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To cite this article: Abigail Powers, Amit Etkin, Anett Gyurak, Bekh Bradley & Tanja Jovanovic (2015) Associations Between Childhood Abuse, Posttraumatic Stress Disorder, and Implicit Emotion Regulation Deficits: Evidence From a Low-Income, Inner-City Population, *Psychiatry*, 78:3, 251-264, DOI: [10.1080/00332747.2015.1069656](https://doi.org/10.1080/00332747.2015.1069656)

To link to this article: <https://doi.org/10.1080/00332747.2015.1069656>



Published online: 21 Sep 2015.



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Associations Between Childhood Abuse, Posttraumatic Stress Disorder, and Implicit Emotion Regulation Deficits: Evidence From a Low-Income, Inner-City Population

Abigail Powers, Amit Etkin, Anett Gyurak, Bekh Bradley, and Tanja Jovanovic

Objective: Childhood abuse is associated with a wide range of negative outcomes, including increased risk for development of emotion dysregulation and psychopathology, such as posttraumatic stress disorder (PTSD). The goal of the present study was to examine associations between child abuse, PTSD symptoms, and performance on an emotional conflict regulation task that assesses implicit emotion regulation abilities. *Method:* The sample consisted of 67 (94% African American) females recruited from a public, urban hospital. Childhood abuse was measured using the Childhood Trauma Questionnaire, and PTSD was measured using the modified PTSD Symptom Scale. Task accuracy and implicit emotion regulation were measured through an emotional conflict regulation behavioral task. *Results:* A multivariate analysis of covariance showed that exposure to moderate to severe childhood abuse was significantly related to worse emotional conflict regulation scores independent of current PTSD symptoms, depressive symptoms, and adult trauma exposure, suggesting a deficit in implicit emotion regulation. We also found an interaction between PTSD symptoms and abuse exposure in predicting accuracy on the behavioral task; high levels of PTSD symptoms were associated with poorer task accuracy among individuals who reported moderate to severe exposure to childhood abuse. However, no relationship between implicit emotion regulation abilities and overall PTSD symptom severity was found. *Conclusions:* This study provides preliminary evidence of an implicit emotion regulation deficit for individuals exposed to significant childhood abuse and further supports the growing evidence that addressing various aspects of emotion dysregulation, such as awareness of emotions and strategies to manage strong emotions, in the context of treatment would be valuable.

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The detrimental effects of childhood abuse on healthy development and psychological functioning are well documented (e.g., Cicchetti & Toth, 2005; Manley, Kim, Rogosch, & Cicchetti, 2001). Exposure to child abuse is associated with many maladaptive outcomes, including risk for the development of a range of psychiatric conditions (Heim & Nemeroff, 2001; Kessler, Davis, & Kendler, 1997; Westphal et al., 2013). Prospective studies of maltreated children have shown increased rates of depression, posttraumatic stress disorder (PTSD), and other trauma-related psychopathology (e.g., Horwitz, Widom, McLaughlin, & White, 2001; Kaplow & Widom, 2007).

One important factor that may, at least in part, drive the relationship between exposure to childhood abuse and the development of psychopathology in adulthood is emotion dysregulation. Emotion regulation comprises the strategies we use to modulate or maintain the feelings, behaviors, and physiological responses that make up an emotion (Gross, 1998, 2002). The importance of effective emotion regulation in mental stability and functioning has been shown (for reviews, see Gross, 2002; Gross & Muñoz, 1995). Emotion dysregulation reflects deficits in the ability to regulate intense, negative, and shifting emotional states, and many researchers now suggest that poor emotion regulation can be viewed as a transdiagnostic process that contributes to many types of psychopathology, including PTSD (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Bradley et al., 2011).

Some aspects of emotion regulation are both explicit (or effortful) and implicit (unconscious or automatic). Explicit strategies, such as reappraisal or suppression, require some level of conscious effort and monitoring as they occur and because of this may be easier for individuals to identify or describe. However, studies suggest that implicit emotion regulation represents a very important, adaptive process and accounts for a significant proportion of normal regulation of emotional processing (Gyurak, Gross, &

Etkin, 2011; Phillips, Ladouceur, & Drevets, 2008). With implicit emotion regulation, the processes used to regulate occur outside of an individual's awareness and are done without explicit monitoring. Much of the research conducted does not focus on these two types of emotion regulation but focuses instead on measuring the construct of emotion dysregulation more generally.

