Long-term Effects of Child Abuse and Neglect on Emotion Processing in Adulthood

Joanna Cahall Young and Cathy Spatz Widom

Psychology Department, John Jay College of Criminal Justice/CUNY Graduate Center
Correspondence may be sent to Joanna Cahall at: jcahall@gc.cuny.edu

A key component of social competence is emotion processing, which includes emotion perception, communication, interpretation, and regulation of emotion (Halberstadt, Denham, & Dunsmore, 2001). Emotions function to provide information about the environment and prepare for a behavioral response, triggering the appetitive or defensive systems, depending on the situation (Bradley, Codispoti, Cuthbert, & Lang, 2001). Theories of emotion suggest that behavioral responses to emotions are directly related to emotion processing (Halberstadt et al., 2001). This paper brings together research on child maltreatment, emotional development, and psychopathology to examine the consequences of child abuse and neglect for emotion processing in adulthood.

Childhood Maltreatment and Emotion Processing

In general, child maltreatment has been found to disrupt the normal process of emotional development. First, studies of maltreating parents suggest that they show less positive emotion and more negative emotion than non-abusive parents (Bugental, Blue, & Lewis, 1990; Kavanagh, Youngblade, Reid, & Fagot, 1988). It is also believed that maltreating parents tend to be isolated themselves and to isolate their children from interaction with others, providing fewer nonparental models of emotional communication (Salzinger, Feldman, Hammer, & Rosario, 1993).

Second, a child who receives inconsistent or harsh caregiving has difficulty predicting the consequences of his/her behavior (Dadds & Salmon, 2003) and this may be manifest in deficits in processing emotional information. For example, maltreated children have been found to show specific deficits in understanding (Shipman & Zeman, 1999), recognizing (Pollak, Cicchetti, Hornug, & Reed, 2000), and expressing emotion (Gaensbauer, 1982) and are at risk for exhibiting social delays (Kim & Cicchetti, 2010), deficits in empathy (Beeghly & Cicchetti, 1994), and decreased engagement in prosocial behavior (Koenig, Cicchetti, & Rogosch, 2004). These findings reveal general deficits in emotion processing in maltreated children, but the question remains about whether these deficits would persist into adulthood.

Using tests of facial emotion recognition (FER), Pollak and Sinha (2002) found that children with physical abuse histories were better able to identify facial displays of anger compared to controls. Several other studies using event-related potentials and behavioral evidence have found a sensitivity bias to perceive anger in physically abused children (Pollak & Sinha, 2002; Pollak, Vardi, Pultzer-Bechner, & Curtin, 2005; Shackman, Shackman, & Pollak, 2007) and, more generally, in a sample of maltreated children (Curtis & Cicchetti, 2011, 2013; Leist & Dadds, 2009; Masten et al., 2008; Pollak,

Klorman, Brumaghim, & Cicchetti, 2001). In an attempt to explain these findings, Pollak et al. (2005) suggested that in abusive home environments children learn to associate anger with threat of harm and therefore, they are hypervigilant to anger in their environment. Masten et al. (2008) elaborated on this theory to suggest that maltreated children become better prepared to identify threatening situations through hypervigilance of emotions. For example, these children may be more sensitive to anger in their abuser and fear of those around them because both sensitivities could help them identify threat quickly and potentially avoid additional abuse (Masten et al., 2008). Consistent with these theories, Shackman et al. (2007) have shown that maltreated children show enhanced selective attention to angry facial expressions posed by their mothers. Thus, this body of research would suggest that individuals with histories of childhood physical abuse might be less likely to show deficits in processing negative emotional pictures and more likely to show deficits for pictures with positive or neutral valence.

Very little research has examined emotion recognition in neglected children. In earlier research, Bousha and Twentyman (1984) found that neglecting parents were less expressive and engaged with little exchange of affective information in interactions with their children and, thus, provided less support in learning to understand emotions more generally. Impoverished social and emotional environments, which are often present in cases of neglect, prevent the development of normal emotional skills (Pollak et al., 2000) and may cause a blunted pattern of emotional reactivity (Gilles, Berntson, Zipf, & Gunnar, 2000; van der Vegt, van der Ende, Kirschbaum, Verhulst, & Tiemeier, 2009). Pollak et al. (2000) reported that neglected children had more difficulty in recognizing emotional expressions in a vignette than a control group or physically abused children. When rating the similarity between facial expressions of different emotions, neglected children saw fewer distinctions between emotions compared to the other two groups (Pollak et al., 2000). However, this is the only study to investigate emotion perception deficits specific to neglected children. Most studies have included only physically abused children or maltreated children (i.e. physically abused and/or neglected children). To our knowledge, no studies have focused on sexually abused children, and the existing literature is based almost exclusively on studies of children, with no research investigating the long-term effects of childhood abuse and neglect on adult emotion processing ability.

