Embodied Trauma: The Relationship Between Interoception and Emotional Experience

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Abstract

While post-traumatic stress disorder (PTSD) can manifest as a variety of different symptom profiles, many cases of the disorder involve interoceptive difficulties. The goal of this study was to further investigate the relationship between emotional embodiment and interoceptive changes often associated with traumatic events. We conducted two experiments in a sample of healthy participants (n = 48). In experiment 1, emotional embodiment was examined with a topographical body sensation mapping task (EMBODY; Nummenmaa et al., 2014). We assessed interoceptive accuracy in experiment 2 using the Heartbeat Counting Task (HBCT; Schandry, 1981) and the Multidimensional Assessment of Interoceptive Awareness (MAIA; Mehling et al., 2012). Trauma was measured using the Brief Trauma Questionnaire (BTQ; Schnurr et al., 1999). We hypothesized that individuals with PTSD would show abnormal embodiment of emotions as well as disrupted interoceptive awareness. Results showed slightly more diffuse embodiment of sensations in body maps of emotions and signs of altered interoception in the MAIA, but no evidence of impairments of interoceptive accuracy in the HBCT. These results offer additional evidence for the factors influencing the relationship between trauma and the development of subsequent illnesses. Clarifying this relationship has important implications for the treatment of interoceptive deficits in psychiatric disorders.

Embodied Trauma: The Relationship Between Interoception and Emotional Experience

The way we experience emotion and, consequently, how we process and embody trauma may depend on interoception. Interoception refers to the ability to detect internal bodily sensations, including but not limited to heart rate, breath, hunger, thirst, fullness, temperature, and pain (Vaitl, 1996; Khoury, Lutz & Schuman-Olivier, 2018). Interoception plays a pivotal role in maintaining homeostasis (and therefore, keeping us alive) through a bidirectional process; afferent neurons from organs communicate with higher-order cortical areas to help the body achieve homeostasis, influencing our emotional responses and perceptions of safety and threat (Schmitt & Schoen, 2022; Quigley et al., 2021). Given the importance of interoception in our 'gut feelings' or intuition, which govern much of our emotional and social decision-making (Damasio, 1996), it is not surprising to find that disrupted interoception plays a central role in a broad range of psychiatric conditions (Khalsa et al., 2018)

Emotional embodiment arises from the intricate relationship between affect and physiological arousal. (Niedenthal, 2007; Nummenmaa et. al, 2014). Physical sensations associated with emotions can change even within a short period of time, from the inner warmth felt in the chest around a loved one to the heaviness in the limbs when receiving a piece of bad news. Even reading about or watching another person's emotional reaction conveys feelings that most individuals can naturally identify within the body. In the context of trauma, embodied emotions can become dysregulated, leading to altered interoceptive signals and potentially contributing to the persistent effects of traumatic experiences (Schaan et al., 2019; Reinhardt et al., 2020; Pollatos & Schandry, 2008).

Within the general population, there is a wide range of capacities for accessing these bodily sensations associated with emotions. For individuals who survive a traumatic event and develop post-traumatic stress disorder (PTSD), anomalous interoceptive processes can become a debilitating symptom. The inability to accurately sense and trust one's body creates greater stress in patients with PTSD, as well as those with other serious psychiatric disorders (Schaan et al., 2019; Zamariola et al., 2019). Therefore, deficits in the areas of reporting emotional embodiment and interoceptive abilities can have negative functional impacts and profound social consequences, which is suggestive of a possible area for intervention.

Embodiment of Emotions

Despite individual and group differences, emotion is generally understood across cultures. While it is usually described using basic linguistic categories such as "happy," "angry," or "sad," emotion is a complex construct that involves multisensory integration of affect, arousal, perception, and cognition, across different levels of cortical and subcortical information processing. As previously described, emotions are felt in distinct places in the physical body (i.e., embodied) (Niedenthal, 2007). The ability to understand and simulate others' experiences of emotional embodiment is the foundation of empathy, a crucial component of regular social interaction. However, individuals such as those with autism or schizophrenia may experience particular abnormalities and deficits in this area, challenging their ability to engage in social settings and experience a typical sense of empathy (Decety & Jackson, 2004; McIntosh et al., 2006). Therefore, the understanding of embodied emotion is crucial in our day-to-day experience.