Developmental research suggests that exposure to childhood abuse may be a major risk factor for emotion regulation difficulties that persist into adulthood (Pollak, 2008; Shields, Cicchetti, & Ryan, 1994). Cross-sectional and longitudinal studies have shown that children exposed to child abuse are more likely to show impairment in emotional expression, recognition, and communication (for a review, see Southam-Gerow & Kendall, 2002), all of which play a critical role in affective emotion regulation. These emotion regulation difficulties also appear to affect behavioral outcomes across development. For example, a longitudinal study by Erickson, Egeland, and Pianta (1989) found that maltreated children followed from age two through kindergarten continued to show both emotion regulation and behavioral problems, such as more anger, lack of self-control, and high levels of negative affect, when compared with children in a control group matched on demographic variables. Other research has shown that emotion regulation problems persist into adulthood and may be an important mechanism in which childhood abuse leads to adult psychopathology (Alink, Cicchetti, Kim, & Rogosch, 2009; Kim & Cicchetti, 2010).

PTSD is of particular interest because it is strongly associated with both child abuse and emotion dysregulation. Although emotion dysregulation is not a specific symptom of PTSD, a number of symptoms represent failures to effectively regulate the experience and expression of emotions (e.g., negative affect and anger/irritability) and others reflect efforts to regulate emotions that impair adaptive functioning (e.g., avoidance behaviors). PTSD is also marked by

overengagement (e.g., intrusion symptoms) and maladaptive efforts to control overengagement (e.g., avoidance) with environmental stimuli. This inability to effectively and flexibly respond to emotionally charged environmental stimuli represents another form of problematic emotional regulation. Research on PTSD treatment among survivors of childhood sexual abuse suggests that deficits in emotion regulation are particularly salient in this group of individuals, and addressing emotion regulation difficulties (e.g., teaching distress tolerance, emotional labeling, and acceptance of strong emotions) makes treatment success more likely (Cloitre, Koenen, Cohen, & Han, 2002).

To date, there has been only limited effort to study emotion regulation difficulties using more objective measures or studying the construct of implicit emotion regulation specifically. Instead, researchers have relied primarily on self-report measures that assess individuals' perceived emotion regulation abilities and difficulties. Some aspects of emotion regulation that are implicit may not be reflected in these self-report data because individuals may be unaware such processes are occurring, and we may therefore be missing valuable information regarding emotion regulation in the context of psychopathology.

Recent research conducted in normal controls and anxiety disorder patient populations supports the use of a computerized behavioral task to measure implicit emotion regulation deficits (Egner & Hirsch, 2005a, 2005b; Etkin, Egner, Peraza, Kandel, & Hirsch, 2006; Etkin, Prater, Hoeft, Menin, & Schatzberg, 2010; Etkin & Wager, 2007). This experimental paradigm tracks emotion regulation from trial to trial through a facial affect identification emotional conflict task using reaction time. Subjects are asked to identify the expression of a face (fearful or happy) while ignoring an overlying emotion word ("fear" or "happy") that is either matched (congruent) or conflicted (incongruent) with the facial expression. In two studies conducted with healthy volunteers, reaction time interference by

emotionally incongruent stimuli was seen almost universally (Egner, Etkin, Gale, & Hirsch, 2008; Etkin et al., 2006). However, there was less conflict (faster reaction times) for incongruent trials if they were preceded by an incongruent trial than if they were preceded by a congruent trial. This finding suggested that emotional conflict generated by incongruency on the previous trial activates a regulatory mechanism that leads to improved emotional conflict regulation on the current incongruent trial. The researchers termed this across-trial effect "emotional conflict regulation" and, using functional magnetic resonance imaging (fMRI) to evaluate differential brain activation, have shown this is a useful measure of implicit emotion regulation (for additional details, see Egner et al., 2008; Etkin et al., 2006).

Preliminary research suggests impaired implicit emotion regulation can be shown in anxiety disorder patient populations (Etkin, Prater, Hoeft, Menon, & Schatzberg, 2010; Etkin & Schatzberg, 2011). For example, in a sample of adults with a primary diagnosis of generalized anxiety disorder and matched controls, Etkin and colleagues (2010) found that patients with generalized anxiety disorder showed a marked implicit emotion regulatory deficit. More specifically, these patients did not show emotional conflict regulation. Interestingly, the implicit emotion regulatory deficit was related to symptom severity in this group, suggesting that implicit emotion regulation may be associated with important outcomes, such as general functioning and ability to manage anxiety symptoms.