Potential Mechanisms Linking Childhood Maltreatment and Emotion Processing

If the impact of child abuse and neglect on emotion processing extends into adulthood, what might be some of mechanisms that lead to these outcomes? Research has increasingly shown that childhood abuse and neglect can result in a cascade of negative consequences across multiple domains of functioning (Gilbert, Widom, Browne, Fergusson, Elspeth, & Janson, 2009; Widom, 2000) that might explain an increased risk for deficits in emotion processing abilities for individuals with histories of child abuse and/or neglect. Specifically, child abuse and neglect has been associated with cognitive deficits in general and various forms of psychopathology that may lead to emotion processing deficits.

First, several studies have reported that abused and neglected children are at increased risk for lower academic performance and intelligence in childhood (Eckenrode, Laird, & Doris 1993; Jonson-Reid, Drake, Kim, Porterfield, & Han, 2004; Lansford, Dodge, Pettit, Bates, Crozier, & Kaplow, 2002) and that these effects of childhood maltreatment extend into young adulthood (Perez & Widom, 1994). Thus, it is possible that deficits in intelligence lead to general deficits in performance on processing tasks, particularly those that involve memory, and this finding may help explain why maltreated children perform worse on these tasks.

It is also possible that some of the psychological consequences that have been associated with child abuse and neglect have a negative impact on performance on emotion processing tasks in adulthood. For example, individuals with histories of abuse have been found to exhibit more symptoms of anxiety disorders (Springer, Sheridan, Kuo, & Carnes, 2007). A separate body of research reveals that individuals with higher levels of anxiety symptoms show deficits in emotion perception (Mogg & Bradley, 1999) and emotion regulation (Suveg, Morelen, Brewer, & Thomassin, 2010), and individuals with PTSD have shown an attentional bias to trauma-related stimuli (Buckley, Blanchard, & Neill, 2000). In work by Pollak et al. (2001), certain emotional cues become salient indicators of threat. Thus, in an emotion processing task, highly anxious individuals might be more likely to perform poorly on emotion processing tasks.

Childhood maltreatment has also been associated with increased risk for depression (Cannon, Bonomi, Anderson, Rivara, & Thompson, 2010; Springer et al., 2007; Widom, DuMont, & Czaja, 2007). In turn, a separate body of research suggests that individuals with depression exhibit deficits in regulating emotions (Joormann, Siemer, & Gotlib, 2007) and perceiving emotion in others (Stuhrmann, Suslow, & Dannlowski, 2011). Therefore, it is possible that maltreated children may have difficulty recognizing emotions as a function of higher levels of depression (Eberhart, Auerbach, Bigda-Peyton, & Abela, 2011).

At present, it is unclear whether the association between child maltreatment and deficits in processing of emotion would persist, independent of the effects of psychopathology. In one of the few studies to address this issue, Masten et al. (2008) focused on how PTSD might relate to maltreated children's processing of emotions and found that maltreated children displayed a heightened ability (faster reaction time compared to controls) to identify fearful faces, independent of PTSD diagnosis. These findings with children suggest that maltreatment is uniquely related to emotion processing deficits, regardless of PTSD symptomatology.

In addition to internalizing consequences of child abuse and neglect, there is also a body of research that has linked childhood maltreatment to externalizing traits, including antisocial behavior and psychopathy (Bernstein, Stein, & Handelsman, 1998; Kolla, Malcolm, Attard, Arenovich, Blackwood, & Hodgins, 2013; Lang, Klinteberg, & Alm, 2002; Weiler & Widom, 1996). A number of studies have also reported emotion processing deficits in individuals with antisocial and psychopathic traits (Blair, Peschardt, Budhani, Mitchell, & Pine, 2006), including deficits in empathy (Blair, 1995), experiencing of emotion (Blair et al., 2006; Frick, Lilienfeld, Ellis, Loney, & Silverthorn, 1999), and identifying emotional expressions (Blair et al., 2004; Deeley et al., 2006; Iria & Barbosa, 2009; Pham & Philippot, 2010). Antisocial individuals have been found to show specific deficits in perceiving negative emotions in facial expressions and to be less accurate in identifying emotions of fear or sadness than emotions of happiness or surprise (Blair, Colledge, Murray, & Mitchell, 2001; Nichols, 2001). Maltreated children may show emotion processing deficits in adulthood through higher levels of psychopathic traits, reflecting greater desensitization, less empathy, or less responsiveness to the needs of others (Weiler & Widom, 1996), critical characteristics of psychopaths. In sum, there are a number of plausible mechanisms that might explain deficits in emotional processing in adults with histories of childhood abuse and neglect and warrant investigation.

