

## Evaluative Conditioning: A Possible Explanation for the Acquisition of Disgust Responses?

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The present study attempted to demonstrate that through the contingent presentation of subjectively neutral pictures (CS) with disgusting pictures (US), the neutral stimuli will acquire the ability to evoke psychophysiological disgust responses. It was also investigated if this effect is more pronounced in individuals who are characterized by an elevated disgust sensitivity or blood-injury fear. Forty females underwent a learning experiment following the evaluative conditioning paradigm. The subjects were presented with 18 pictures depicting disgusting (D), pleasant (P), and neutral (N) scenes, displayed in pairs of 3 N-D, 3 N-P, and 3 N-N. Each pair was repeated 6 times. During the picture presentations, the facial EMG of the *M. levator labii*, the heart rate, the skin conductance, and blood pressure were recorded. Affective ratings for the pictures were determined before and after the experiment. The viewing of the disgusting US pictures led to increases in muscle tension, skin conductance, and heart period, but had no effect on blood pressure. Subjects with a high degree in disgust sensitivity and blood-related fears showed more pronounced EMG responses to the US disgust pictures and rated them as more disgusting than the low-scorers. There was no indication of disgust conditioning within the whole sample neither for the subjective nor for the physiological measures. However, the blood-fearful group showed a stronger increase in EMG activity toward the neutral pictures that had been paired with the disgusting ones compared to low-fearful subjects. This could be interpreted as evaluative conditioning. © 2001 Academic Press

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In the majority of definitions, disgust has been described as a food-related emotion. Starting with Darwin (1872), who referred to disgust as “something offensive to the taste” (p. 256), other authors have emphasized the function of disgust to oppose the hunger drive and to trigger oral rejection of bad-tasting or health-threatening food (Angyal, 1941; Davey, 1994a; Ekman & Friesen, 1975; Frijda, 1986; Oatley, 1988; Rozin & Fallon, 1987; Tomkins, 1963; Wierzbicka, 1986). As an extension of this concept, disgust has been

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seen as a motivator to keep one's own body as well as the immediate environment clean in order to prevent illness and disease (Izard, 1977; Plutchick, 1984).

The characteristic expressive component of disgust also points to its evolutionary origin as a protective response against the incorporation of harmful substances (Ekman & Friesen, 1975). The (proto-)typical disgust face mirrors the rejection of unwanted food and odors since it is characterized by the retraction of the upper lip, which facilitates the expelling of the mouth's content, and the nose wrinkle, which leads to the closing of the nostrils and thus prevents the intake of odors. The described expression is accompanied by an increase in facial muscle activity (EMG) in the levator labii superioris alaeque nasi muscle region (muscle which retracts the skin of the upper lip and the side of the nose), which seems to be a sensitive physiological disgust indicator. This could be demonstrated in studies by Vrana (1993, 1994) and also by an experiment by Stark, Schienle, and Vaitl (1998). In Vrana's first investigation, subjects were asked to imagine situations eliciting disgust, anger, pleasure, and joy. The disgusting scenes provoked pronounced increases in the EMG levator labii activity, which therefore could be used to differentiate between the pleasure and anger condition. This was not possible for the joy imagery, since the smiling of the subjects also led to increases in the facial muscle tension of this particular region. When focusing on negative emotions, however, a differentiation was possible, which was demonstrated in a subsequent investigation (Vrana, 1994) where disgust was accompanied by the largest rise in levator labii activity compared to anger-eliciting and neutral images. In a study by Stark et al. (1998), subjects were presented with pictures depicting different disgust elicitors (e.g., cockroaches, dirty toilets, injuries, feces) as well as neutral scenes. The subjective disgust ratings for the material were strongly connected with the integrated EMG of the levator labii, resulting in a Pearson's correlation coefficient of  $r = .70$ .

Other studies focusing on the autonomic physiology revealed that disgust experiences are associated with a reduction or only minor increases in heart rate (Ekman, Levenson, & Friesen, 1983; Johnsen, Thayer, & Hugdahl, 1995; Levenson, Ekman, & Friesen, 1990; Boiten, 1996; Lang, Greenwald, Bradley, & Hamm, 1993) as well as elevated skin-conductance responses (Balaban & Taussig, 1994; Johnsen *et al.*, 1995; Lang *et al.*, 1993; Levenson *et al.*, 1990).

Only a few investigations have been concerned with individual differences regarding the susceptibility to disgust induction. Within this context it could be shown that anxiety patients suffering from animal phobia (spiders and snakes) or blood phobia are characterized by an elevated disgust sensitivity as indicated by questionnaire scores (de Jong & Merckelbach, 1998; Matchett & Davey, 1991; Merckelbach, de Jong, Arntz, & Schouten, 1993; Mulken, de Jong, & Merckelbach, 1996; Tolin, Lohr, Sawchuck, & Lee, 1997; Tucker & Bond, 1997; Ware, Jain, Burgess, & Davey, 1994). Also, these

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