



Facial trustworthiness perception bias elevated in individuals with PTSD compared to trauma exposed controls



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ABSTRACT

Posttraumatic stress disorder (PTSD) research has focused largely on fear processing. However, interpersonal trauma exposure can also impact interpersonal functioning and the perception of the trustworthiness of others. The present study examined facial perceptions of fearfulness and trustworthiness in individuals with PTSD ($n=29$), trauma-exposed without PTSD ($n=19$), and healthy controls ($n=18$). The PTSD group was hypothesized to exhibit a bias to perceive more fear and untrustworthiness in faces relative to controls. Participants rated the level of fearfulness or trustworthiness of faces that were parametrically morphed along a fear or trustworthiness dimension. The PTSD group was biased to perceive faces as more trustworthy compared to the trauma-exposed healthy controls, yet there were no differences between groups in fear processing. A trustworthiness bias in PTSD may represent a vulnerability factor. Conversely, lower trustworthiness perception may represent a protective disposition in trauma-exposed individuals who do not develop PTSD. Differences in the perception of trustworthiness may be an aspect of social perception that is independent of the fear processing abnormalities observed in PTSD.

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1. Introduction

Posttraumatic Stress Disorder (PTSD) can result from a variety of experiences that are threatening to one's life, including physical violence, sexual assault, natural disasters, wars, and transportation accidents (Breslau, 2009). Although most individuals recover from any initial symptoms (Westphal et al., 2011), those who develop PTSD become functionally impaired by anxiety, excessive physiological arousal, difficulty concentrating, and emotionally distressing reactivity to trauma reminders (Neria et al., 2013). PTSD is also characterized by symptoms of interpersonal dysfunction including the suspiciousness and avoidance of others and feelings of detachment from other people (Cloitre and Rosenberg, 2006). Experimental investigations of PTSD have typically focused on fear and threat processing abnormalities (Milad and Quirk, 2012). Given the prevalence of interpersonal trauma associated with PTSD, as well as symptoms of social impairment, experimental research

examining how individuals with PTSD interpret and perceive the trustworthiness of others is notably sparse.

One common approach to the examination of fear processing in PTSD involves the presentation of fearful or threatening faces (Shvil et al., 2013). This method has helped elucidate differences in cognitive and emotional processes (Hayes et al., 2012), as well as underlying abnormalities in neural circuitry (Liberzon and Sripada, 2007). For example, in maltreated children, PTSD was associated with attentional bias to avoid threatening faces (Pine et al., 2005). In adults with PTSD, the degree of attentional bias towards threat was positively associated with impairments in fear extinction learning (Fani et al., 2011). Overt presentation of fearful faces was associated with amygdala hyperresponsivity and reduced activation of the medial prefrontal cortex (Shin et al., 2005), whereas nonconscious presentation of fearful stimuli has been associated with increased activation in both brain regions (Bryant et al., 2008; Rauch et al., 2000). Moreover, the neural processing of fearful faces among individuals with PTSD was moderated by sex (Felminham et al., 2010), in that men with PTSD exhibited relatively greater hippocampal activity to fear than women, while both men and women with PTSD exhibited greater amygdala activity to fear relative to controls. Another study found that women with intimate

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partner violence related-PTSD exhibited hyperactivity and disconnection among affective and limbic sensory systems when processing threat-related emotion compared to controls (Fonzo et al., 2010), highlighting heterogeneity within PTSD.

This fear processing research has been valuable in expanding the understanding of PTSD psychopathology, however, several limitations should be noted. First, studies have primarily relied on the most expressive poles of the emotional expression (e.g., extremely fearful faces compared with emotionally neutral or happy faces). Although some studies incorporate subjective ratings of the fearful stimulus, it remains unclear how the strength of the signal (i.e., intensity of fearful expression in the face) influences these ratings, and whether signal intensity and subjective rating of emotion and trustworthiness stimuli is biased or exhibits increased sensitivity or discriminability in those with a PTSD diagnosis relative to controls.

Moreover, the dimension of trustworthiness, which may be relevant in the perception of threat, has been relatively unexplored, and may provide a broader understanding of psychopathology. For example, in Borderline Personality Disorder (BPD), which is partly characterized by severe rejection sensitivity and a high prevalence of trauma exposure (Chesin et al., 2014; Goodman et al., 2014; Sauer et al., 2014), a bias towards untrustworthiness perception with longer response times has been reported (Miano et al., 2013; Fertuck et al., 2013). Among trauma survivors, interpersonal difficulties have been associated with sexual revictimization (Classen et al., 2001; Thomas et al., 2014) and functional impairment above and beyond PTSD symptom severity (Cloitre and Rosenberg, 2006).

The present study employs a social cognitive assessment of both facial trustworthiness and fearfulness perception. Participants with PTSD were hypothesized to rate faces as exhibiting higher levels (i.e., bias) of both fear and untrustworthiness relative to trauma exposed individuals without PTSD and healthy controls. We explored the degree to which individuals with PTSD would exhibit increased sensitivity, discriminability, bias, and greater response time (RT) towards untrustworthy and fear faces relative to healthy controls.