Specific Aims and Hypotheses

This study has several aims. The first goal is to assess emotion processing abilities in individuals with documented histories of childhood abuse and neglect and a matched control group who have been followed up into adulthood.

Hypothesis 1

Participants with a history of childhood maltreatment will be less accurate overall in recognizing affective pictures than controls, suggesting general deficits in processing emotional cues.

The second aim is to determine whether these emotion processing deficits vary by types of childhood maltreatment (physical and sexual abuse and neglect) and by emotional valance (positive, negative, or neutral). However, given the dearth of literature on the topic, no specific predictions are made about children who have been sexually abused.

Hypothesis 2

Based on earlier work suggesting that children growing up in abusive home environments will learn to associate anger with threat of harm (Pollak et al., 2005), it is hypothesized that victims of childhood physical abuse will be more accurate in recognizing negative images (that is, physically abused children will not differ from controls), but less accurate in recognizing positive and neutral images, than matched controls.

Hypothesis 3

As a result of their impoverished social and emotional environments, it is predicted that neglected children will be less accurate in recognizing negative and positive images (emotionally valenced pictures) than controls.

A final aim is to examine whether the associations between childhood maltreatment and deficits in emotion processing abilities are, in part, a function of consequences of child maltreatment, specifically, IQ, psychopathology (Generalized Anxiety Disorder, PTSD, Dysthymia, and Major Depressive Disorder), and psychopathy or whether deficits are independent of these forms of psychopathology.

Hypothesis 4

It is hypothesized that IQ, psychopathology, and psychopathy will each mediate the relationship between child abuse and neglect and emotion processing accuracy.

Methods

Overview

The data used here are from a prospective cohort design study in which abused and neglected children were matched with non-abused, non-neglected children and followed into young adulthood. Because of the matching procedure, the participants are assumed to differ only in the risk factor (i.e., having experienced childhood sexual or physical abuse or neglect). Because it is not possible to assign participants to groups randomly, the assumption of equivalency for the groups is an approximation. The control group may also differ from the abused and neglected individuals on other variables associated with abuse or neglect. (For complete details of the study design and subject selection criteria, see Widom, 1989a.)

The initial phase of the study compared the abused and/or neglected children to the matched comparison group (N = 1,575) on juvenile and adult criminal arrest records (Widom, 1989b). The second phase involved tracking, locating, and interviewing both groups during 1989–1995, approximately 22 years after incidents of abuse and neglect (N = 1,196). This interview consisted of a series of structured and semi-structured questionnaires and rating scales, including the National Institute of Mental Health (NIMH) Diagnostic Interview Schedule - Revised (DIS-III-R), a standardized psychiatric assessment that yields Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R) diagnoses (Robins, Helzer, Cottler, & Goldring, 1989). Subsequent follow-up interviews were conducted in 2000–2002, 2003–2005, and in 2009–2010. The research presented in this paper uses information collected during all four interviews.

Participants and Design

The original sample of abused and neglected children (N = 908) was made up of court-substantiated cases of childhood physical and sexual abuse and neglect processed from 1967 to 1971 in the county juvenile (family) or adult criminal courts of a Midwestern metropolitan area. Cases of abuse and neglect were restricted to children 11 years of age or less at the time of the incident. A control group of children without documented histories of child abuse or neglect (N = 667) was matched with the abuse/neglect group on age, sex, race/ethnicity, and approximate family social class during the time that the abuse and neglect records were processed.

The control group represents a critical component of the study design. Children who were under school age at the time of the abuse and/or neglect were matched with children of the same sex, race, date of birth (±1 week), and hospital of birth through the use of county birth record information. For children of school age, records of more than 100 elementary schools for the same time period were used to find matches with children of the same sex, race, date of birth (±6 months), class in elementary school during the years 1967–1971, and home address, preferably within a five-block radius of the abused/neglected child. Overall, matches were found for 74% of the abused and neglected children. Non-matches occurred for a number of reasons. For birth records, non-matches occurred in situations when the abused and neglected child was born outside the county or state or when date of birth information was missing. For school records, non-matches occurred because of lack of adequate

identifying information for the abused and neglected children or because the elementary school had closed and class registers were not available.

Of the original sample, 83% were located, and 1,196 (76%) participated in the 1989–1995 interview. Of those participants, 896 completed the second interview (2000–2002), 808 completed the third interview (2003–2005), and 649 completed the 2009–2010 interviews. The composition of the sample at the various waves of interviews has remained about the same. There were no significant differences in sex, race, age at initial abuse/neglect petition, or proportion who experienced overall abuse and/or neglect or any specific type of abuse or neglect across the four waves.

