



Altered emotion modulated startle in women with a history of childhood neglect



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ABSTRACT

Research has demonstrated the utility of emotion-modulated startle paradigms in assessing emotional regulation and processing. Previous research has documented various abnormalities in emotion regulation and processing among individuals with a history of childhood maltreatment. Less is known about the psychophysiological correlates of emotion processing among maltreated individuals, particularly the relationship between history of childhood neglect and emotion modulated startle. A sample of 85 incarcerated female offenders with or without a history of childhood neglect completed a task assessing affective modulation of the startle reflex by picture valence (positive, neutral, negative). Compared to non-neglected women, neglected women showed a significantly larger startle response during pleasant image trials, and did not show the typical linear effect (i.e., negative startle response > positive startle response). These findings complement and extend previous literature investigating emotion dysregulation among neglected individuals.

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1. Introduction

The deleterious consequences of childhood maltreatment (e.g., physical, sexual, emotional abuse and neglect) are far-reaching, adversely affecting both cognitive (e.g., deficient executive function) and emotional (e.g., poor emotion regulation) faculties, as well as conferring risk for a range of internalizing (e.g., depression, anxiety) and externalizing (e.g., substance use, aggression) psychiatric symptoms and disorders (see McCrory, De Brito, & Viding, 2011).

Despite evidence of widespread consequences of maltreatment generally, research has begun to identify important distinctions among abuse subtypes (e.g., physical, sexual, emotional). For instance, childhood physical abuse predisposes a person toward aggressive social interactions (Finzi, Ram, Har-Even, Shnit, & Weizman, 2001; Herrenkohl et al., 2004) whereas childhood sexual abuse is more associated with intimacy problems (Feiring, Simon, & Cleland, 2009; Jumper, 1995) and deliberate self-harm (Gladstone et al., 2004). Additionally, history of childhood emotional abuse is related to lower self-esteem in adulthood (Gross & Keller, 1992) and increased depressive symptoms (Dube et al., 2003; Gibb, Chelminski, & Zimmerman, 2007; Spertus, Yehuda, Wong, Halligan, & Seremetis, 2003). While the literature on the differential consequences of childhood abuse is growing, less is known about the developmental consequences associated with childhood neglect (Stoltenborgh, Bakermans-Kranenburg, & van Ijzendoorn, 2013).

Childhood neglect is, officially, the most common form of childhood maltreatment in the United States (U.S. Department of Health and Human Services, 2013) implicated in 79.5% of the 679,000 child maltreatment reports made to child protective services in 2013. Given these estimates, it is important to consider the consequences of developing in an environment lacking physical or emotional stimulation. In this regard, childhood neglect is associated with cognitive dysfunction that differentiates neglected children from non-neglected and abused children. For instance, neglected children show delayed cognitive development on general cognitive functioning measures (Strathearn, Gray, O'Callaghan, & Wood, 2001), and in comparison to non-neglected children and children with post-traumatic stress disorder, neglected children perform significantly worse on measures of IQ, visual spatial skills and language skills (De Bellis, Hooper, Spratt, & Woolley, 2009). Not surprisingly, neglected children also have more severe academic deficits (i.e., lower grades and standardized test scores) than abused children (Hildyard & Wolfe, 2002).

Of particular importance for their psychological adjustment, neglected children also display significant differences in emotion regulation and processing when compared to non-neglected and abused children. Specifically, compared to nonmaltreated children, neglected children show greater difficulty regulating emotions, contributing to increased internalizing and externalizing symptomatology (Kim & Cicchetti, 2010). Similarly, compared to abused children, neglected children exhibit a greater number of internalizing symptoms (Manly, Kim, Rogosch, & Cicchetti, 2001; O'Mahen, Karl, Moberly, & Fedock, 2015), and are rated as more aggressive by their primary caregivers (Kotch et al., 2008). Additionally, whereas physically abused

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children are prone to over-allocate attention to angry faces and stimuli, physically neglected children have difficulty distinguishing between emotional states (Fries & Pollak, 2004; Pollak & Sinha, 2002; Pollak, Cicchetti, Hornung, & Reed, 2000). Neglected children engage in fewer positive social interactions when compared to physically abused and nonmaltreated children (Hoffman-Plotkin & Twentyman, 1984), and, compared to sexually abused children, have restricted positive, but not increased negative, self-views (Toth, Cicchetti, Macfie, & Emde, 1997), potentially indicative of specific disruption in the experience of positive affect. Furthermore, Young and Widom (2014) found that adults who experienced childhood neglect (or sexual abuse) were less accurate in recognizing positive pictures in comparison to adults who experienced childhood physical abuse. Thus, it appears that children and adults who experience neglect during childhood have difficulty differentiating between valences of emotional stimuli as well as difficulty processing or interpreting positive stimuli (see also; Hanson, Hariri, & Williamson, 2015).

Given the prevalence and deleterious consequences of childhood neglect, further research is needed to clarify the emotional profile of neglected individuals. Additionally, the potential long-term consequences of childhood neglect in adulthood require further specification. Lastly, it is unclear how physiological response to emotional stimuli may differ among neglected and non-neglected individuals.