Emotional embodiment can be visually represented by mapping the location of felt sensations during an emotional experience. A topographical body mapping tool known as the EMBODY has been used extensively to study the embodiment of bodily sensations (Nummenmaa et al., 2014). The body mapping technique method assumes, based on previous literature, that when one recalls memories associated with an emotional experience, the same sensory-motor and emotional brain parts are activated as in the original occurrence, creating an affective state equivalent to that of the original experience (Niedenthal, 2007; Ianì, 2019). During an EMBODY task, participants are instructed to shade where on the body they feel activation and deactivation associated with a specific emotion category. Group maps are then created. Past research shows that there is a high degree of consensus across the general public with respect to the topography of felt sensations in the body for each specific emotion within a culture (Nummenmaa et al., 2014). Importantly, different emotions correspond to different patterns of felt sensations, resulting in distinct body maps for each emotion. For example, in neurotypical individuals, the majority of body maps show significant activation in the head and chest for emotions such as love and happiness, whereas body maps of sadness and depression show deactivation of the regions of arms and legs. Therefore, the maps indicate that each emotion contains its own unique bodily sensations associated with it and suggest a consistent pattern within the general population. (Nummenmaa et al., 2014)

As a subjective experience, emotion is difficult to measure and quantify. Therefore, much of behavioral emotion research relies on self-report methods and social cognition tasks such as facial emotion perception tasks (Barrett et al., 2007). While offering a phenomenological view of a person's emotional state, research indicates that pairing self-report methods with physiological measures can provide deeper insight into the way emotion affects arousal in the body in ways that self-report methods might not fully capture (Hadinejad et al., 2019). To explore this connection in the current study, we examined interoceptive awareness, as measured by heart rate and temperature change in addition to asking participants to indicate subjective sensations using the EMBODY.

Interoception

With the previous information on emotion as context, it is important to carefully consider the role of interoception in emotional embodiment. For example, an internal level of arousal such as an increased heartbeat is an important component of affect, suggesting that interoceptive capabilities and the emotional experience are inextricably intertwined (Dunn et al., 2010). Indeed, previous literature supports the idea that knowledge of what is going on in the body and the cognitive interpretation of physiological states both contribute to our emotional experience (Barrett et al., 2004; Decety & Jackson, 2004; McIntosh et al., 2006). Therefore, insight into the individual's personal experiences with emotional embodiment and interoception would be important for bridging the gap between the subjective experience of the individual and the objective measurement of physiological arousal.

Given the central roles of interoceptive awareness and embodiment of emotions in promoting adaptive social behavior, it is likely that these are implicated in disorders that are associated with emotional dysregulation. Therefore, individuals who experience PTSD following a traumatic event may be particularly at risk for anomalous experiences of emotional embodiment and interoceptive awareness, which could be involved in the maintenance of the disorder and an important barrier in the process of recovery to address.

The Effect of Trauma on Interoception and Embodiment

Exposure to trauma is very common, with an estimated 70% of the population worldwide reporting at least one traumatic event over their lifetime (Kessler et al., 2017). According to the United States Department of Veteran Affairs, most people who experience a traumatic event will not go on to develop PTSD (United States Department of Veterans Affairs). However, those who do develop PTSD after experiencing something traumatic are much more likely to develop other forms of psychopathology. Results from one study estimate that individuals who experienced a traumatic event are 23-27 times more likely to develop major depressive disorder and 10-38 times more likely to develop generalized anxiety disorder (Creamer et al., 2001). Another study found that almost 90% of interviewed individuals with PTSD disclosed being diagnosed with at least one other psychiatric disorder (Zimmerman et al., 2008). Therefore, it is clear that when trauma does cause PTSD, there is often a much broader impact on several additional areas of mental health, including anxiety and mood.

The psychological effects of trauma often extend into an individual's perception of their own body. Trauma often involves a violation of personal boundaries or safety, which can cause a person to reexperience bodily sensations associated with memories of the event. Research on chronic stress due to some form of trauma concluded that interoception can be severely impacted due to abnormal communication to and from the body to the brain (Schaan et al., 2019). This leads to hypervigilance or ultra-sensitivity to sensation within the body, with slight changes in heart rate or temperature causing extreme distress in some people (Domschke, 2010). This sensitivity to change and the typical cascade of anxiety-related thoughts is not necessarily representative of what is actually occurring in the body. Heightened sensitivity to change, often inaccurately attributed, was also found to be related to increased physiological responses to stressors (Pollatos & Schandry, 2008).