Of the 649 participants that completed the 2009–2010 interviews, 547 had complete information on the measures included here. Participants ranged in age from 38- to 55-years old ($M = 47.10$; $SD = 3.45$), and 42.2% were male. Race/ethnic composition was 56.2% White, 35.3% African American, and 3.4% Hispanic. The overall abuse and neglect group represented 53.9% ($n = 295$) of the sample [physical abuse 7.7% ($n = 42$), sexual abuse 9% ($n = 49$), and neglect 43% ($n = 235$)]. These numbers add up to more than 295 because some participants had experienced more than one type of abuse or neglect). Table 1 presents demographic characteristics of the sample and descriptive statistics on each of the variables.

Table 1
Demographic Information and Descriptive Statistics

Procedure

Participants completed the interviews in their homes or, if preferred by the participant, another place appropriate for the interview. The interviewers were blind to the purpose of the study and to the inclusion of an abused and/or neglected group. Participants were also blind to the purpose of the study and were told that they had been selected to participate as part of a large group of individuals who grew up in the late 1960s and early 1970s. Institutional Review Board approval was obtained for the procedures involved in this study, and participants who participated gave written, informed consent. For individuals with limited reading ability, the consent form was presented and explained verbally.

Measures

Independent variable
Childhood abuse and neglect Childhood physical and sexual abuse and neglect were assessed through review of official records processed during the years 1967–1971. Physical abuse cases included injuries such as bruises, welts, burns, abrasions, lacerations, wounds, cuts, bone and skull fractures, and other evidence of physical injury. Sexual abuse charges included felony sexual assault, fondling or touching in an obscene manner, sodomy, incest, and rape. Neglect cases reflected a judgment that the parents' deficiencies in childcare were beyond those found acceptable by community and professional standards at the time and represented extreme failure to provide adequate food, clothing, shelter, and medical attention to children. For the current study, abuse/neglect was coded (0 = *no abuse history*, 1 = *history of physical, sexual abuse, and/or neglect*). Any Physical abuse was coded (0 = *no physical abuse history*, 1 = *history of physical abuse*). Any Sexual abuse was coded (0 = *no sexual abuse history*, 1 = *history of sexual abuse*). Any Neglect was coded (0 = *no neglect history*, 1 = *history of neglect*). The specific type of abuse or neglect was coded as present, regardless of whether or not the person had experienced other types of abuse as well. Overall, 10.5% ($n = 31$) of the abuse/neglect group experienced more than one type of maltreatment.

Outcome variable
International Affective Picture System (IAPS, Lang, Bradley, & Cuthbert, 2005) The IAPS, a set of photos depicting positive, negative, or neutral content, has been used as a paradigm for studying the processing of emotional stimuli (Bradley, Greenwald, Petry, & Lang, 1992). The IAPS has previously been used as a recall/recognition task to measure memory of affective information (Blake, Varnhagen, & Parent, 2001; Bradley et al., 1992; Talmi, Schimmack, Paterson, & Moscovitch, 2007). Research

suggests that attention is more likely to be directed to a stimulus with a motivational significance to an individual (e.g., an emotional stimulus) than a neutral, non-relevant stimulus (Sanchez-Navarro, Martinez-Selva, & Roman, 2005). In addition, several researchers have found that emotion has an enhancing effect on memory (e.g. Bradley et al, 1992). Therefore, in the IAPS recognition task, participants should be more accurate in recognizing positively and negatively valenced pictures compared to neutral pictures and deficits in recognizing emotionally valenced pictures may suggest that the participant failed to attend to the emotional cues in the picture. In this conceptualization, recognition is a marker of vigilance for emotional stimuli.

The latest version of the IAPS (Lang et al. 2005) was used during the 2009–2010 in-person interview. The developers of the IAPS provide normative ratings on the valence (positive, negative, neutral) and dimensions of valence, ranging from 1 (*the most negative*) to 9 (*the most positive*) on a Likert-type rating scale. Out of the total 942 digital still photos that comprise the IAPS library, a total of 24 images, 8 neutral and 16 emotional (8 positive, 8 negative) were chosen using valence ratings obtained from prior validation studies (see Appendix A for the IAPS numbers, a brief title for the image, and image valences for all images used in this study). The pictures selected varied widely in content (including the neutral and mundane) and affective tone, from calm to arousing and pleasant to unpleasant. Each of these 24 images had a novel partner image similar in content and, when possible, matched on emotional valence that was used in the recognition task. Like the original images, the 24 matching, novel images were selected from the IAPS. The IAPS emotion valence scores for each group (negative, positive, and neutral) differed significantly from each other, $F (2, 47) = 334.32$, $p < .01$, with the valence of positive images averaging 7.48, neutral images 5.17, and negative images 2.92.