Despite the clear relationship between early trauma exposure, emotion regulation difficulties, and adult psychopathology, there is still little known about how these associations might relate to implicit emotion regulation deficits. One population at particularly high risk for exposure to childhood abuse, multiple traumatic events, and PTSD is individuals living in low-income, inner-city environments, who show PTSD rates close to 40% (Gillespie et al., 2009). The high rates of trauma exposure and PTSD in this population

makes it a particularly useful group to study when trying to understand the detrimental effects of trauma on such outcomes as emotion regulation. The goal of the present study was to determine whether exposure to childhood abuse and PTSD symptoms were related to (a) task accuracy and (b) deficits in implicit emotion regulation as measured by a computerized emotional conflict regulation task in a sample with low income and high rates of trauma.

METHOD

Procedure

Participants were drawn from a study, funded by the National Institute of Mental Health (NIMH), of risk factors for the development of PTSD in a low-socioeconomic, primarily African American, urban population. Participants were recruited from waiting rooms in the gynecology and primary care medical (nonpsychiatric) clinics at Grady Memorial Hospital, a publicly funded hospital in Atlanta, Georgia. We did not narrow our recruitment to specific selection criteria but approached any individual in the waiting room. To be eligible for participation, subjects had to be at least 18 years old, not actively psychotic, and able to give informed consent. After signing the informed consent approved by the Emory Institutional Review Board, an initial interview was administered with questionnaires regarding trauma history and psychological variables. All questionnaires were self-report but were read verbally to participants to avoid any issues with participant variability in reading ability. Interviewers were research assistants who had been trained to administer these self-report questionnaires by research staff via a combination of laboratory practice and observation of real participants. A subset of these participants completed the emotional conflict

behavioral task during an associated study (for full details regarding study procedures, see Gillespie et al., 2009). There were no specific criteria for the participants chosen to complete the emotional conflict task, except that these individuals were brought back for participation in other studies offered by our research group for female participants.

Participants

The sample consisted of 67 females.¹ The subjects were all adult (≥ 18 years; median age of 40) and primarily African American (94.0%). See Table 1 for detailed demographic details on participants. All participants in the study met criteria for at least one Criterion A traumatic event.

Measures

Traumatic Events Inventory

The Traumatic Events Inventory (TEI) is a 14-item screening instrument for lifetime history of traumatic events. It was administered by trained research interviewers to detail frequency and type of trauma(s) experienced; consistent with prior research (Gillespie et al., 2009), total level of trauma exposure was measured by a sum score reflecting the total number of different types of trauma (e.g., car accident, sexual assault, natural disaster) to which a participant had been exposed over the course of his or her life. For this study, TEI was used to measure overall trauma type exposure excluding child abuse.

Childhood Trauma Questionnaire

The Childhood Trauma Questionnaire (CTQ) (Bernstein et al., 2003) is a 25-item, reliable, and valid self-report instrument assessing sexual, physical, and emotional abuse, as well as neglect, in childhood

¹ A priori power analyses were run using G*Power 3.1.5 based on effect sizes found by Etkin and colleagues (2010) to ensure adequate power for finding moderate effect sizes in this sample.

TABLE 1. Descriptive Statistics of Demographic Variables, Trauma Exposure, PTSD Symptoms, and Depressive Symptoms Across Moderate to Severe Child Abuse Exposed and Low-Abuse/No-Abuse Groups

Variables	No to Low Abuse	Moderate to Severe Abuse	Pearson Chi-Square	P Value
	N (%)	N (%)		
Race			4.43	0.22
African American/Black	35 (97.20)	28 (90.30)		
Hispanic	1 (2.80)	0 (0.00)		
Caucasian/White	0 (0.00)	2 (6.50)		
Other	0 (0.00)	1 (3.20)		
Employment			0.65	0.42
Unemployed	24 (68.60)	24 (77.40)		
Income			1.93	0.75
\$0–249	4 (11.10)	4 (12.90)		
\$250–499	1 (2.80)	3 (9.70)		
\$500–999	14 (38.90)	9 (29.00)		
\$1,000–1,999	11 (30.60)	9 (29.00)		
\$2,000 or more	6 (16.70)	6 (19.40)		
	M (SD)	M (SD)	F	P Value
Age	39.94 (11.96)	37.45 (11.18)	0.77	0.38
Lifetime Trauma Exposure (Total Types Excluding Abuse)	3.93 (2.53)	5.43 (2.66)	5.59	0.02*
PTSD Symptom Severity	8.00 (7.96)	16.41 (13.07)	10.45	0.002**
Reexperiencing PTSD Symptom Severity	1.61 (2.37)	4.03 (4.29)	8.47	0.005**
Avoidance PTSD Symptom Severity	1.44 (2.14)	2.29 (2.23)	2.49	0.12
Numbing PTSD Symptom Severity	1.69 (2.94)	4.10 (4.78)	6.34	0.01*
Hyperarousal PTSD Symptom Severity	3.24 (3.12)	6.00 (4.21)	9.39	0.003**
Depressive Symptoms	11.03 (9.55)	19.87 (13.11)	10.14	0.002**

Note. Differences between abuse groups are indicated in *p* value column.

p* < .05; *p* < .01.

