Learning to feel safe: A translational study of the influence of safety learning on anxiety-related overgeneralized fear

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BACKGROUND

• Anxiety disorders are among the most common, debilitating mental disorders affecting approximately a third of the population in their lifetime (Kessler et al., 2012).

• However, a third of the patients with anxiety do not respond to current gold-standard treatments (Bystritsky, 2006), demonstrating significant gaps in our understanding of the underlying mechanisms in the etiology and remediation of anxiety.

• One such mechanism is overgeneralized fear (OGF), which is the tendency to respond to non-threat as if it were threatening.

• OGF has been examined using fear learning, and it is reflected in reduced discriminative learning about threat-safety signals.

• While research has focused on maladaptive fear learning in the emergence of OGF, recent evidence suggests that impaired safety learning may play a unique role (Kong et al., 2010), and that safety learning may reduce behavioral indices of anxiety (Pollak et al., 2009).

• Yet, the independent influence of safety learning on anxiety-related OGF is still unclear.

HYPOTHESES

Using methods that are directly translated from rodent research, we hypothesized that safety, versus fear learning will

1. Reduce anxiety-related response towards a conditioned stimulus (i.e., the conditioned cue operates as an explicit safety signal)

2. Enhance discriminative learning about threat-nontreat signals, indicating less OGF.

3. Further, we will explore whether the saliency and timing in safety cues influences these effects.

METHODS

Participants

Participants were 21 adults, aged 18-45 (M = 21.86, SD = 4.39). There were 10 males (47.6%) and 11 females (52.4%). Participants were assigned to one of the four tasks: 1) Fear Learning (n = 7), 2) Safety Learning 1 (n = 5), 3) Safety Learning 2 (n = 5), and 4) Safety Learning 3 (n = 4).

Fear and Safety Learning Task

Skin conductance response (SCR) was collected on the BIOPAC MP 150 system (BIOPAC Systems Inc., Goleta, CA). Recording was filtered with a 2 Hz low-pass filter before analysis. Mean skin conductance level was calculated for each CS (“CS-On”) and ITI (“CS-Off”), and scores were generated by computing the mean of all trials.

RESULTS

Hypothesis 1: Fear and Safety Learning

Fear Generalization Task

Figure 3: Temporal sequence of a typical trial. The unconditioned stimulus (US) was an electrical stimulation on the left thumb. An auditory cue co-terminated (Safety Learning 2) or co-occurred (Safety Learning 3) to add more saliency to the CS.

Hypothesis 2: Fear Generalization

Figure 4: Conditional and generalization stimuli were adapted from Lissek et al. (2009) and that safety learning may reduce behavioral indices of anxiety (Pollak et al., 2009).

DISCUSSION

• Preliminary findings of this ongoing investigation of anxiety-related OGF in humans points to potentially unique roles of fear and safety learning.

• As hypothesized, the Safety Learning 1 condition elicited reduced SCL responses when the CS was on versus off, suggesting that the CS was recognized as a safety cue.

• Across conditions, participants discriminated threat from all non-threat cues including GS 1 which is the most perceptually similar, based on behavioral ratings. This is consistent with the literature in non-clinical samples (Lissek et al., 2008).

• Hypothesis 2 was not supported. Interestingly, the Safety Learning 1 condition induced more OGF compared to other conditions although the differences were not statistically significant. This demonstrates the importance of developing safety learning methods focusing on the saliency and timing of safety cues (i.e., the Safety Learning 2 and Safety Learning 3).

• Findings may inform development of innovative treatment approaches.

REFERENCES


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