



Disgust and the development of posttraumatic stress among soldiers deployed to Afghanistan

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ABSTRACT

Although the DSM-IV recognizes that events can traumatize by evoking horror, not just fear, the role of disgust in the development of posttraumatic stress disorder (PTSD) has received little research attention. In a study of soldiers deployed to Afghanistan, we examined whether reports of peritraumatic disgust and trait disgust vulnerability factors (disgust propensity and disgust sensitivity) predict PTSD-symptoms, independently of peritraumatic fear, neuroticism, and anxiety sensitivity. Participants ($N = 174$) enrolled in this study before deployment, and were retested around 6 months ($N = 138$; 79%) and, again, 15 months ($N = 107$; 62%) after returning home. The results showed that (1) greater peritraumatic disgust and fear independently predicted PTSD-symptom severity at 6 months, (2) greater disgust propensity predicted more peritraumatic disgust, but not PTSD-symptom severity, and (3) disgust sensitivity moderated the relationship between peritraumatic disgust and PTSD-symptom severity. Implications of these findings for broadening the affective vulnerabilities that may contribute to PTSD will be discussed.

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1. Introduction

A growing literature has implicated disgust in the development of anxiety disorders, including spider phobia, blood-injection-injury phobia, and contamination-based obsessive-compulsive disorder (see Cisler, Olatunji, & Lohr, 2009a; McNally, 2002; Olatunji & McKay, 2007; Rozin, Haidt, & McCauley, 2008). Cognitive (Dagleish & Power, 2004) and contemporary conditioning (Davey, 1997) theories suggest that disgust may also be relevant in the development of posttraumatic stress disorder (PTSD) by means of the representation of the traumatic event. The association between disgust and PTSD may be understood in conditioning terms (see Engelhard, de Jong, van den Hout, & van Overveld, 2009) where a person learns that previously neutral, conditioned stimuli (CSs), present at the time of the traumatic event (unconditional stimulus; US), are linked to the event. Later exposure to the CS will activate memory representations of the US, which activates associated, conditioned responses (CRs). This may take two forms: signal-learning and evaluative learning (Hermans, Vansteenwegen, Crombez, Baeyens, & Eelen, 2002).

Signal-learning refers to learning that the CS is a signal of the re-occurrence of the US (i.e., CS predicts US; e.g., for sexual assault

victims: "If I'm alone with a man, then I'll be assaulted"). Extinction of learned fear requires the acquisition of disconfirming information (CS/No-US), so that the CS loses its signaling quality. *Evaluative learning* involves the process by which an affective evaluative reaction evoked by a US is transferred to a CS (De Houwer, Thomas, & Baeyens, 2001). In the event of evaluative conditioning with a disgusting US, the CS would not become a predictor of the US, but would become intrinsically disgusting (i.e., CS refers to a disgusting US representation; e.g., the smell of aftershave of a perpetrator or the location where a bomb exploded and mutilated a fellow soldier may elicit disgust via activating a disgust-related US representation). Effects of evaluative conditioning are less sensitive to extinction procedures than signal learning (see De Houwer, 2007). Experimental research suggests that disgust responses may be acquired through evaluative learning and evaluative conditioned disgust is often resistant to extinction (Mason & Richardson, 2010; Olatunji, Forsyth, & Cherian, 2007).

Signal-learning and evaluative conditioning effects both seem to be relevant for PTSD. First, trauma-related cues may predict US activation, and depending on the type of US representation that is elicited, this may give rise to intense fear, anger, shame, disgust, etc. Second, trauma-related cues may also become intrinsically aversive (e.g., disgusting). Peritraumatic emotions (e.g., disgust) may thus not only be an important source of (current) emotional responses (e.g., fear, disgust), but may also provide important clues regarding the type of US representation elicited by trauma cues (cf.

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Huijding & de Jong, 2007). For example, strong (peritraumatic) disgust responses may point to experienced threat of “contamination” or to being exposed to intense moral transgressions (e.g., Rozin, Haidt, & Fincher, 2009; Rozin, Haidt, & McCauley, 2009).

Although the DSM-IV (APA, 1994) recognizes that events can traumatize by evoking peritraumatic horror, not just fear, thus far the role of disgust has received only scant attention in research on PTSD. Preliminary research has shown that reported peritraumatic emotions often include disgust, for example, in witnesses of a catastrophic train crash (Engelhard, van den Hout, Arntz, & McNally, 2002). Likewise, when female sexual assault victims recall the assault memory, they report elevated feelings of disgust (Fairbrother & Rachman, 2004; Feldner, Frala, Badour, Leen-Feldner, & Olatunji, 2010). This also occurs in female students who imagine experiencing a non-consensual kiss (Fairbrother, Newth, & Rachman, 2005), and in women with PTSD during exposure to a variety of traumatic events (Olatunji, Babson, Smith, Feldner, & Connolly, 2009). Furthermore, women with a history of childhood sexual abuse and associated PTSD report significantly more disgust during the recollection and imagery of the event than those without PTSD (Shin et al., 1999). Although these initial findings suggest that disgust may indeed be relevant in the development of PTSD, an important next step would be to test the prognostic value of peritraumatic disgust in a longitudinal design. In addition, it may be helpful to determine whether the relationship between peritraumatic disgust and PTSD symptoms is independent of levels of peritraumatic fear, because disgust and fear are closely related (Woody & Teachman, 2000), and the combination of fear and disgust (horror) may be a common response to trauma (McNally, 2002). Therefore, the *first aim* of this study was to test the predictive validity of peritraumatic disgust independently of peritraumatic fear.

