Fear learning to visceral sensations: atypical fear generalization and reduced discrimination of painful and non-painful visceral stimuli

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BACKGROUND

Interoceptive fear learning and generalization have been hypothesized to play a key role in unexplained abdominal pain in patients suffering from functional gastrointestinal disorders (FGID) [1,2]. However, there is no experimental evidence demonstrating that fear learning and generalization to visceral sensations can be established in humans and alter visceral perception.

AIM

- Demonstrate fear learning towards visceral sensations
- Investigate fear generalization to painful visceral sensations
- Study learning-induced alterations in visceral discrimination
- Explore the influence of fear learning on visceral perception thresholds

MATERIAL & METHODS

- 30 (10 M) healthy participants (conditioning group), 30 (13 M) healthy participants (control group)
- Categorical rating scale (Faint sensation – Sensation – Faint discomfort – Discomfort – Faint pain – Pain – Strong pain)
- CS and GSs = esophageal balloon distension
- US = electrical stimulation (individually calibrated, 8/10 on VAS, 9.14 mA ± 3.32)
- ISI (min: 7 s, max 12 s)
- Signal detection parameters: $P(a)$ as index of discrimination sensitivity

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REFERENCES


RESULTS

Fig. 2. Mean startle amplitudes response times. ISI = inter-stimulus interval. CS = conditioned stimulus. GS = generalization stimulus. Error bars represent standard errors of the mean. *: $p < .05$. **: $p < .01$. ***: $p < .001$.

PARADIGM

A. TEST SEQUENCE

1. PRE-CONDITIONING
2. THRESHOLDING
3. TEST
4. DISCRIMINATION
5. GENERALIZATION

B. STIMULI

1. BALLOON PRESSURE (PSI)
2. 2PSI 4PSI

CONCLUSION

- Fear learning can be established towards visceral stimuli
- Fear generalizes to more intense visceral stimuli
- Fear learning influences visceral perception thresholds
- Fear learning impairs visceral discrimination.

CLINICAL IMPLICATIONS

These findings suggest that in FGID, fear learning and generalization may foster gastrointestinal-specific anxiety, contribute to visceral hypersensitivity, and impair patients’ ability to discriminate painful from non-painful visceral sensations.