

# Abstract

It has been proposed that conditioned eyeblink responses, once established, may help to facilitate fear extinction. This has potential clinical relevance because the extinction of learned fear responses is at the core of exposure therapy in the treatment of many anxiety disorders. Based on our findings, this proposal has to be rejected. Our findings do not support the two-stage theory of aversive conditioning, which predicts the suppression of conditioned fear once conditioned eyeblinks are acquired. Rather, we found that concomitant extinction of conditioned eyeblink and fear responses facilitated the recall of conditioned fear responses and impeded the extinction of conditioned eyeblinks. Findings are best explained by increased salience of conditioned stimuli and, therefore, support the sensory-gating hypothesis of the amygdala.

## Related publications:

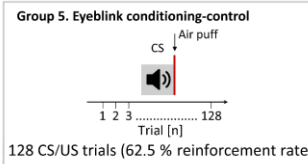
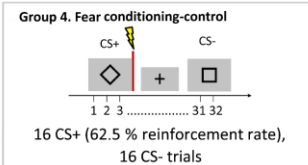
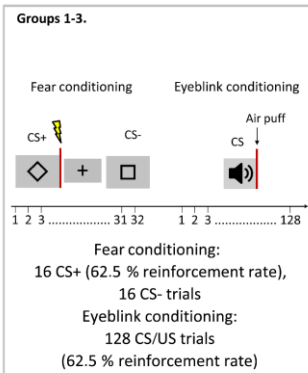
- Magal and Mintz, Eur J Neurosci 40, 3548-3555 (2014)
- Farley *et al*, J Neurosci 36, 2190-2201 (2016)

# Techniques & Methods

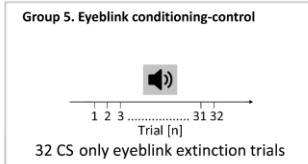
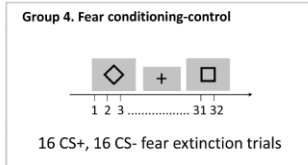
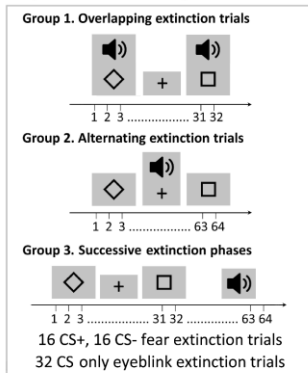
- 5 groups of 20 human male participants (100 participants in total,  $23.58 \pm 3.26$  years) were recruited for a two-day experiment.
- Differential fear and delay eyeblink conditioning paradigms were performed: acquisition training on day 1 and extinction training on day 2.
- Skin conductance and conditioned eyeblink responses were measured.

Inoue *et al.*, eNeuro (2020)

## Day 1. Acquisition training

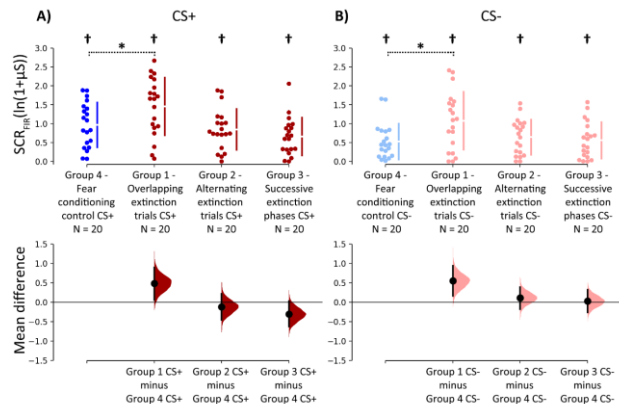


## Day 2. Extinction training



# Results

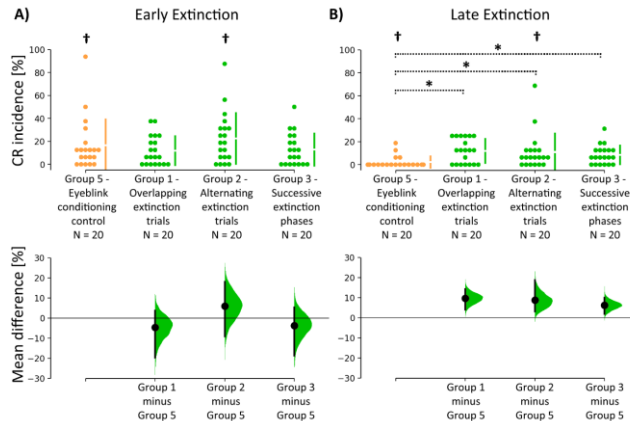
## Extinction of conditioned fear responses



*The concomitant presentation of eyeblink and fear conditioned stimuli*

- did not facilitate extinction but facilitated recall of conditioned fear responses

## Extinction of conditioned eyeblink responses



- impeded extinction of conditioned eyeblink responses

## Results / Conclusions

- As expected, prior fear conditioning accelerated acquisition of conditioned eyeblink responses, accompanied by increased autonomic fear responses
  - Overlapping eyeblink and fear conditioned stimuli during extinction resulted in increased recall of conditioned fear responses (i.e., additive response summation), and impeded extinction of conditioned eyeblink responses
- Findings are difficult to explain with the two-stage theory of aversive conditioning, which predicts the suppression of conditioned fear once conditioned eyeblinks are acquired
- Facilitated acquisition and impeded extinction of eyeblink CRs, however, are in accordance with the sensory-gating hypothesis of the amygdala

Inoue *et al.*, eNeuro (2020)