2. Method

2.1. Participants

Recruitment was done via online and print advertisements. Participants had to be between the ages of 18–65 and have 20/20 natural or corrected vision. They were screened via telephone for trauma history, substance use history, demographics and other demographic information. If the participant was deemed likely to meet criteria for one of the three groups, they were invited to do an in person consent and phone screen. The Structured Clinical Interview for DSM-IV (SCID-IV; First et al., 2002) was used to formally assess other inclusion and exclusion criteria, which included substance use disorders, severe depression, suicidality, and current or history of psychosis or bipolar disorder. Borderline Personality Disorder (BPD) was assessed with the Structured Clinical Interview for DSM-IV Axis I Personality Disorders (SCID-I; First et al., 1997) but not grounds for exclusion in the PTSD group. Current PTSD diagnosis was assessed with the Clinician-Administered PTSD Scale (CAPS; Blake et al., 1995). The SCIDs were administered by doctoral level, advanced clinical psychology students under the supervision of a licensed clinical psychologist.

Participants in the PTSD group ($n=29$) met full DSM-IV-TR (APA, 1994) criteria for PTSD, or subthreshold criteria defined as a minimum CAPS total score of 20 and symptoms in each of the three clusters (i.e., intrusive recollections, avoidance and numbing,

Table 1

Demographic and clinical characteristics of participants in each group.

	PTSD $N=29$		TEHC $N=19$		NTHC $N=18$	
	<i>M</i> or <i>n</i>	<i>SD</i> or %	<i>M</i> or <i>n</i>	<i>SD</i> or %	<i>M</i> or <i>n</i>	<i>SD</i> or %
Demographics						
Gender						
Male	$n=10$	34.5%	$n=9$	47.4%	$n=7$	38.9%
Female	$n=19$	65.5%	$n=10$	52.6%	$n=11$	61.1%
Age	33.2	10.3	41.2	13.2	36.0	10.2
Education	14.7	2.4	14.8	2.3	15.2	2.0
Race/Ethnicity						
Black	$n=10$	34.5%	$n=8$	42.1%	$n=10$	55.6%
Latino	$n=8$	27.6%	$n=1$	5.3%	$n=4$	22.2%
White	$n=5$	17.2%	$n=9$	47.4%	$n=2$	11.1%
Other	$n=6$	20.7%	$n=1$	5.3%	$n=2$	11.1%
Criterion A trauma type						
Physical abuse/ Assault	$n=14$	48.3%	$n=10$	52.6%	–	–
Sexual trauma	$n=12$	41.4%	$n=3$	15.8%	–	–
Other ^a	$n=18$	62.1%	$n=12$	63.2%	–	–
Multiple trauma	$n=18$	62.1%	$n=11$	57.9%	–	–
CAPS symptom severity						
Re-experiencing	12.9	7.2	1.79	3.2	–	–
Avoidance/ numbing	19.2	11.0	1.53	2.5	–	–
Hyperarousal	14.5	7.7	1.53	3.3	–	–
Total severity	46.5	22.9	4.84	6.6	–	–
Age at first trauma	10.21	7.37	10.11	7.27	–	–

Note. PTSD=posttraumatic stress disorder; TEHC=trauma exposed healthy controls; NTHC=no trauma healthy controls.

^a Other trauma includes natural disasters, transportation accidents, and witnessing/learning about sudden or violent death.

hyperarousal; Weathers et al., 2001). The Trauma Exposed Healthy Control group (TEHC; $n=19$) was composed of individuals with no Axis I diagnoses, who experienced a traumatic event that met Criterion A for PTSD (i.e., extreme threat or injury, experienced with horror or helplessness) but did not meet the full PTSD or subthreshold requirements outlined above. The No Trauma Healthy Control group (NTHC; $n=18$) participants had no Axis I diagnoses and did not experience any traumatic event that met Criterion A for PTSD. Table 1 provides details on the demographic characteristics of the sample. All participants provided written informed consent to participate in the study, and all procedures were approved by the Institutional Review Board of the City College of New York. Participants were compensated \$100.00 and for public transportation to and from the site for participating in this study. Participants received payment on the first day regardless of whether or not they were eligible for the second phase of the study (a separate electroencephalogram [EEG] phase), and the second phase is not a focus of the current manuscript.

2.2. Experimental procedure

Participants performed a computerized task involving the perception of trustworthiness or fear in faces of varying emotional expressions as previously described (Fertuck et al., 2013). The task was programmed using Matlab (www.mathworks.com) and Psychtoolbox (www.psychtoolbox.org). A Windows XP laptop was used to present stimuli, and to record ratings and response time (RT). The task was split into two conditions that varied in facial expressiveness along two dimensions: trustworthy to untrustworthy, or neutral to fearful. Two faces at each extreme (high trust vs. low trust, and fearful vs. neutral). The trustworthiness block utilized trustworthiness stimuli developed by Todorov and colleagues (<http://tlab.princeton.edu/databases/trustworthinessfaces/>) (Oosterhof and Todorov, 2008; Todorov et al., 2008). For the trustworthiness stimuli there were eight male identities from the

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