If peritraumatic disgust causally contributes to PTSD, then people with enhanced trait disgust would be especially at risk for developing PTSD symptoms. There is some preliminary evidence that trait disgust vulnerabilities may indeed contribute to PTSD symptoms (Foy, Sippelle, Rueger, & Carroll, 1984; Herba & Rachman, 2007). Recent research suggests that it is important to distinguish disgust propensity and disgust sensitivity. *Disgust propensity* is the tendency to experience disgust more readily (Van Overveld, de Jong, Peters, Cavanagh, & Davey, 2006). Potential disgust domains include core disgust (related to food, animals, and body products), animal-reminder disgust (death and envelope violations), and contamination disgust (concerns about interpersonal transmission of essences; Haidt, McCauley, & Rozin, 1994; Rozin et al., 2008; Olatunji, Williams, et al., 2007). These domains may be relevant for different types of traumatic events. For instance, animal-reminder disgust may be relevant for exposure to horrific images, while contamination disgust may be relevant for events involving physical contact. *Disgust sensitivity* is the tendency to find the emotion of disgust unpleasant (Van Overveld et al., 2006). Disgust propensity and disgust sensitivity can reliably be assessed (e.g., Olatunji, Cisler, Deacon, Connolly, & Lohr, 2007; Olatunji, Forsyth, et al., 2007; Van Overveld et al., 2006). Higher levels of disgust propensity are assumed to increase the probability that certain stimuli acquire a disgust-evoking status, whereas higher levels of disgust sensitivity are thought to motivate people to avoid stimuli that will evoke the unpleasant emotion of disgust, thereby maintaining symptoms (Van Overveld, de Jong, & Peters, 2010). Therefore, the *second aim* of this study was to test whether people higher in disgust propensity report more peritraumatic disgust, and the *third aim* was to test whether disgust sensitivity moderates the relationship between peritraumatic disgust and PTSD symptoms.

More specifically, in a sample of soldiers exposed to horrific events on deployment to Afghanistan, we tested the hypothesis that (1) the intensity of peritraumatic disgust predicts PTSD symp-

toms, independently of peritraumatic fear, (2) disgust propensity (especially animal-reminder disgust) predicts levels of peritraumatic disgust, thereby predicting PTSD symptoms, and (3) disgust sensitivity moderates the relationship between peritraumatic disgust and PTSD symptoms. Neuroticism and anxiety sensitivity are related to disgust propensity and sensitivity (see Van Overveld et al., 2006), and are known risk factors for PTSD symptom severity (Engelhard, van den Hout, & Lommen, 2009; Taylor, 2003). Indices of neuroticism and anxiety sensitivity were included to examine whether the relationships between disgust propensity/sensitivity and PTSD symptom severity are independent of these variables.

Given that evaluative conditioning effects may be involved in disgust-related problems, we also explored whether peritraumatic disgust and disgust propensity predict negative evaluative ratings (hedonic shifts) of deployment-related stimuli, including deployment itself, colleagues, and local people. Moreover, based on the observation (Olatunji, Lohr, Smits, Sawchuk, & Patten, 2009) that disgust sensitivity may enhance disgust-relevant learning (the more aversive the experience of disgust, the stronger the impact of disgust on evaluative conditioning effects), we also explored whether disgust sensitivity moderates the link between peritraumatic disgust and negative evaluative changes.

2. Material and methods

2.1. Participants and procedure

About 6–8 weeks before deployment, 176 infantry soldiers from the Royal Netherlands Army were invited to participate in this study. They were from two Air Assault Brigades that deployed to Afghanistan’s southern province Uruzgan for about 4 months in 2006 or 2007. The operation Task Force Uruzgan was part of the NATO’s International Security Assistance Force in Afghanistan. Their main duties were to improve security and support reconstruction.

At several sites, troops available during their preparation program were told about this study by their commanding officers. They met the principal investigator (IME) or research assistant several days later, who gave complete information about the study. Participation was voluntary without financial compensation. Two soldiers refused, and 174 soldiers agreed to participate. Their mean age was 24 (SD = 4.9). About 27% was married or cohabiting, 33% had a partner, and the others were single. Most had finished high school, and 5% was college-educated. About 35% had no prior deployment, 43% had one, and 22% had at least two.

Before deployment, several measures were administered, including questionnaires about demographic and military characteristics, neuroticism, and PTSD symptoms. This sample sustained two fatal casualties on deployment, including one participant. About 6 months after returning home, 138 participants (79%) were retested using questionnaires about potentially traumatizing events, trauma-related emotions, disgust propensity, disgust sensitivity, and PTSD symptoms, and 134 participants completed a clinical interview to index PTSD diagnosis. About 15 months after returning home, 107 participants (62%) completed questionnaires measuring PTSD symptoms and negative evaluative changes in deployment-related stimuli. Considerable effort was put into contacting and retesting participants to limit potential bias from dropout. The reasons for attrition included being on leave, attending a course, or being posted to new units. The institutional review board of Maastricht University/Academic Hospital Maastricht approved this study.

2.2. Measures

The Eysenck Personality Questionnaire (EPQ; Eysenck & Eysenck, 1975; Sanderman, Arrindell, Ranchor, Eysenck, & Eysenck,

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