



Childhood trauma and sensitivity to reward and punishment: Implications for depressive and anxiety symptoms



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ABSTRACT

Extensive evidence indicates that early adversity is associated with a lifelong increased risk for psychopathology. One of the mechanisms underlying this effect may involve maladaptive personality traits. This study investigated whether childhood trauma is related to individual differences in sensitivity to reward and punishment, construed as the personality correlates of the behavioral activation system (BAS) and the behavioral inhibition system (BIS). The potential mediator role of these individual differences in the relation between childhood trauma and emotional symptoms was also examined. Healthy adult participants ($N = 375$), with a self-reported history of childhood interpersonal trauma, non-interpersonal trauma or no trauma, filled in questionnaires about the anticipation of, and emotional responsiveness to reward and punishment, as well as depressive and anxiety symptoms. Participants with a history of interpersonal trauma reported both reduced levels of motivation for reward and increased levels of sensitivity to punishment, compared to participants with non-interpersonal trauma and no trauma. Sensitivity to punishment carried the effect of interpersonal trauma on both depressive and anxiety symptoms, whereas motivation for reward played a mediator role only in the relation between trauma and depressive symptoms.

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1. Introduction

Childhood trauma is associated with a lifelong increased risk of psychopathology, including depression and anxiety (e.g., Lindert et al., 2014; Nanni, Uher, & Danese, 2012). The psychological mechanisms by which this effect persists into adulthood are not clear, but a well-known hypothesis is that exposure to early trauma enhances the development of maladaptive traits, which in turn increase vulnerability to psychopathology (e.g., Barlow, Ellard, Sauer-Zavala, Bullis, & Carl, 2014; Rachman, 1980; Roy, 2002). For instance, a recent study (Spinoven, Elzinga, Van Hemert, de Rooij, & Penninx, 2016) has found that a maladaptive personality pattern (i.e., high neuroticism and low extraversion, agreeableness and conscientiousness) may serve as mediator in the relation between child maltreatment (i.e., physical abuse, sexual abuse, and emotional abuse and neglect) and depressive and anxiety symptoms. The present study sought to test a similar mediation hypothesis, but in light of recent suggestions that altered responsiveness to reward may be involved in the link between childhood trauma and psychopathology (e.g., McLaughlin & Sheridan, 2016; Vujanovic, Wardle, Smith, & Berenz, 2017), it employed Gray's

approach to personality (Gray, 1987; Gray & McNaughton, 2000), which emphasizes individual differences in sensitivity to reward and punishment.

The revised reinforcement sensitivity theory (Gray, 1987; Gray & McNaughton, 2000) argues that there are three emotional systems underlying motivated behavior: the fight-flight-freeze system, which is hypothesized to mediate fear and anger triggered by threat; the behavioral activation system (BAS), which is thought to support positive emotions induced by reward; and the behavioral inhibition system (BIS), which is involved in negative emotions induced by goal conflict. The personality correlates of these emotional systems have been widely investigated, with an increased focus on BAS and BIS (for review see Corr, 2016; Corr & McNaughton, 2008). Individual differences in the pursuit of appetitive goals and emotional responsiveness to reward are thought to reflect BAS sensitivity, whereas individual differences in the concern for potential punishment and emotional responsiveness to bad outcomes are thought to reflect BIS sensitivity. These individual differences have often been assessed using the BIS/BAS scales (Carver & White, 1994), a self-report measure which includes a BIS scale and three BAS subscales (i.e., Reward Drive, Fun Seeking and Reward Responsiveness) (for a review of other measures see Corr, 2016). Relative to extraversion and trait anxiety, BAS and BIS may be better able to predict happiness induced by cues of impending reward, and nervousness induced by cues of impending punishment, respectively (Carver & White, 1994).

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Moreover, clinical studies have confirmed the theoretical prediction (Fowles, 1993) that both anxiety disorders and depression are characterized by enhanced BIS (Johnson, Turner, & Iwata, 2003). In addition, depression may involve reduced BAS (Kasch, Rottenberg, Arnow, & Gotlib, 2002; but see Johnson et al., 2003). This hypothesis has been supported by behavioral evidence of reduced responsiveness to reward in depression (Henriques & Davidson, 2000). Furthermore, increased BAS scores, especially on the Reward Drive subscale, have been associated with long-term clinical improvements in depression (Kasch et al., 2002).

Considering that childhood trauma has been linked with several personality differences that contribute to risk for psychopathology (e.g., Roy, 2002; Spinhoven et al., 2016; Szentagotai-Tatar & Miu, 2016), we were interested to examine its influence on BIS/BAS. These individual differences may carry the influence of childhood trauma on psychopathology, while also capturing specific aspects of the vulnerability to depression and anxiety. From this perspective, an outstanding question is whether childhood trauma is related to blunted BAS, which, in conjunction with enhanced BIS, may contribute more specifically to depression proneness. This issue is prominent given behavioral and neural evidence suggesting that childhood trauma may be indeed associated with dysfunctions in reward processing, and anhedonia (for a review see McLaughlin & Sheridan, 2016). For example, it has been recently reported that adults with a history of child maltreatment assess reward cues (i.e., potential financial gain) less positively and show reduced neural responses to reward in the basal ganglia (Dillon et al., 2009).