Furthermore, the perpetual conditioned negative emotional responses to these somatic sensations continue the cycle of panic, which is believed to maintain anxiety disorders over time (Domschke, 2010). Additionally, trauma survivors have been shown to have difficulty forming, regulating, and verbalizing these emotions, which in line with the previous connection between interoception and emotion, is likely due to interoceptive difficulties (Domschke, 2010; Schaan et al., 2019; Zamariola et al., 2019).

The ability to regulate somatic sensations and accurately rationalize the causes of these sensations can have a valuable role in recovery from anxiety-based disorders. One study on treatment involving interoceptive accuracy interventions demonstrated that as participants' interoceptive accuracy increased, PTSD symptoms decreased (Reinhardt et al., 2020). While this study did not have findings related to the directionality of this effect, it suggests that the ability to self-regulate internal states can facilitate a sense of healing in trauma survivors. Therefore, interoceptive accuracy may be an important treatment target for trauma. In conclusion, heightened sensitivity, lowered accuracy, and negative emotions associated with sensations such as heart rate could serve as further risk factors for psychiatric diagnoses.

Current Study

This study aimed to examine the role of trauma in the embodiment of emotion and interoceptive processing. Past literature suggests that both dysregulation of emotion and abnormal interoception contribute to PTSD, but no study has examined both interoception and emotional embodiment in the same participants. In this study, we conducted two experiments to investigate the relationship between bodily experiences of emotions and the presence of trauma in the context of the development of PTSD and other related conditions. For Experiment 1, we hypothesized that participants who met the diagnostic criteria for PTSD would generate anomalous maps of bodily sensations using the EMBODY task (Nummenmaa et al 2014). For Experiment 2, we hypothesized that these participants would have lower interoceptive accuracy on a heartbeat counting task (HBCT; Schandry, 1981). To investigate the experience of trauma, we used the Brief Trauma Questionnaire (BTQ; Schnurr et al., 1999). Significant findings of a relationship between experiences of trauma and impaired interoceptive accuracy and emotional embodiment could provide initial evidence and motivation for developing a treatment involving somatic-oriented interventions (Price & Hooven, 2018).

Methods

Participants

Sixty-seven participants were recruited by advertisement from Vanderbilt University and the greater community of Nashville, Tennessee. Thirteen participants were excluded for a history of psychosis. Another six participants were excluded for incomplete data. The final participant number was forty-eight participants who completed the EMBODY and HBCT experiments, all without a history of DSM-5 disorders. Written informed consent was obtained from each participant according to the protocol approved by the Vanderbilt University Institutional Review Board (Vanderbilt IRB #200629). All participants were compensated for their time. Demographic information is presented in Table 1. Participants were asked to avoid caffeine 30 minutes before arriving and to not come hungry as these are two common ways to affect interoceptive accuracy.

Table 1

Demographic Information and Self-Report Psychological Measures

	Total Participants (n = 48)	CO (n = 29)	PTSD (n = 19)
Demographics	*Mean (SD)*	*Mean (SD)*	*Mean (SD)*
Age (years)	24.42 (7.55)	22.31 (4.73)	27.63 (9.80)
Gender (M/F)	18/30	11/18	7/12
Ethnicity (Black/Asian/Native American/Pacific Islander/Hispanic/White/Middle Eastern or North African/ Other/Multiple/ Prefer Not to Answer)	4/20/0/0/2/15/0/0/7/0	3/15/0/0/0/9/0/0/2/0	1/5/0/0/2/6/0/0/5/0
Self-report Questionnaires			
Brief Resilience Coping Scale (BRCS)*	15.35 (2.17)	14.69 (2.11)	16.37 (1.89)
Brief Trauma Questionnaire (BTQ)*	1.48 (1.62)	0.55 (0.78)	2.90 (1.56)
Multidimensional Assessment of Interoceptive Awareness (MAIA) Total	105.35 (17.93)	100.83 (15.61)	112.26 (19.43)

* Significant differences found in independent sample t-tests for group comparisons ($p<0.05$).

