Noradrenaline Potentiates Conditioned Fear Bradycardia, N170, and Late Positive Potential Amplitudes

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Background
Fear conditioning is an important model for understanding the etiology and maintenance of anxiety disorders, while extinction of fear is considered to reflect the underlying learning process of exposure therapies. Previous research has pointed to a potential role of noradrenaline and dopamine, in acquiring emotional memories (e.g., McGaugh, 2013; Bowers & Ressler, 2015). Here, we investigated whether the noradrenergic alpha-2 adrenoceptor antagonist yohimbine and the dopaminergic D2 receptor antagonist sulpiride modulate long-term fear conditioning and extinction in humans. We showed that yohimbine modulated consolidation and enhanced recall of conditioned (but not extinguished) fear. We did not find dopaminergic effects on fear and extinction consolidation.

Pharmacological Challenge: Yohimbine and Sulpiride

Day 2 Fear and Extinction Recall Only in Yohimbine Group

EEG: Fear bradycardia (cardiac deceleration 2-5 s post-CS)

Contingency (CS+/E) x Extinction (E/N) x Substance: p = .020 (first 10 trials)

EEG: N170 (145-185 ms post-CS, T7/8, TP7/8, TP9/10, P7/8, PO9/10)

EEG: LPP (400-800 ms post-CS, P1/z/2, PO3/z/4, O1/z/2)

Experimental Manipulation Check: α-Amylase
Increased α-amylase activity for yohimbine group (reflecting central noradrenaline release; Ehler et al., 2006)

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Fear Conditioning and Extinction Paradigm

Participants received yohimbine (10 mg, n = 18), sulpiride (200 mg, n = 18), or placebo (n = 18) between acquisition and extinction stages.

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