($\alpha = 0.94$ in current study). Bernstein and Fink (1998) established scores for none, mild, moderate, and severe for each type of abuse. The data from the CTQ were used to create a categorical variable to account for the presence or absence of moderate to severe reported exposure to emotional (score ≥ 13), physical (score ≥ 10), and sexual (score ≥ 8) abuse in childhood (0 = none or mild abuse; 1 = the presence of moderate or severe abuse scores for at least one of the three types of abuse). This classification has been shown to be a strong predictor of other psychological variables, including depression and PTSD, in prior studies with this population.

Modified Posttraumatic Stress Disorder Symptom Scale

The Modified Posttraumatic Stress Disorder Symptom Scale (mPSS) (Falsetti, Resnick, Resick, & Kilpatrick, 1993) is a psychometrically valid, 18-item self-report measure assessing PTSD symptoms and overall duration of symptoms ($\alpha = 0.92$ in current study). For the present study, summed scores were calculated for total PTSD symptom severity and four PTSD clusters: intrusions (five symptoms), avoidance (two symptoms), numbing (five symptoms), and hyperarousal (five symptoms). The mPSS is based on the

Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR; (American Psychiatric Association [APA], 2000) criteria. However, with the changes to PTSD criteria included in DSM-5 (APA, 2013), we separated avoidance and numbing symptoms into their own clusters to more closely align with the new diagnostic system. PTSD diagnosis (0, 1) was affirmed if participants presented with at least one reexperiencing symptom, three avoidance and/or numbing symptoms, two hyperarousal symptoms, and if the duration of symptoms was greater than one month.

Beck Depression Inventory–II

The Beck Depression Inventory–II (BDI-II) (Beck, Steer, & Brown, 1996) is a psychometrically validated, 21-item self-report measurement of depressive symptoms ($\alpha = 0.93$ in current study).

Emotional Conflict Regulation Behavioral Task

The emotional conflict task (Etkin et al., 2006) consisted of 148 presentations of happy or fearful facial expression photographs. Faces were cropped and the word *FEAR* or *HAPPY* was presented in prominent red letters across the face, such that word and expression were either congruent or incongruent (e.g., a fearful expression with the word *HAPPY*). Stimuli were presented with the Presentation software package (Neurobehavioral Systems, <http://nbs.neuro-bs.com>) for 1,000 milliseconds (ms), with a varying inter-stimulus interval of 3,000 to 5,000 ms (mean = 4,000 ms), in a pseudorandom order, counterbalanced across trial types for expression, word, response button, and gender. For the present study, accuracy and emotional conflict regulation scores based on reaction time were used.

Participants had to show at least 75% overall accuracy to be included in the study. Ten cases were removed due to overall

accuracy falling below 75%. Participants and those excluded did not differ significantly on mean age, conflict adaptation, child abuse, lifetime trauma exposure, or PTSD intrusive, avoidance, and numbing symptoms. There was a statistically significant mean difference in hyperarousal symptoms, with those excluded showing a higher level of hyperarousal symptoms ($p < .05$).

Four types of trials are assessed: post-incongruent incongruent trials (il), postincongruent congruent trials (iC), postcongruent incongruent trials (cI), and postcongruent congruent trials (cC). The trial-to-trial emotional conflict regulation index of emotion regulation (il – cI) is a variant of the full Gratton effect, which describes the observation that congruency effects are larger following a congruent relative to an incongruent trial: (il – cI) – (iC – cC) (Gratton, Coles, & Donchin, 1992).