Design and Procedure

After informed consent, participants were given detailed instructions and information about the self-report questionnaires and the two experiments: Experiment 1 (EMBODY) and Experiment 2 (HBCT). Participants were then given the battery of self-report questionnaires. These measures were included to obtain information about past experiences of trauma, childhood experiences, coping, as well as subjective experience of interoception. For both experiments, a practice trial was run to allow the participants to become familiarized with the protocol and ask any questions they may have had. The entire study took about 2 hours.

Psychological Assessments

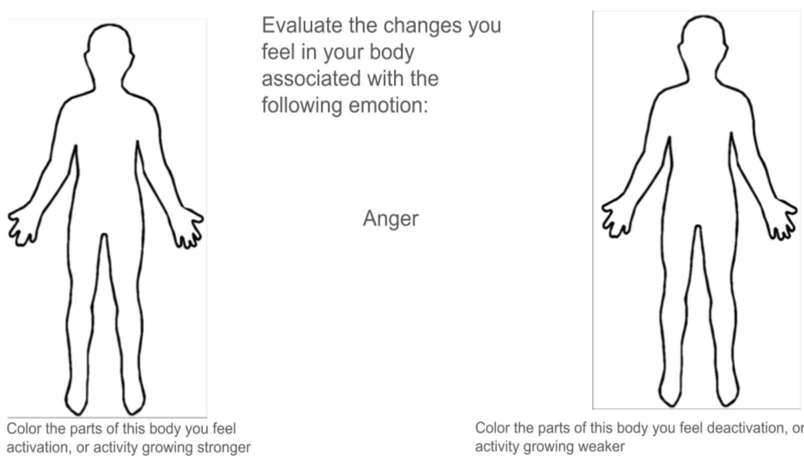
The following self-report questionnaires were shared across the two experiments. The Brief Trauma Questionnaire (BTQ) measured experiences of trauma and diagnostic cutoffs for PTSD diagnosis (Schnurr et al., 1999). The Adverse Childhood Experiences (ACE) questionnaire was administered to assess distressing childhood experiences such as abuse, neglect, and household dysfunction in childhood (Felitti et al., 1998). The Benevolent Childhood Experiences (BCE) assessed positive and nurturing experiences possibly related to resiliency (Narayan et al., 2018). Similarly, the Brief Resilient Coping Scale (BRCS) measured response and resilience to stressful events (Sinclair & Wallston, 2004). Finally, the Multidimensional Assessment of Interoceptive Awareness (MAIA) was administered to obtain a subjective measure of interoception, focusing on the ability to perceive and understand bodily sensations (Mehling et al., 2012). The MAIA includes 5 dimensions, containing a total of 8 subscales. These include Noticing, Not Distracting, Not Worrying, Attention Regulation, Emotional Awareness, Self-Regulation, Body Listening, and Trusting. Each of these subscales was included in our analysis, but particular interest was in the Self-Regulation and Emotional Awareness subscales.

Experiment 1: EMBODY

At the beginning of the experiment, EMBODY instructions were presented on the computer screen. After reading the instructions, participants filled in a set of standard questions for the EMBODY on the computer, which included demographic information as well as weight and height. The RA 1 explained the task again and asked the participant to recall a memory of that emotion to further access bodily sensations associated with that emotion. Next, the RA counted down from 3, and said "Start." With this, the participant clicked on a screen to start. Two human body silhouettes were presented (see Figure 1). These silhouettes were accompanied by one emotional word (e.g., Fear).

Figure 1

Example of the EMBODY Task



Note. Participants are asked to use the computer mouse to color where they feel activation or deactivation associated with the emotion on the body silhouette depicted on the screen.

The participants were instructed to indicate using the computer mouse where in the body they felt sensations associated with the presented emotion. The left body outline was used to indicate where in the body they feel an increase in activation or a sensation growing stronger. The right body outline was used to indicate where in the body they felt a decrease in activation or a sensation growing weaker. Participants were encouraged to take longer than 30 seconds to complete each emotion. When the participant finished coloring, they notified the RA by saying "Stop." and the time was recorded. There were 6 emotion words including: anger, fear, sadness, happiness, anxiety, and disgust. One control trial of a headache was also presented to gauge if an interoceptive cue that is not associated with emotion could be identified correctly within the body. The emotions were presented in a randomized order to control for order effects. This procedure was repeated for all 6 emotions and the 1 control word (headache).