Appendix A
International Affective Picture System (IAPS) Number, Image Title, Image Valence, and Valance Score

Before the IAPS was administered, participants were told that they would be viewing a series of images on the computer screen and to watch the images as they would a television. Administration consisted of two parts: a) an initial presentation phase in which the participant watched a series of 24 target images (positive, neutral, and negative) presented in random order for two seconds each (with no pause between images), and b) a recognition phase approximately 15 minutes later in which the participant watched a second series of 48 images (24 of which were the original target images from the presentation phase and 24 "novel partner" images) presented in random order. During the recognition phase, the participant was instructed to indicate whether or not he/she saw each image earlier. Each image appeared on the screen until the participant pressed a key to indicate whether he/she had seen the image before. Pictures were presented on a standard sized laptop PC. Recognition accuracy was calculated as the number of times the participant correctly indicated whether or not he/she had seen each of the positive, negative, and neutral pictures previously during the presentation phase.

Potential Mediators

Psychopathology The Diagnostic Interview Schedule - Revised (DIS-III-R), a standardized psychiatric assessment that yields Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R) diagnoses (Robins et al., 1989) was administered during the 1989–1995 in-person interviews to assess for Generalized Anxiety Disorder (GAD), Posttraumatic Stress Disorder (PTSD), Major Depressive Disorder (MDD), and Dysthymia. Continuous variables reflecting the number of lifetime symptoms reported for each of these disorders are used in analyses. The DIS-III-R demonstrates adequate reliability (Robins, Helzer, Croughan, & Ratcliff, 1981). Table 1 presents the means and standard deviations for the number of lifetime symptoms for each of these disorders for these participants at approximate age 29.

Psychopathy The Psychopathy Checklist- Revised (PCL-R; Hare, 1991, 2003), the revised 20-item version, was used to determine psychopathy scores for the participants. Psychopathy ratings were based on information obtained from *both* official records and the 1989–1995 interviews (see Weiler & Widom, 1996 for details). Following Hare (1991), items were scored as follows: 0 = *the person does not meet the criteria for the item*, 1 = *the person meets the criteria to a certain extent*, and 2 = *the*

person clearly meets the criteria for the item. Because of the large number of participants and the massive amount of information, computer-generated PCL-R scores based on ratings from trained raters were calculated for each subject using SPSSX. A computerized scoring algorithm was developed after careful review and study of the criteria described in the PCL-R manual, discussion of the criteria and information available from our interview and files with PCL-R trainers. Using data from participants without excessive missing data, reliability analysis of the PCL-R in SPSS indicated that Cronbach's Alpha was .80. In this sample, PCL-R scores ranged from 0 to 30 (*M* = 7.65; *SD* = 6.48) with 6.4% scoring above 20, the top third of the distribution of scores (see Table 1).

IQ The Quick Test (QT; Ammons & Ammons, 1962), a vocabulary test of intelligence that provides an index of overall cognitive functioning, was measured during the first interview that occurred during 1989–1995. The QT has been demonstrated to be a useful, reliable estimate of intellectual functioning (Ammons & Ammons, 1962). Total scores were based on a raw count of items correct that were then recoded into scores ranging from 0 to 160 to be consistent with typical IQ test scoring with higher scores indicating higher intellectual functioning (see Table 1). The validity of the QT has been established through comparisons with other measures of IQ such as the Wechsler Adult Intelligence Scale, particularly with WAIS Verbal IQ (Abidin & Byrne, 1967; Davis & Dizzonne, 1970).

Demographic Information Control variables included sex (*male* = 0, *female* = 1), race (*White, non-Hispanic* = 1, *others* = 2), age, and socio-economic status (see Table 1). Age was a continuous variable representing the participant's age during the 2009–2010 interviews. Occupational Code from the Hollingshead Four Factor Index of Socioeconomic Status (SES) (Hollingshead, 1975) was used, with nine categories ranging from *menial service workers* to *higher executives*.

Analyses

Prior to analysis, all variables in the study were assessed for univariate normality and multicollinearity. To assess univariate normality, skewness and kurtosis values were assessed using the guidelines for larger sample sizes (DeCarlo, 1997; Tabachnick & Fidell, 2013). No variables in this study were determined to be skewed or kurtotic. Multicollinearity was assessed using the Variance Inflation Factor (VIF) criteria (Tabachnick & Fidell, 2013) and no variables were determined to be multicollinear. (Correlation coefficients for all variables and measures are presented in Table 2.)

