. Thus, in addition to identifying fear faster, maltreated children may also be quicker to infer a threatening intention in an ambiguous situation. Further work is needed to uncover how aspects of these group differences in facial expression identification map onto overall cognitive styles.

One important issue examined in the current study concerns the degree to which associations between maltreatment and processing of facial emotions may be related to presence of psychopathology. Exploratory analyses yielded no evidence to suggest that increased sensitivity to fearful faces relates to a current diagnosis of PTSD. Findings revealed that maltreated children with no diagnosis and those with PTSD were both faster than controls when identifying fearful faces. Therefore, it is possible that maltreatment and aberrant processing of emotion are linked through a pathway unrelated to the development of PTSD. Despite these findings, it is important to note the unequal numbers of participants in the PTSD and non-PTSD maltreatment groups and consider the possibility that a true difference may not have been detected due to insufficient power.

In this study, no between-group differences emerged in choice of emotional label when identifying faces as happy, neutral, or fearful. Despite differences in processing time, both groups labeled faces in a way consistent with the degree of emotion expressed. This lack of difference in emotion labeling could indicate that the task used is less sensitive than those used in similar, previous studies. For example, Pollak and Kistler (2002) found that maltreated children were more likely than controls to categorize an ambiguous emotional face as negative during a task similar to the one used in the current study. In this previous study, however, a morphed face continuum that included happy, fearful, sad, and angry faces with emotions varying in 10% increments was used, whereas in the current study the degree of emotion in the faces changed in 25% increments. Thus, compared to Pollak and Kistler's study, the task used in this study included fewer faces with a high degree of ambiguity, which might explain the lack of group difference.

One interesting aspect of these findings is that aside from clear group differences in reaction time related to fear processing, maltreated and control children displayed quite similar responses to emotional faces overall, for both reaction time and emotion labeling choices. Some of this selectivity in the between-group differences for maltreated and control children may be a result of careful demographic matching across groups. This procedure likely reduced group differences resulting from factors unrelated to maltreatment,

and helped illuminate differences due to maltreatment. In addition, it is interesting to note that for the two faces for which significant differences were found, controls appeared to increase reaction time somewhat compared to their response times for other faces, whereas maltreated children maintained their speed (Figure 2). This pattern suggests that nonmaltreated children may spend extra time processing fearful faces, whereas for maltreated children, these faces are recognized as readily as neutral and happy faces. This finding provides further evidence that fearful faces may be somewhat novel and disconcerting for children growing up in typical caregiving environments, whereas for maltreated children they may be more commonly encountered in daily life.

Limitations and future directions

There were three primary limitations of this study. First, the sample size was small, which limited statistical power, especially when making comparisons between maltreated children with and without PTSD. However, given that significant results emerged in several analyses, small sample size seems unlikely to undermine the conclusions that emerge from the key analyses. Second, this study included children spanning a relatively wide age range (8–15 years). Age was covaried in all analyses to account for potential age-related differences in reaction time, and there were no significant age differences across groups; however, it is possible that developmental level differentially influenced interpretation of task instructions and performance. Third, the task stimuli used had limited sensitivity, as discussed above, which may have concealed group differences in emotional labeling of emotionally ambiguous stimuli. The decision to use 25% increments of emotional change and only two types of emotion resulted from concerns with subject compliance, since the inclusion of more stimuli would have produced a considerably longer task. It remains unclear if severely traumatized children with high rates of PTSD could comply with task demands throughout a longer task.

Future studies with larger samples will be able to explore processing of facial emotions among clinically diagnosed children with a greater range of disorders. Although several children in the maltreated group met criteria for comorbid diagnoses, there was not sufficient power to explore differential outcomes related to diagnoses other than PTSD. In addition, future longitudinal studies spanning a broader time period also may reveal later outcomes of atypical processing of emotion beyond those explored in the current study.

Clinical implications

This study explored the impact of childhood maltreatment on social-cognitive processing. Understanding how maltreated children differ from nonmaltreated children may lead to more targeted treatment strategies. For example, findings indicate experience with maltreatment leads to heightened sensitivity to distressing emotional stimuli. Thus, treatments may be developed for maltreated children that focus on more normative interpretation of social stimuli, so that ambiguous social encounters are not rapidly identified as threatening. In addition, the results suggest that treatments designed to normalize atypical processing of emotion may benefit all maltreated children, not just those with psychological symptoms, as abnormal processing was present in maltreated children regardless of diagnosis.

Summary

This is the first known study to examine processing of facial emotions in a sample of maltreated children characterized by high rates of maltreatment-based PTSD. Results indicated that maltreated children exhibit heightened sensitivity to fearful faces, as indicated by reaction times significantly faster than those of control children. In addition, there were no differences found in processing of emotion between maltreated children with and without diagnoses of PTSD, suggesting that atypical processing of emotion results from maltreatment and is not uniquely associated with PTSD resulting from maltreatment. Atypical processing of emotion and psychopathology symptoms may be two independent outcomes of childhood maltreatment.

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