Data Analysis

All statistical analyses were run using SPSS version 18.0. Descriptive statistics were computed for overall sample and by abuse groups. Differences between groups on demographic and psychological variables were assessed using chi-square tests of independence for categorical or rank order variables and analysis of variance (ANOVA) for continuous variables. Then, a multivariate analysis of covariance (MANCOVA) was used to determine the nature of the relationship between childhood abuse, overall task accuracy, and emotional conflict regulation score on the behavioral task. A separate MANCOVA was run with accuracy across the four types of trials as well. Lifetime trauma exposure, current PTSD symptom severity, and current depressive symptoms were included as covariates in these analyses because of the statistically significant differences across abuse groups (see Table 1). To better understand the associations between PTSD symptoms and our outcome variables of interest (emotional conflict regulation score, task accuracy), bivariate correlations

between PTSD symptoms and the behavioral task variables were also assessed. This was done for the overall sample as well as by abuse group because there were significant differences in PTSD symptoms across abuse groups. Finally, based on the results of the correlational analyses, a MODPROBE analysis (Hayes & Matthes, 2009) was used to examine the association between current PTSD symptom severity and overall task accuracy and whether abuse type moderated that association. This macro is used for probing categorical interactions in linear regression models (for details, see Hayes & Matthes, 2009). Because correlational analyses suggested a particularly strong association with avoidance PTSD symptoms, an additional MODPROBE analysis was run using avoidance PTSD symptom severity as the predictor variable.

RESULTS

The rate of childhood abuse within our sample was high, with 46.3% ($N = 31$) of participants reporting moderate to severe child abuse. The average number of lifetime trauma types experienced by participants (excluding child abuse) across the whole sample was 4.63 ($SD = 2.68$), demonstrating the magnitude of trauma exposure in this population. Approximately 30% of this sample also met diagnostic

criteria for PTSD ($N = 19$). Rates of trauma and PTSD symptoms were elevated further in participants who had been exposed to moderate to severe childhood abuse compared with those with no abuse or low levels of reported abuse (see Table 1 for descriptive statistics across the two groups). Table 2 provides descriptive statistics for the emotional conflict regulation behavioral task by group.

Associations Between Childhood Abuse and Emotional Conflict Task

As shown in Figure 1, MANCOVA results showed a statistically significant difference in emotional conflict regulation scores based on reported exposure to childhood abuse ($F(1, 66) = 9.09; p < .01$; partial $\eta^2 = 0.13$),

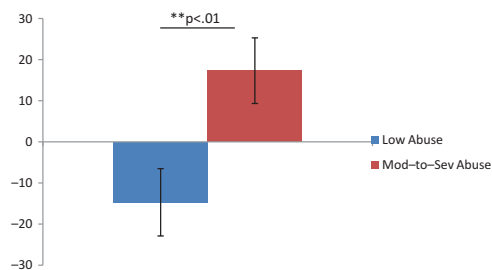


FIGURE 1. Mean Scores on Reaction Time Differences for Emotional Conflict Regulation (iI-cI) to Tasks With Conflict Across Abuse Groups.

TABLE 2. Descriptive Statistics for the Emotional Conflict Regulation Task

	Overall Accuracy	Postincongruent Incongruent Trials	Postincongruent Congruent Trials	Postcongruent Incongruent Trials	Postcongruent Congruent Trials	Emotional Conflict Regulation
Total Sample						
M (SE)	94% (1%)	94% (1%)	96% (1%)	92% (1%)	94% (1%)	0.10 (6.01)
Range	77–100%	76–100%	78–100%	72–100%	77–100%	–143.92–130.12
No or Low Abuse						
M (SE)	95% (1%)	94% (1%)	97% (1%)	92% (1%)	96% (1%)	–14.70 (49.11)
Range	89–99%	78–100%	92–100%	81–100%	86–100%	–143.92–130.12
Moderate to Severe Abuse						
M (SE)	93% (1%)	93% (1%)	94% (1%)	91% (1%)	95% (1%)	17.29 (44.08)
Range	77–100%	76–100%	78–100%	72–100%	77–100%	–77.27–96.61

even when controlling for the effects of lifetime trauma exposure, current depressive symptoms, and current PTSD symptoms. There was no significant difference in overall task accuracy by abuse group ($F(1, 66) = 0.53; p = .47$). None of the covariates was significantly related to emotional conflict regulation. Only PTSD symptom severity was significantly associated with task accuracy ($F(1, 66) = 10.73; p < .01$; partial $\eta^2 = 0.15$). A second MANCOVA run to examine the accuracy across the four different types of trials also showed no significant associations between abuse type and reaction time accuracy on the trials, independent of lifetime trauma exposure, current depressive symptoms, and current PTSD symptoms.