Table 2

Intercorrelation Matrix of All Variables

Ordinary Least Squares (OLS) regressions were conducted to determine whether child abuse and neglect predicted potential mediators (psychopathology and IQ) and recognition accuracy. Regressions are reported using standardized coefficients (*β*) and all analyses controlled for age, sex, race, and SES. Separate regressions were performed to examine positive, negative, and neutral recognition accuracy.

Mplus Version 6.0 was used to conduct Structural Equation Modeling (SEM) to examine the role of potential mediators of the relationship between childhood abuse and neglect and picture recognition accuracy. All analyses controlled for age, sex, race, and SES, and matched controls were used as the comparison group in all analyses. For structural models, multiple indices of overall model fit (chi-square statistic [χ^2], comparative fit index [CFI], Tucker–Lewis index [TLI], Root-mean-square error of approximation [RMSEA], and standardized root mean square residual [SRMR]) were evaluated. A low chi-square and non-significance (*p* < .05) are desirable, and a chi-square to degrees of freedom (*df*) ratio of less than 5 is considered adequate (Bollen, 1989). A comparative fit index (CFI) and Tucker–Lewis index (TLI) of .90 or higher indicate good fit. Root-mean-square error of approximation (RMSEA) of less than .05 is considered a close fit, and a standardized root mean square residual (SRMR) of less than .08 is generally considered a good fit (Hu & Bentler, 1999). Current recommendations support consideration of both the chi-square test and other indices of model fit (Barrett, 2007).

Strength of mediational relationships was evaluated with tests of indirect effects ([MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002](#)) and bias-corrected bootstrapped confidence intervals ([MacKinnon, Lockwood, & Williams, 2004](#)). Full information maximum likelihood estimation was used to handle missing data on the SES variable. This method uses all data available for each case and thus avoids biases and loss of power associated with traditional approaches to missing data ([Allison, 2003](#); [Schlomer, Bauman, & Card, 2010](#)).

Results

Child Abuse and Neglect and Recognition Accuracy

[Table 3](#) presents findings regarding accuracy in emotion recognition by group (abuse/neglect vs. control) and type of maltreatment (any physical abuse, any sexual abuse, and any neglect vs. control). As hypothesized, childhood abuse and neglect significantly predicted overall recognition accuracy (β =−0.11, $p < .01$) and this model explained 5% of the variance ($R^2 = .05$, $p < .01$) indicating that individuals with a history of childhood abuse/neglect were less accurate in recognizing pictures than those without a history of childhood abuse/neglect. Neglect also significantly predicted overall recognition accuracy (β =−0.10, $p < .05$) explaining 5% of the variance ($R^2 = .05$, $p < .05$), but physical and sexual abuse did not. However, it should be noted physical and sexual abuse showed a similar non-significant trend. The effect size and the mean recognition accuracy scores for physical and sexual abuse groups were similar to those for the neglect group, suggesting that the lack of significant findings for overall picture recognition accuracy for the physical and sexual abuse groups may have been due to the small sample size of these two groups.

[Table 3](#)

Regressions Predicting Picture Recognition Accuracy by Group (Abuse/Neglect vs. Control) and Type of Abuse/Neglect

Picture Valence and Recognition Accuracy

Negative, neutral, and positive picture recognition accuracy scores were also compared for group (abuse/neglect vs. control) and type of maltreatment (see [Table 3](#)). Abuse/neglect overall ($\beta = −0.13$, $p < .01$) and neglect (β =−0.13, $p < .01$) each significantly predicted <u>positive</u> picture recognition accuracy, indicating less accuracy among these individuals in recognizing positive pictures, compared to controls. In addition, abuse/neglect overall ($\beta = −0.10$, $p < .05$) and physical abuse (β =−0.12, $p < .05$) each significantly predicted less accuracy in <u>neutral</u> picture recognition. Neither abuse/neglect in general or specific types of maltreatment predicted <u>negative</u> picture recognition accuracy. Interestingly, although not hypothesized, childhood sexual abuse predicted poorer performance on positive picture recognition, compared to controls (β =−0.13, $p < .05$).

Child Abuse and Neglect and Potential Mediators: Psychopathology, Psychopathy, and IQ

The next set of results examined the extent to which the independent variables (overall abuse/neglect and type of maltreatment) predicted the hypothesized mediators (psychopathology, psychopathy, and IQ). The results in [Table 4](#) indicate that a history of child abuse and neglect significantly predicted increased symptoms of MDD ($\beta = 0.11$, $p < .01$), Dysthymia ($\beta = 0.14$, $p < .01$), PTSD ($\beta = 0.16$, $p < .001$), and Psychopathy ($\beta = 0.21$, $p < .001$), and lower IQ ($\beta = −0.21$, $p < .001$) compared to controls. This pattern of results was the same for the neglect group (see [Table 4](#)). A history of physical abuse predicted increased symptoms of PTSD ($\beta = 0.21$, $p < .001$) and Psychopathy ($\beta = 0.17$, $p < .001$), compared to controls, but not IQ ($\beta = −0.10$, $p = 0.08$) or GAD ($\beta = 0.09$, $p = 0.14$), MDD ($\beta = 0.10$, $p = 0.10$), or Dysthymia symptoms ($\beta = 0.11$, $p = 0.07$). The pattern of results for the sexual abuse group was the same as for the physical abuse group (see [Table 4](#)).