Experiment 2: HBCT

Following the EMBODY task, the participant began experiment 2 which was the HBCT. First, the participant was fitted with the heartbeat tracking belt around their chest. Two research assistants (RA 1 and RA 2) were involved in running this experiment. The participant was instructed to concentrate on and count their number of heartbeats for 3 trials. The trials were 25, 17, and 41 seconds respectively. When RA 1 said "Start", RA 2 started the recording of the heartbeat tracking device. After the designated time, RA 1 ended the trial by saying "Stop", the RA 2 stopped the heartbeat tracking device. The participant was asked how many times their heart had beat in the trial. This number and the actual number of heartbeats (recorded via the belt) were recorded. After the trial, they were asked about their confidence level (i.e., "How confident are you with that guess on a scale from 0-10?"). This was repeated for each trial.

Results

Data Analysis

The body maps were generated using a previously developed procedure for EMBODY analysis, particularly for smaller sample sizes, using MATLAB (Torregrossa et al., 2019; Lee et al., 2022). To summarize, every participant's response for activation and deactivation in each emotion was converted to positive and negative values which were then combined to generate one body map for that emotion. Therefore, the maps depict the proportion of each negative and positive value per pixel. Group maps were combined as average responses for each pixel.

Interoceptive accuracy (IA) was calculated using the three HBCT trials (25, 17, and 41 seconds) where the participant was asked to focus on their heart rate for a set amount of time. This was converted into an estimate for beats per minute (BPM). The actual heart rate found via the heartbeat belt was also converted into actual BPM. Their BPM estimate score was divided by the actual BPM to yield a percentage, which we used for the interoceptive accuracy score for that trial. We repeated this method for all three trials and averaged the percentages to calculate the final IA score for that participant.