Associations Between PTSD Symptoms and Emotional Conflict Task

Associations of overall PTSD symptom severity and the four PTSD symptom clusters with accuracy and emotional conflict regulation were first examined using bivariate correlation analyses. As shown in Table 3, significant negative associations between PTSD symptoms and accuracy were present in the overall sample for overall accuracy, postincongruent–congruent accuracy, and postcongruent–incongruent accuracy ($p < .05$). When looking at associations separately by abuse groups, there were no longer significant associations between PTSD symptoms and task accuracy for those in the low abuse to no abuse group. In the moderate

TABLE 3. Bivariate Correlations Between PTSD Symptom Severity Scores and Accuracy and Emotional Conflict Regulation on Emotional Conflict Task

Accuracy Measures	Overall PTSD Symptom Severity	Reexperiencing Symptom Severity	Avoidance Symptom Severity	Numbing Symptom Severity	Hyperarousal Symptom Severity
On Overall Task					
Full Sample	−0.30*	−0.27*	−0.28*	−0.19	−0.25*
No or Low Abuse	0.10	−0.07	0.07	0.15	0.11
Moderate to Severe Abuse	−0.40*	−0.30	−0.47**	−0.28	−0.36*
On Inc–Inc					
Full Sample	−0.13	−0.12	−0.18	−0.06	−0.11
No or Low Abuse	0.15	0.08	0.01	0.16	0.18
Moderate to Severe Abuse	−0.27	−0.19	−0.33	−0.15	−0.28
On Inc–Con					
Full Sample	−0.31*	−0.27*	−0.22	−0.22	−0.32*
No or Low Abuse	0.14	0.07	0.30	0.11	−0.02
Moderate to Severe Abuse	−0.36*	−0.28	−0.43*	−0.23	−0.34
On Con–Inc					
Full Sample	−0.30*	−0.30*	−0.31*	−0.19	−0.22
No or Low Abuse	−0.07	−0.26	−0.10	0.11	−0.01
Moderate to Severe Abuse	−0.40*	−0.32	−0.46**	−0.31	−0.33
On Con–Con					
Full Sample	−0.20	−0.16	−0.24	−0.16	−0.15
No or Low Abuse	0.13	0.11	0.07	0.10	0.10
Moderate to Severe Abuse	−0.31	−0.22	−0.42*	−0.24	−0.25
Emotional conflict regulation					
Full Sample	0.02	−0.05	−0.01	0.13	−0.03
No or Low Abuse	−0.22	−0.27	−0.14	−0.08	−0.19
Moderate to Severe Abuse	−0.04	−0.14	0.01	0.14	−0.15

Note. No or low child abuse = 0; moderate to severe child abuse = 1.

* $p < .05$; ** $p < .01$.

to severe childhood abuse group, again, overall PTSD symptom severity was negatively correlated with overall accuracy, postincongruent–congruent accuracy, and postcongruent–incongruent accuracy ($p < .05$). Avoidance symptoms showed the strongest negative associations with task accuracy across all trials ($p < .01$) except the postincongruent–incongruent trial. See Table 3 for differences among all PTSD clusters and accuracy on trial types. PTSD symptoms (overall severity and severity by PTSD symptom clusters) were not significantly associated with emotional conflict regulation in the overall sample or when separated by abuse type.

To examine the association between accuracy and PTSD symptom severity further, the MODPROBE macro was used, which enabled analysis of the potential moderating effect of abuse type on the relationship between PTSD symptom severity and task accuracy with linear regression while controlling for lifetime trauma exposure and current depressive symptoms. The model predicting overall accuracy on trials by current PTSD symptoms and child abuse group was significant ($F = 3.51$, $p < .01$). The overall model explained 22% of variance in accuracy score. As shown in Figure 2, a significant interaction

between current PTSD symptom severity and abuse was found ($F = 3.92$, $p \leq .05$, R^2 change = 0.05), showing that individuals exposed to moderate to severe abuse were significantly less accurate on the behavioral task when also high on current PTSD symptoms. Because of the significant correlations between avoidance PTSD symptom severity and task accuracy in the moderate to severe abuse group, a separate MODPROBE linear regression was run using avoidance symptoms as the predictor of overall task accuracy. Very similar results emerged, with an even stronger effect showing a significant interaction between current avoidance PTSD symptoms and abuse ($F = 8.73$, $p < .01$, R^2 change = 0.11). Again, individuals high on avoidance symptoms and reporting exposure to moderate to severe abuse were significantly less accurate on the behavioral task.