[Table 4](#)

Table 4

Group (Abuse/Neglect vs. Control) and Type of Abuse/Neglect as I
Psychopathology and IQ

Structural Equation Models

Overall Picture Recognition Accuracy Separate models were tested for each potential mediator, with controls for age, race, sex, and SES (see Table 5) for abuse/neglect overall and for neglect specifically. We did not test these mediation models for physical and sexual abuse because the results of the earlier analyses indicated that they were not significant predictors of picture recognition accuracy.

Table 5

Group (abuse/neglect overall vs. controls) and Neglect (IVs) as Predictors of Overall Picture Recognition Accuracy (DV) with Lifetime Symptoms of Major Depressive Disorder, Dysthymia, Generalized Anxiety Disorder, and Posttraumatic Stress Disorder, Psychopathy, **...**

For child abuse and neglect overall, the first column of Table 5 shows that the effect of child abuse/neglect on psychopathology and IQ was consistent with bivariate relationships described. Column 2 shows that MDD, GAD, and IQ predicted overall emotion processing, whereas the other variables did not. Looking at columns 3 and 4, it can be seen that the introduction of IQ had a significant mediation effect and reduced the effect of child maltreatment on overall accuracy in emotion processing to non-significance, suggesting that child abuse and neglect influences picture recognition accuracy through its effects on IQ. Goodness of fit indices for the model including child abuse and neglect overall and IQ as a mediator were $\chi^2(4) = 8.40$, $p = .08$, CFI = 0.96, TLI = 0.90, RMSEA = .05, SRMR = 0.02. This model explained 10% of the variance in recognition accuracy and the indirect effect was significant ($\beta = -0.07$, $p < .001$). In contrast, the models that included other potential mediators (MDD, Dysthymia, PTSD, GAD, and Psychopathy) did not yield fit indices in the acceptable range, and therefore, paths are not interpretable.

For the neglect group specifically, the first column again shows that the effect of neglect on psychopathology and IQ was consistent with bivariate relationships described earlier. However, Column 2 shows that only GAD and IQ predicted emotion processing accuracy, whereas the other potential mediators did not. Again, the introduction of IQ produced a significant mediation effect and reduced the effect of child maltreatment on emotion processing to non-significance, suggesting that child abuse and neglect influences picture recognition accuracy through its effects on IQ. Goodness of fit indices for the model including only IQ were $\chi^2(4) = 9.65$, $p < .05$, CFI = 0.96, TLI = 0.90, RMSEA = .05, SRMR = 0.03. This model explained 15% of the variance in recognition accuracy and the indirect effect was significant ($\beta = -0.08$, $p < .001$). In contrast, the models including each of the other potential mediators (MDD, Dysthymia, PTSD, GAD, and Psychopathy) did not yield fit indices in the acceptable range and, therefore, the paths were not interpretable.

Discussion

This is the first prospective study of emotion processing accuracy in individuals with documented cases of childhood abuse and neglect who were followed up and assessed in middle adulthood. As hypothesized, these findings showed that individuals with a history of childhood abuse and/or neglect were less accurate in processing affective pictures than those without such a history. In addition, these results showed that childhood histories of abuse/neglect in general and neglect and sexual abuse in particular predicted deficits in positive, but not negative, picture recognition. These results were unexpected, but it is possible that these previously abused and neglected individuals have developed negative worldviews that might have prevented them from recognizing positive emotions. It is also possible that they have received and perceived less positive emotions during their lives, making it more difficult in adulthood to recognize and distinguish positive emotions.

In contrast to our hypotheses, the processing of negatively valenced pictures did not differ between maltreated and control groups and specifically for individuals with histories of physical abuse and neglect. It is possible that the task assessed here was substantially different than past studies of facial emotion perception. Facial emotion perception depends on facial expressions for emotion-related cues, whereas cues in the affective pictures presented here include those from facial expression, body posture, and contextual factors. Therefore, deficits may be more difficult to detect because more emotion-related cues are available. It is also possible that these extra cues enabled these individuals to compensate for deficits.

