Contextual Renewal and Awareness:

Dissociating awareness from SCR within an electrodermal conditioning paradigm.

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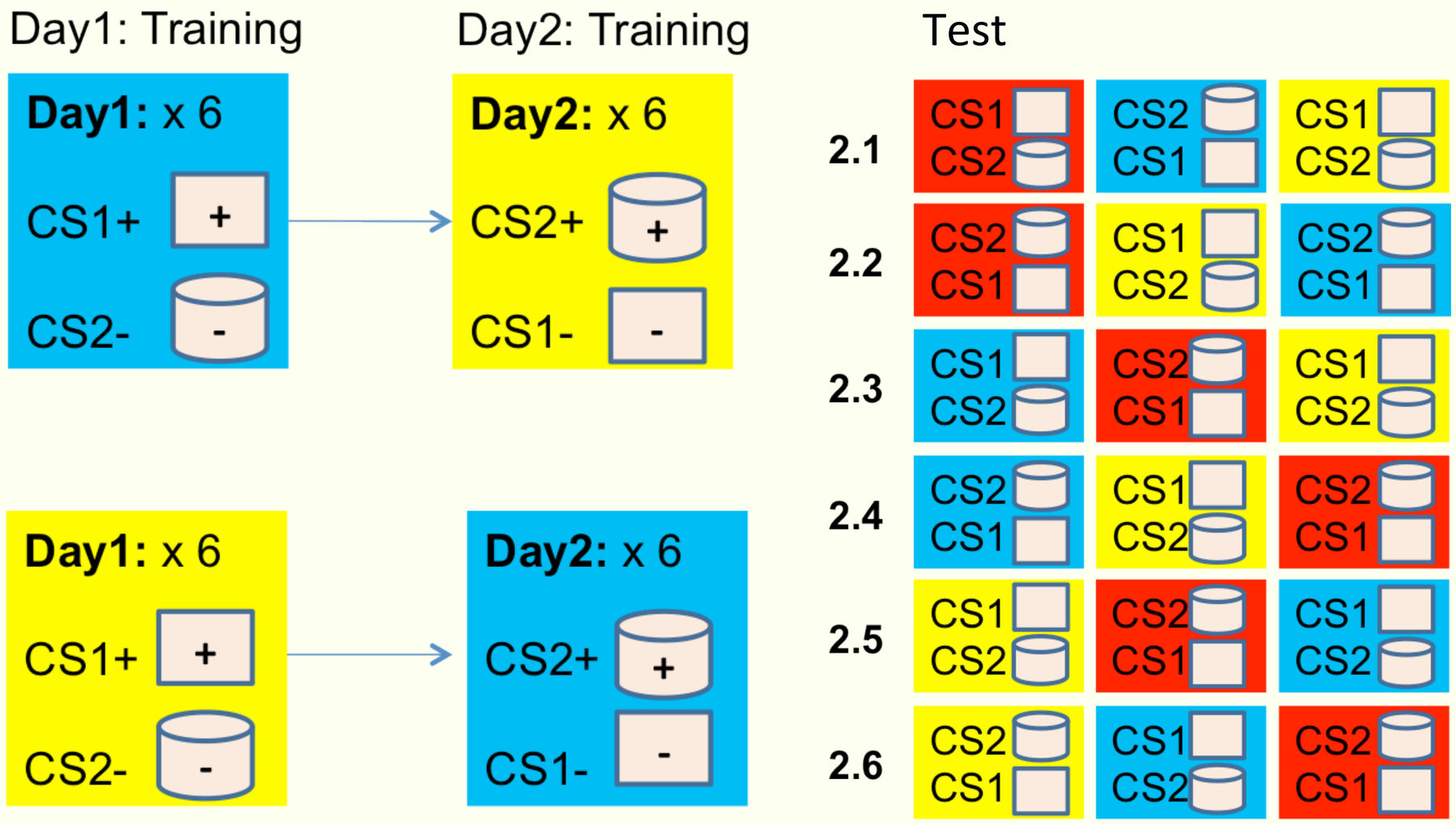
Background

Research investigating associative learning in animals suggests conditioned relationships can be context dependent. This is typically demonstrated by the renewal effect; where a CS reinforced in context A, and subsequently extinguished in context B, shows reliable recovery when returned to either the original (A-B-A renewal) or novel context (A-B-C renewal) (Bouton & Brooks, 1993).

However, the effect is less robust in humans: Whilst A-B-A renewal is often observed (Havermans et al, 2005), A-B-C renewal is less reliable, and has only been observed in predictive learning paradigms (Ungor & Lachnit, 2008). The renewal phenomenon is often attributed either to configural associative learning (Pearce, 1987) or to independently competing memory traces (Bouton, 2004). Within a dual-process framework (McLaren et al, 1994), such theories attribute contextual learning to a low-level unconscious system. However, the fragility of A-B-C renewal in humans has led some researchers to suggest that contextual learning may be better understood as the product of a more complex, propositional, system (Havermans et al, 2005).