Group Comparisons

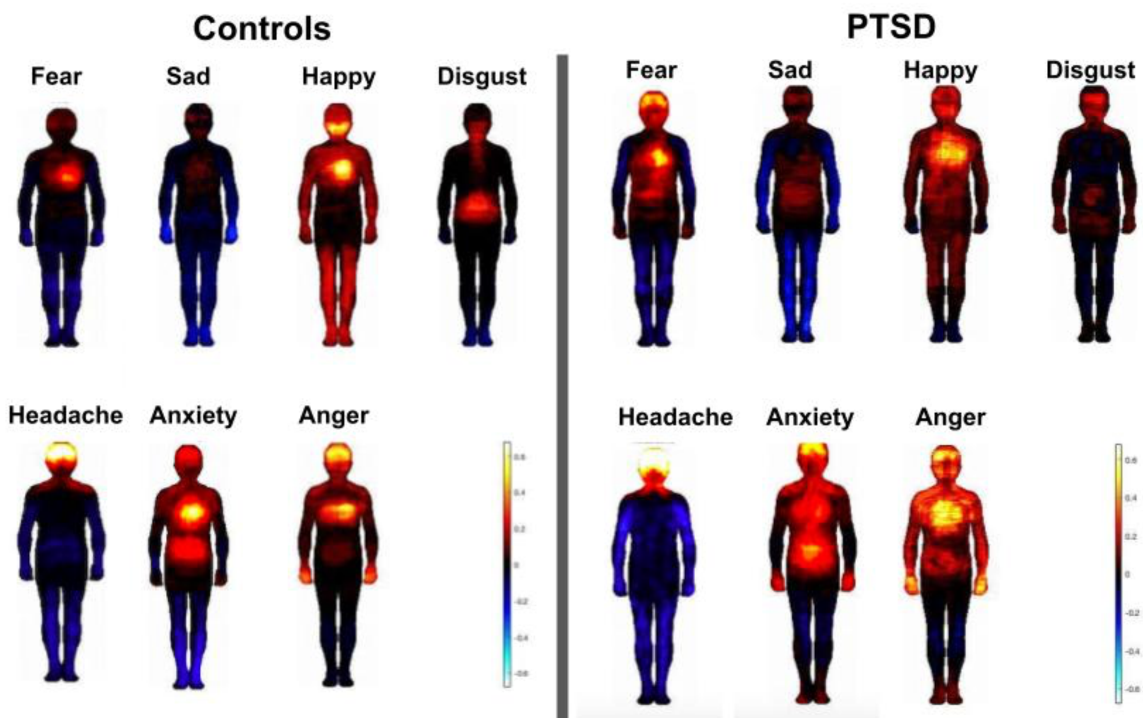
EMBODY

All participants, regardless of their experience with trauma, showed similar patterns in general areas of activation and deactivation associated with emotions that were consistent with previous literature on bodily maps of emotions (Figure 2; Nummenmaa et al., 2014). All participants indicated high levels of activation in the torso and head for anxiety, anger, and happiness which is depicted by warmer hues in all maps. Additionally, body maps of sadness from both groups show heightened levels of deactivation in the limbs, which is depicted by blue tones.

However, there were a few differences in the specific areas of some of the maps when examining them separated by meeting the criteria for PTSD diagnosis via the BTQ. The body maps generated from responses of individuals who met the criteria for PTSD diagnosis showed particularly heightened activation throughout the body in the fear condition. In this same body map, this group depicted greater arousal in the head compared to the non-PTSD group. In general, a comparison of all maps generated by the two groups revealed that individuals who have PTSD tended to color more diffusely across many of the conditions. This can be seen particularly in anger, happiness, and fear, which are interestingly all emotions associated with high arousal. This more diffuse embodiment is also true for the non-emotional control condition of a headache. While both groups indicated activation in the head for a headache, which is to be expected of the headache condition, individuals who could have PTSD indicated a heaviness or greater deactivation in the limbs with a headache.

Figure 2

Bodily Maps of Emotions - EMBODY



Note. Compiled group maps for individuals who met the BTQ diagnostic criteria for post-traumatic stress disorder (PTSD) and healthy controls (Controls).

Interoception

Interoceptive accuracy score (IA) was compared between those who met the criteria for PTSD diagnosis and those who did not. The IA of the non-PTSD group (M = 0.734, SD = 0.11, n = 29) and the IA of the PTSD diagnosis group (M = 0.736, SD = 0.16, n = 19) showed no statistically significant differences, t (46) = -0.065, p = 0.95.

Independent samples t-tests were performed to assess group differences. For the MAIA, the group of participants who met the diagnostic criteria for PTSD scored higher on the Emotional Awareness subscale compared to the group who did not meet the criteria for PTSD, $t(46) = 2.566$, $p = 0.014$, suggesting that those with PTSD show a greater awareness of the connection between body sensations and emotional states. The results were similar for the Noticing subscale, a subscale that assesses one's awareness of comfortable, uncomfortable, and neutral bodily sensations, with the PTSD group showing higher scores, $t(46) = 0.822$, $p = 0.007$. No difference was found between the two groups for the other MAIA subscales, including the total MAIA score.

Discussion

The goal of this study was to investigate differences in interoceptive accuracy and emotional embodiment in people who met diagnostic criteria for PTSD and healthy controls. We also aimed to evaluate resiliency as it relates to the effects of trauma on the body. We found that, while people who met the criteria for PTSD showed generally similar patterns of emotional embodiment, they did differ in that they colored activation and deactivation more diffusely in multiple emotions. These more dispersedly colored body maps could be evidence that people with trauma feel emotions, whether they are positive or negative, in more salient ways across the entire body. Particularly, this is depicted in high-arousal emotions (i.e., anger, fear, happiness), which may be evidence that the physiological changes associated with these emotions are affecting the body more. Because high arousal can be linked to the memory of the traumatic event, these emotions may be affecting a person's experience within their body more than someone without PTSD, leading to the anomalous embodiment depicted by more diffusely colored maps.

The previous findings that suggest the PTSD group indicated more widespread embodiment across a variety of emotions are also supported in the analysis of self-reported interoceptive abilities in the MAIA. The MAIA Noticing subscale assesses awareness of all bodily sensations, and the MAIA Emotional Awareness subscale measures awareness of the connection between body sensations and emotional states. Participants in the PTSD group showed higher scores on both of these measures, meaning that they are more aware of positive, negative, and neutral sensations as well as the connection between those sensations and emotional states. We suggest that this heightened awareness could explain why hypervigilance of body sensations is a common problem in individuals who have PTSD (Reinhardt et al., 2020). While this heightened sense of interoceptive awareness was not also supported in our analysis of interoceptive accuracy using the HBCT, our previous findings are evidence of some degree of anomalous embodiment of emotion and heightened interoceptive awareness.