DISCUSSION

This study examined emotional conflict regulation using a paradigm in which emotional processing is regulated implicitly. Extensive research has already shown strong

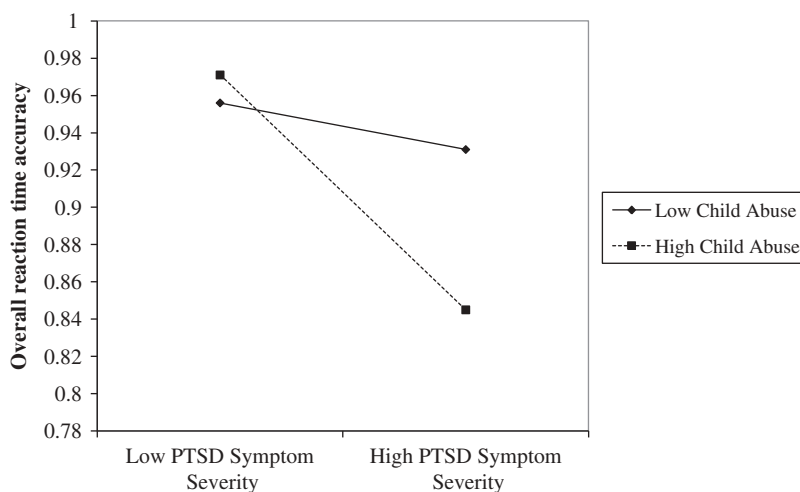


FIGURE 2. Interaction Between PTSD Symptom Severity and Abuse Type in Predicting Accuracy on Behavioral Task.

relationships between both child abuse exposure and PTSD with emotion dysregulation (e.g., Aldao et al., 2010; Bradley et al., 2011; Kim & Cicchetti, 2010). To our knowledge, this is the first study to investigate the associations of childhood abuse and PTSD symptoms with reactions times on an implicit emotion regulation task. We found that individuals who reported exposure to moderate to severe childhood abuse showed significantly poorer emotional conflict regulation to tasks with an emotional incompatibility between task-relevant and task-irrelevant stimulus dimensions compared with individuals who did not report exposure to childhood abuse. More specifically, these individuals appeared to have more difficulty identifying a correct facial expression (either fearful or happy) when it was shown with a distracter word (either *FEAR* or *HAPPY*), both when the incongruent stimulus was presented after a congruent stimulus and when it was presented after an incongruent stimulus. This significant difference was present even after controlling for any effects of lifetime trauma exposure, current PTSD symptoms, and current depressive symptoms, suggesting that there may be something particularly important about the experience of child abuse that affects implicit emotion regulation processing.

A growing body of evidence suggests that trauma exposure may alter patterns of attention toward and interpretation of threat (Fani et al., 2012; Pollak, Vardi, Bechner, & Curtin, 2005; Shackman, Shackman, & Pollak, 2007; Vasterling, Brailey, Constans, & Sutker, 1998). It has been suggested that after trauma some individuals develop “fear structures” or pathological cognitive frameworks that lead them to perceive benign stimuli as threatening (Foa & Kozak, 1986). This results in exaggerated responses both behaviorally and cognitively, and over time, these selective attentional patterns become maladaptive, disrupt appropriate information processing, and perpetuate anxious symptoms. There is some evidence that biased attention occurs in children who have been

abused. For example, in a study with 8- to 11-year-old physically abused children, Pollak and colleagues (2003) found that abused children showed an inability to disengage from angry facial cues on a selective attention task using emotional faces as cues. This automatic attention to threatening cues takes attentional resources that may otherwise be used for other things, such as to attenuate emotional reactivity. This research on biased attentional patterns may provide some explanation for the pattern of emotion regulation deficits we observed with individuals exposed to child abuse in this sample. It is possible, for example, that the word *FEAR* triggered these individuals’ attention so strongly that it was impossible to ignore and complete the task at hand, therefore providing a clear example of how emotion regulation may be negatively impacted in such individuals. Examining differences in findings across the valence of faces was outside the scope of the present study; however, it would be beneficial to examine whether the valence of faces does affect emotion regulation deficits in future research.

There was also a significant interaction between PTSD symptom severity and childhood abuse in predicting level of accuracy on the emotional conflict task. Individuals with high levels of PTSD symptoms showed poorer accuracy on the emotional conflict task only among those who reported moderate to severe exposure to childhood abuse. This was shown independent of any effects of lifetime trauma exposure and current depressive symptoms. When looking at correlational associations across the PTSD symptom clusters, avoidance symptoms in particular were associated with poorer accuracy on almost all types of trials among individuals with moderate to severe childhood abuse exposure. Not surprisingly, based on these correlations, we found a similar interaction effect between avoidance symptoms and childhood abuse in predicting task accuracy. Breaking down associations with accuracy by trial type in the correlational analyses, we found the strongest association with avoidance symptoms to be with the most difficult