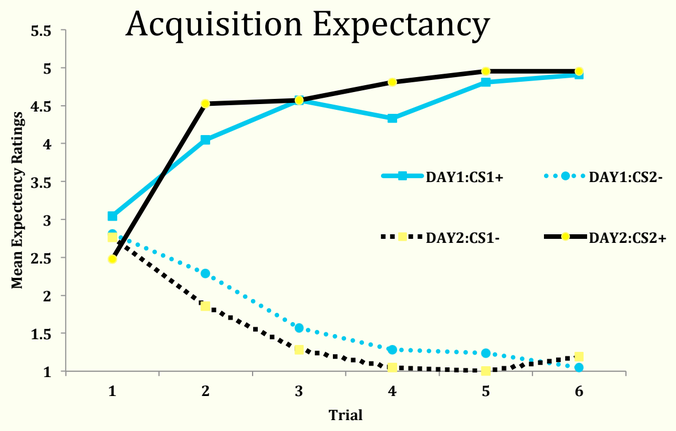
The research presented here investigates both A-B-A and A-B-C renewal in an electrodermal paradigm, by concurrently measuring conscious expectancy and skin conductance responses in an electrodermal conditioning paradigm.

Design

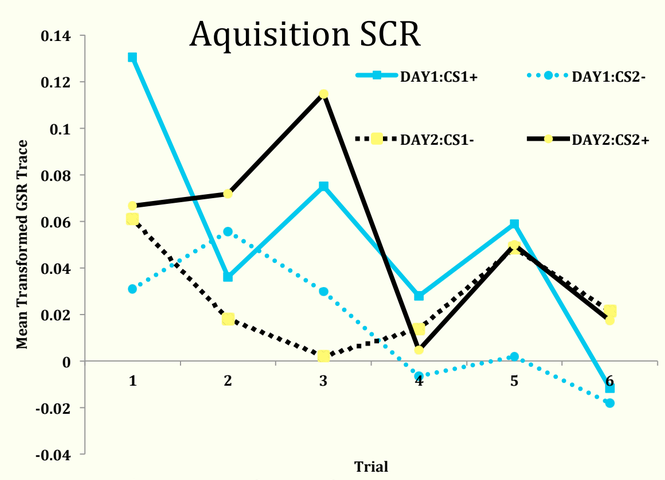


- Shocks delivered on reinforced trials (+)
- Measures of conscious expectancy and conditioned skin response taken prior to each US
- Each CS was presented for 5000ms, with a shock (US) in the last 500ms.
- Trials separated by 30,000-50,000ms.
- Training consisted of six CS presentations on each day.
- Test consisted of one presentation of each CS-Context pair in the absence of shock.

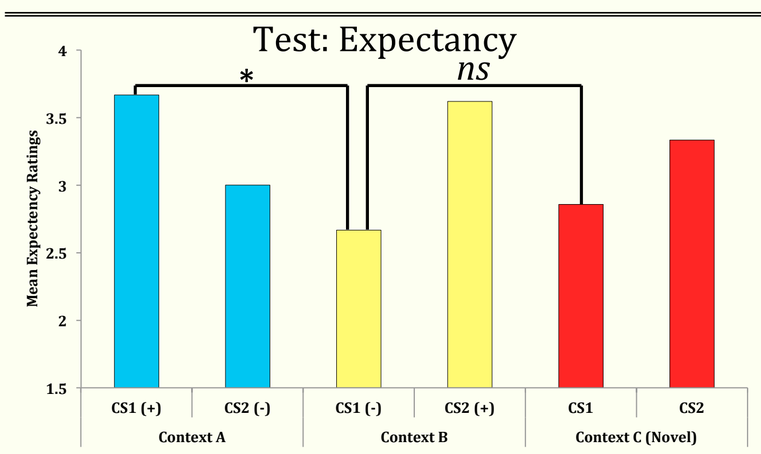
Results



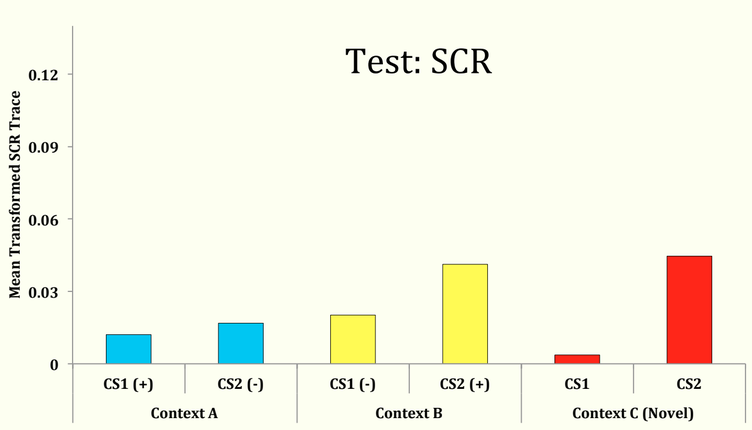
CS*DAY: $F(1,20)=572.27$, $p<.001$



CS*DAY: $F(1,20)=6.19$, $p<.022$



CS*CONTEXT: $F(2,40)=5.51$, $p<.008$
A-B-A: CS1-A vs. CS1-B, $F(1,20)=6.77$, $p<.017$
A-B-C: CS1-B vs. CS1-C, $F(1,20)=.19$, $p<.67$



CS*CONTEXT: $F(2,40)=.23$, $p<.79$, n.s.

Discussion

- Participants significantly acquired CS-US contingencies across training for both measures of expectancy and SCR.
- However, only conscious expectancy measures showed contextual modulation upon test.
- Analysis of CS1 in isolation, revealed contextual renewal when returned to the previously reinforced context (A-B-A renewal). However, placing CS1 in a novel context did not result in any renewal (no A-B-C renewal).
- These results suggest propositional mechanisms are responsible for renewal in humans, as indexed by conscious expectancy.
- The observed lack of contextual modulation on SCR measures during test (despite successful acquisition) could be due to a lack of sensitivity, or due to a dissociation between implicit and explicit indices of learning.

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