We had specifically hypothesized that physically abused children would have problems with negative emotion pictures, but the results did not support this hypothesis. On first glance, one might attribute this result to the smaller sample size for the physically abused group and interpret the lack of deficits in negative emotion processing as a power problem. However, inspection of the small effect size suggests that low power was not the case, and the significant finding that adults with a history of childhood physical abuse were less accurate in processing neutral affective pictures. Another possibility is that individuals with histories of physical abuse might have been more likely to identify neutral stimuli as negative, based on a negative attribution bias (Dodge, Pettit, Bates, & Valente, 1995). This possibility is intriguing, but unfortunately, the current paradigm does not permit an examination of the type of errors made. Participants were only asked to indicate whether they had seen the picture previously or not. They were not asked to judge the positivity or negativity of the pictures as has been done in facial emotion recognition paradigms. Future research will need to examine these issues more carefully.

Although it was hypothesized that the emotion processing deficits in previously abused and neglected children might be the result of psychopathology (Generalized Anxiety Disorder, PTSD, Dysthymia, and Major Depressive Disorder) or psychopathy, we found that lifetime symptoms of MDD and GAD assessed at age 29 predicted overall emotion recognition accuracy at mean age 47. Interestingly, these new findings are consistent with the previous research on psychopathology and emotion perception in clinical samples. However, these two forms of psychopathology (MDD and GAD) did not account for the relationship between child abuse/neglect and picture recognition accuracy. These new findings are similar to the earlier work of Masten et al. (2008) with children that suggested that maltreatment is uniquely related to emotion processing deficits regardless of PTSD symptomatology.

It was also expected that psychopathy would predict deficits in emotion perception, although we did not find this to be the case. It may be that characteristics of much of the prior literature [a focus on incarcerated or forensic samples (Blair et al., 2004; Deeley et al., 2006; Iria & Barbosa, 2009; Pham & Philippot, 2010)] may in part explain the differences in findings. For example, one might wonder whether there is something about psychopaths who get caught and are incarcerated that influences the emotion perception findings.

These results indicated that only IQ played a significant role as a mediator between child maltreatment and emotion processing accuracy in adulthood. These new findings suggest that emotion processing studies need to control for participants' IQ because it is clear from these results that IQ had a substantial impact on recognition accuracy. It is also possible that the task here may have demanded more cognitive skills than other types of emotion processing tasks and, therefore, maltreated individuals with lower IQs might have been particularly disadvantaged.

Although these findings provide important information about the effects of child abuse and neglect on emotion processing, some limitations should be noted. First, the findings are based on cases of childhood abuse and neglect drawn from official court records and most likely represent the most extreme cases processed in the system. Second, cases that came to the attention of the courts are skewed toward the lower end of the socio-economic spectrum and, therefore, these results cannot be generalized to abused and neglected children who grew up in middle- or upper-class homes. Third, the data were from cases of abuse and neglect that occurred in the late 1960s and early 1970s in the Midwest part of the United States. Research should attempt to replicate these findings in samples from other time periods and geographic regions. However, these cases of child abuse and neglect are from the late 1960s and early 1970s are comparable in demographic characteristics to the kinds of cases being processed by child protection services across the country. Fourth, a final limitation suggested by

one anonymous reviewer is that IQ may not be stable over time (see Salthouse, 2001). Therefore, although the temporal relationship in the present study is appropriate to examine the mediating role of intelligence, it is possible that IQ assessed in childhood or adolescence may have shown a different relationship to emotion picture accuracy than IQ assessed in young adulthood. Unfortunately, we are not able to explore these possibilities with our existing data.

Despite these limitations, the present study builds on previous research on emotion processing and childhood maltreatment in several ways. First, by studying affective picture recognition rather than emotion perception ability, this study examines another aspect of emotion processing that involves more basic attentional processes to emotionally salient environmental cues. This aspect of emotion processing has broader implications for daily emotional functioning in that it suggests deficits in attending to various emotional cues in the environment rather than just faces in particular. Second, by studying an adult sample, this study showed that effects of childhood abuse/neglect on emotion processing extend until middle adulthood, although it would be worthwhile to have multiple assessments over time to rule out competing explanations for improvement (or lack thereof) in emotion processing skills. Third, this study examined effects of different types of maltreatment on emotion processing and found victims of childhood neglect and sexual abuse had difficulty processing positive pictures. Fourth, the current study suggests that psychopathology and psychopathy do not significantly mediate the relationship between childhood maltreatment and emotion processing, although it was clear that certain forms of psychopathology did have an impact on emotion processing accuracy. Lastly, this study adds to the existing literature by suggesting that intelligence may mediate the relationship between childhood maltreatment and emotion processing. Therefore, research and interventions that target emotional processing deficits in victims of childhood maltreatment must consider and take into account the possible presence of intellectual deficits.

Acknowledgments

Footnotes

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