trial type (a congruent trial followed directly by an incongruent trial). Interestingly, avoidance symptoms were also associated with postcongruent–congruent trials, which are considered the easiest trial. Avoidance behavior in PTSD is seen as a maladaptive effort to regulate emotions and reduce distress, and it is possible that such symptoms were making it difficult for these individuals to stay engaged in the task regardless of trial type, although it is impossible to know if that is the case in the present study. Surprisingly, we did not find a relationship between PTSD symptom severity and emotional conflict regulation. It is possible that the significant limitation in accuracy on the most difficult types of trials prevented us from seeing any association between PTSD symptoms and implicit emotion regulation deficits, but it is difficult to determine based on these preliminary results. Additional studies with larger samples are needed to evaluate whether implicit emotion regulation deficits can also be shown in individuals with PTSD and whether an interaction with childhood abuse in that relationship may occur.

Several study limitations are worth noting. First, given the cross-sectional nature of this study and the use of retrospective reports, we cannot make assertions about causality or time of onset for child abuse, PTSD symptoms, and performance on the implicit emotion regulation measure. Prospective, longitudinal studies are required to examine the temporal onset of child abuse, PTSD symptomatology, and the implicit emotion regulation difficulties observed. However, developmental research has shown that exposure to child abuse is associated with the later development of emotion regulation difficulties and psychiatric conditions, such as PTSD (e.g., Alink et al., 2009; Kim & Cicchetti, 2010). This is preliminary evidence that needs to be followed up with longitudinal research, and we are currently conducting a longitudinal study of children and their mothers in this traumatized population with the hope of answering such temporal and developmental questions.

We also focused on self-report measures of both child abuse and current PTSD

symptoms, which may have affected the accuracy of our classification of individuals into abuse groups. In addition, our sample size was small for each group, and it is possible that we did not find significant results in some cases due to low power. We also cannot make clear assertions about the behavioral outcomes in this study without corresponding imaging data. Although there is evidence from other studies regarding what brain mechanisms are (or are not) activated during this task, behavioral and imaging data sometimes show different patterns, and this cannot be disentangled in the present study. Finally, our sample was largely low income, female, and African American. However, this weakness is balanced by the public health importance of studying these variables in an often underresearched and underserved population with such high rates of trauma exposure as well as mental and physical health problems. Very limited mental health resources are available for individuals in this population, despite the strong need for treatment options given the high rates of trauma and trauma-related psychopathology. Therefore, it is even more critical that we continue to study factors that might influence symptom severity of a given disorder and thus affect how successful current evidence-based treatments are for such groups.

Our findings provide further evidence of the detrimental effects of exposure to childhood abuse on outcomes in adulthood. More specifically, this study provided preliminary evidence of an implicit emotion regulation deficit for individuals exposed to significant childhood abuse. Because emotion dysregulation has been found to be a component of a wide range of psychiatric conditions, this adds to the evidence that addressing emotion dysregulation in the context of treatment would be valuable across trauma-related psychopathology and could likely benefit overall treatment success. This has already been shown through initial research in the context of PTSD treatment with child abuse survivors; more specifically, treatment incorporated a separate emotion regulation training component to the therapy protocol prior to the introduction of

exposure therapy (Cloitre et al., 2002). This suggests that specific treatment focused on emotion regulation may be useful in addition to trauma therapy protocols that already address maladaptive symptoms related to emotion dysregulation (e.g., avoidance targeted through exposure therapy). It is possible that behavioral tasks or computerized training might be of use in enhancing emotion regulation in combination with therapy as well, and some initial evidence suggests repeated attentional training could be one way this could be implemented (Wadlinger & Isaacowitz, 2011). Continued research on what types of emotion regulation may best be targeted and how individuals' perceptions of their own emotion regulation relate to more implicit measures of emotion regulation will be beneficial.

ACKNOWLEDGMENT

The content is solely the responsibility of the authors and does not necessarily represent

the official views of the National Institutes of Health. In addition, the contents of this report do not represent the views of the Department of Veterans Affairs or the U.S. government.

The authors thank the staff, volunteers, and participants of the Grady Trauma Project, and Allen Graham and Angelo Brown for research expertise and technical assistance.

FUNDING

This work was primarily supported by the National Institute of Mental Health (MH071537; MH100122; MH102890) and the National Institute of Child Health and Human Development (HD071982). Support also included Emory and Grady Memorial Hospital General Clinical Research Center, NIH National Centers for Research Resources (M01 RR00039), and the Burroughs Wellcome Fund.

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