The findings of the PTSD group scoring high on the MAIA yet not showing any more accurate estimates of heart rate (IA) are seemingly contradictory. One possible reason that there was no group difference in interoceptive accuracy is that the PTSD group may self-report being very aware of bodily sensations, but in reality, they are not any better at sensing their true inner state than others. In terms of our study, if people with PTSD were as in tune with their bodily sensations as they disclosed in the MAIA, they would be more accurately estimating their heart rate. However, they were not more accurate on the IA measure. People with PTSD may be too aware of bodily sensations to the point where they are no longer accurately evaluating them. This could also explain why people with PTSD can overestimate the seriousness of small changes, causing greater stress to the individual. They often negatively evaluate typical bodily sensations, appraising them as unsafe or abnormal, which is inaccurate to the real state of the body

(Domschke, 2010; Pollatos & Schandry, 2008). Therefore, people with PTSD may disclose having more interoceptive awareness, causing them distress over changes healthy controls may find typical. However, at the same time, people with PTSD may also lower interoceptive accuracy, therefore incorrectly evaluating the severity or truth of these changes.

The experience of headaches being more widespread in the body in the PTSD group could suggest that people with trauma may have anomalous experiences of regular bodily sensations that are not associated with emotion. Furthermore, this finding is consistent with the MAIA Noticing subscale findings, where the analysis found that people with PTSD notice even neutral bodily sensations more than people without PTSD. This could be evidence that people who have PTSD experience an anomalous sense of interoception that extends from the sense of emotional embodiment to typical everyday experiences with bodily sensations.

Interestingly, individuals in the PTSD group scored higher on the BRCS, which measures resilience, than those who did not meet the diagnostic criteria for PTSD. High resiliency has previously been linked with lowered risk of developing PTSD (Wrenn et. al, 2011). While our finding is contradictory to this previous literature, we suggest that perhaps this high resiliency served as a protective factor that prevented our participants from showing any serious anomalies that would be depicted in the body maps, such as endorsing lots of activation in the sadness condition. Another reason for these seemingly contradictory findings would be that resiliency developed following the traumatic event, rather than existing prior to it. This would explain why the participants still developed PTSD and may serve as a preventative factor for developing PTSD again following future traumatic events.

While not all findings support our initial hypotheses, the implications of this study are important. Our data suggest that people with PTSD experience some degree of anomalous emotional embodiment, which corroborates the growing evidence of somatic-based therapies in trauma recovery. Despite not finding observable differences in interoceptive accuracy through the HBCT, variations in interoceptive awareness were evident on the MAIA. This finding suggests that individuals with PTSD may be hyperaware of bodily sensations and points to a potential target for intervention in rehabilitation for PTSD.

There are several limitations of this study to be noted. First, our sample size was limited due to preexisting psychiatric diagnoses and incomplete data, which may be attributable to the length of the task. Our sample was composed of predominately white and Asian American individuals, therefore reducing the generalizability of our findings. Also, we recognize that Black individuals and other people of color are exposed to a disproportionate amount of trauma, which may influence their embodiment of trauma and perceptions of body sensations. The current study is constrained in exploring these differences fully due to limited ethnic diversity.

Due to the design of the study, we also cannot establish temporal precedence in any of the measures; therefore, we cannot know if PTSD was the cause of observed group differences. As previously indicated, the BRCS was only able to measure resilience following exposure to the traumatic event. Therefore, it is difficult to tell if resilience was subsequently developed or a preexisting attribute of the individual. Furthermore, another limitation of our study is that we did not distinguish our group of healthy controls between those who had experienced trauma without developing PTSD and those who had never experienced a traumatic event. Future research on the topics of emotional embodiment and interoceptive awareness could analyze differences in these abilities between three groups: those who experienced trauma and developed PTSD, those who experienced trauma and did not develop PTSD, and finally, those who had no experiences of trauma in their lifetime. This research could be more telling of resiliency factors and further illuminate better paths to recovery for trauma survivors.

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