Accordingly, the emotion-modulated startle paradigm (EMS) may provide further insight into the consequences of childhood neglect. Typical performance in such paradigms involves a linear effect, with participants displaying larger startle responses during unpleasant images (e.g., weapon) than pleasant images (e.g., baby) (Lang, Bradley, & Cuthbert, 1990; Vrana, Spence, & Lang, 1988). Abnormalities in this linear effect have been cited as evidence of emotion processing abnormalities across various psychological disorders (Dichter, Tomarken, Shelton, & Sutton, 2004; Miranda, Meyerson, Buchanan, & Lovallo, 2002; Patrick, Bradley, & Lang, 1993). For instance, it is well documented that individuals with psychopathic traits display blunted affective responses (see Dawel, O'Kearney, McKone & Palermo, 2012 for review). Accordingly, psychopathic offenders display a smaller linear effect during EMS paradigms, reflecting this blunted affective style (see Patrick et al., 1993). Conversely, anxious individuals often show exaggerated startle potentiation to aversive images on EMS paradigms (e.g., Larson, Nitschke, & Davidson, 2007). Thus, the EMS paradigm is a well-established method for studying individual differences in emotion processing.

Accordingly, the current study sought to examine EMS among adult female incarcerated inmates with and without histories of childhood neglect. Previous work has shown that rates of childhood maltreatment are significantly higher among incarcerated individuals than in the general population, especially among female offenders (Boşgelmez, Aker, Köklük, & Ford, 2010; Harlow, 1999). Thus, studying incarcerated female offenders provides a unique opportunity to examine the long-term consequences of neglect in a sample characterized by extensive histories of maltreatment. Based on previous research documenting global abnormalities in emotion regulation, we predict that neglected women, in comparison to non-neglected women, will show an abnormal linear effect in the EMS paradigm. Though this disrupted response may result from abnormal processing of negative or positive stimuli, previous research suggests that neglected individuals have more difficulty processing positive as opposed to negative stimuli (e.g., Young & Widom, 2014). As such, we predict that the neglected and non-neglected groups will differ specifically during the pleasant trials.

2. Methods

2.1. Participants

Eighty-five female offenders incarcerated at a multisecurity-level prison in Wisconsin participated in the study after completing an informed consent procedure. Participants were eligible if they were 45

or fewer years old, performed above the fourth grade level on a standardized measure of reading or math achievement, scored above 70 on a brief measure of intelligence (i.e., the Shipley Institute of Living Scale; Zachary & Shipley, 1986) and did not have diagnoses of bipolar disorder or psychosis.¹

2.2. Materials²

Parent–Child Conflict Tactics Scale (CTSPC; Straus & Hamby, 1997; Straus, Hamby, Finkelhor, Moore, & Runyan, 1998). The CTSPC is a 22 item, self-report questionnaire designed to measure psychological and physical maltreatment of children, and can be completed in an interview form with children/adolescents, or questionnaire form with adults. The CTSPC also includes 14 supplementary items assessing sexual abuse and neglect. Participants were directed to indicate experiences they may have had up until the time they finished elementary school. Each of the items are rated 0 (never happened) to 5 (most of the time).³ The scores can then be dichotomized to create a prevalence variable, with 0 indicating that the maltreatment did not occur (i.e., endorsed neglect on 1 item or less) and 1 indicating that the maltreatment did occur (i.e., responded that maltreatment occurred more than once) (see also, Reichenheim & Moraes, 2006). The psychometric characteristics of the instrument (i.e., reliability, discriminant validity and construct validity) have been well documented (Straus et al., 1998). Reliabilities for the current sample include: physical abuse $\alpha = .87$, neglect $\alpha = .71$, sexual abuse $\alpha = .80$.

International Affective Picture System (IAPS; CSEA; Lang, Bradley, & Cuthbert, 1999). All pictures were selected from the IAPS. Pictures were selected on the basis of (1) normative ratings collected at the University of Florida (unpleasant: negative valence and high arousal; neutral: neutral valence and low arousal; pleasant: positive valence and high arousal) and (2) appropriateness for the target prison population (e.g., no pictures of men assaulting women).

2.3. Apparatus

Psychophysiological data were collected using equipment and software from the James Long Company (Corga Falls, NY). Electromyographic (EMG) signals from the orbicularis oculi muscle region were collected using Ag/AgCl minielectrodes (In Vivo Metric, Rochester, NY). Orbicularis electrodes were placed according to Lang (1995). A ground electrode was placed in the middle of the forehead. Impedance values were below 20 k. EMG signals were hardware-filtered in two ways – a high-pass filter set at 1 Hz and a 60-Hz notch filter – before being amplified 5000 times. The acoustic startle probes were played through a 12-bit digital-to-analog board and then through standard headphones (Radio Shack Model Optimus Pro40). Sound levels were

¹ Exclusion criteria reflected criteria used in a larger, on-going study. Data was initially collected from 170 participants. 14 participants' data were dropped due to apparatus or experimenter error. Of the remaining 156 participants, 85 had maltreatment data available.

² Previous research has documented EMS differences among females with psychopathy, borderline personality disorder, and depression. As such, independent samples *t*-tests were run to assess differences between the neglected and non-neglected groups on these variables. The groups did not differ on depression (BDI; A. Beck & Steer, 1996) or psychopathy (Psychopathy Checklist-Revised; Hare, 2003), but neglected individuals had a greater number of borderline features (The Diagnostic Interview for Borderline-Revised; Zanarini, Gunderson, Frankenburg, & Chauncey, 1989); (means presented in Table 1). Including borderline personality scores as a covariate did not alter the crucial Group x Valence interaction, reflecting a significantly weaker linear effect for neglected participants in the 2 s condition. Similarly, it did not alter the significant group difference in the pleasant condition, reflecting larger startle responses in neglected participants. After adjusting for borderline personality symptoms, the linear effect for neglected participants became statistically significant. Nevertheless, this effect for neglected individuals was still significantly smaller than the one for non-neglected participants.

³ The CTSPC was adapted for the current study to be more accessible to our sample as a questionnaire. The original used 0–6 rating system, ranging from never happened to happened more than 20 times in the past year. A 7 was given if the abuse has happened before, but not in the past year.

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