To our knowledge, only one study has investigated the relation between childhood adversity and BIS/BAS (Rosenman & Rodgers, 2006), with some unexpected findings. Using a cumulative measure of childhood adversity, which included items about experiencing or witnessing physical and sexual abuse, emotional maltreatment, parental conflicts, parental depression, and financial hardships, this study (Rosenman & Rodgers, 2006) found a reduced probability of scoring in the top quartile of BIS for individuals with a history of childhood adversity. Separate analyses on each childhood adversity revealed both positive (e.g., parental depression, emotional abuse) and negative (e.g., parental separation, witnessing abuse) relations with BIS (Rosenman & Rodgers, 2006). Childhood adversity was not significantly related to BAS in this study. The negative association with BIS and the null results on BAS are difficult to reconcile with previous research considering that childhood adversity is a well-documented risk factor for psychopathology (e.g., Lindert et al., 2014; Nanni et al., 2012), and both self-report (Johnson et al., 2003; Kasch et al., 2002), and behavioral and neural evidence (Dillon et al., 2009; Henriques & Davidson, 2000) show that sensitivity to reward and punishment is altered in mental disorders such as depression. Therefore, we believe that further research is necessary in order to clarify the connections between early adversity and individual differences in sensitivity to reward and punishment.

The present study investigated the relations between childhood trauma, BAS and BIS in adults. Childhood trauma can include a wide range of negative events, from physical and sexual abuse to chronic illness and loss of family or friends, and not all of these trauma types may increase vulnerability to psychopathology. Indeed, recent meta-analyses indicate that interpersonal trauma, which involves intentional harm inflicted by another person, is associated with depression and anxiety more often than non-interpersonal trauma (Alisic et al., 2014; Rytwinski, Scur, Feeny, & Youngstrom, 2013). Therefore, we examined BAS and BIS in individuals with a history of interpersonal or non-interpersonal trauma, in comparison to individuals with no reported history of childhood trauma. In addition, this study investigated the potential mediator role of BAS and BIS in the relations between childhood trauma and depressive and anxiety symptoms. In light of previous evidence on depression (e.g., Dillon et al., 2009; Henriques & Davidson, 2000; Kasch et al., 2002), we expected that low BAS and high BIS would carry the effects of childhood trauma on emotional symptoms, with the former being specifically involved in the path to depressive symptoms.

2. Method

2.1. Participants

An initial sample of 679 volunteers (574 women) was recruited through campus and online advertisements, and screened with a childhood trauma questionnaire. Based on inclusion and exclusion criteria, a final sample of $N = 375$ participants (331 women), aged between 18 and 40 years ($M = 21.33$, $SD = 4.40$ years), was selected. An a priori sample size estimation indicated that a sample of minimum 159 participants was necessary to detect a medium size effect with a power over 0.80. Inclusion criteria were related to having a history of childhood interpersonal or non-interpersonal trauma, or no history of trauma. Considering that we were interested to investigate the specific effects of these types of trauma, exclusion criteria referred to a history of mixed trauma, that is, either both interpersonal and non-interpersonal trauma, or one of these types and another type of trauma (see below). In accordance with the Declaration of Helsinki guidelines, participants signed an informed consent and the procedure was approved by the university's Ethics Committee.

2.2. Measures

The Childhood Traumatic Events Scale (CTES) (Pennebaker & Susman, 1988; see also Szentagotai-Tatar & Miu, 2016) was used to investigate the history of interpersonal (i.e., sexual abuse, such as rape or molestation; violent events, such as physical abuse, mugging or assault) and non-interpersonal trauma (i.e., death of a very close friend or family member; severe illness or injury) before age 17. Each type of trauma was assessed by a single item, asking participants to report whether the event had occurred and to rate its traumatic severity on a scale from 1 (not at all traumatic) to 7 (extremely traumatic). There was an additional item asking participants about any other unspecified traumatic event that may have affected their life and personality. Following Pennebaker and Susman (1988), only events rated as traumatic (≥ 6) were considered. Given that each type of trauma was assessed by a single item, internal consistency was not applicable.

BIS and BAS were assessed using the BIS/BAS scales (Carver & White, 1994), which include a 7-item BIS scale (i.e., reactions to the anticipation of punishment) and three BAS subscales: 4 items for Reward Drive (i.e., persistent pursuit of desired goals), 4 items for Fun Seeking (i.e., desire for new rewards and willingness to approach potentially rewarding events on the spur of the moment) and 5 items for Reward Responsiveness (i.e., positive responses to the occurrence or anticipation of reward). In this sample, Cronbach's alphas were 0.72 for BIS, 0.68 for BAS Reward Drive, 0.64 for BAS Fun Seeking, and 0.63 for BAS Reward Responsiveness.

Depressive symptoms (e.g., hopelessness, lack of interest) and anxiety symptoms (e.g., subjective apprehension, autonomic arousal) were assessed using the Depression Anxiety Stress Scales (DASS) (S. H. Lovibond & P. F. Lovibond, 1995). Each scale has 7 items and the Cronbach's alphas in this sample were 0.85 for the depressive symptom scale, and 0.78 for the anxiety symptoms scale. Notably, DASS has been shown to distinguish anxiety and mood disorders in clinical samples (e.g., Brown, Chorpita, Korotitsch, & Barlow, 1997) and its correlations with other clinical scales are high (e.g., P. F. Lovibond & S. H. Lovibond, 1995).

2.3. Procedure

All questionnaires were filled in online. Based on answers to CTES, only participants who reported either childhood interpersonal trauma (sexual or physical abuse) or non-interpersonal trauma (severe illness or injury, loss of family or close friend), and participants who reported no trauma were included in the study. In order to compare groups with specific trauma, individuals ($N = 288$) who reported another

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