



Modulation of Imagery Rescripting and Extinction using Transcranial Direct Current Stimulation

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BACKGROUND

- Extinction training and imagery-rescripting reduce threat-based conditioned fear responses through contingency-based expectancy evaluation and re-evaluation of the cognitive representation of the unconditioned stimulus.
- The effects of these interventions may be modulated by Transcranial direct current stimulation (tDCS), which targets cortical excitability and impacts fear learning.
- This study investigates the effects of tDCS on imagery rescripting and extinction of generalized fear responses to establish a drug-free paradigm for reducing fear responses.

PARTICIPANTS

Sample Size

- Statistical power analysis using ***G*power*** (Faul, Erdfelder, Lang, & Buchner, 2007).

Sampling

- Non-Probability ***Purposive Sampling***

Inclusion Criteria

- Male or female ***healthy individuals***, aged between ***18 to 35 years***

Exclusion Criteria

- Individuals with ***colour blindness***; who are currently using any ***medication that can impair attention, concentration, reaction time, or memory***; diagnosed with any ***psychiatric disorder like anxiety, phobia, depression***, etc.; ***pregnancy***; diagnosed with any serious neurological or medical condition like ***epilepsy or heart disease***; having ***implants***; have consumed ***alcohol, any psychoactive substances*** or any caffeinated drink within the past 24 hours

STIMULI

- Ten rings, white lines against a black background, of gradually increasing diameter, in a perceptual continuum will be used as CS (Lissek et al. 2010).
- UCS will be an aversive image (dimensions: 1024x768, resolution: 72dpi) selected from a standardized database, the International Affective Picture System (IAPS), (Lang, Bradley & Cuthbert, 2008).
- The subject will choose a level of aversiveness that is unpleasant but not unbearable.

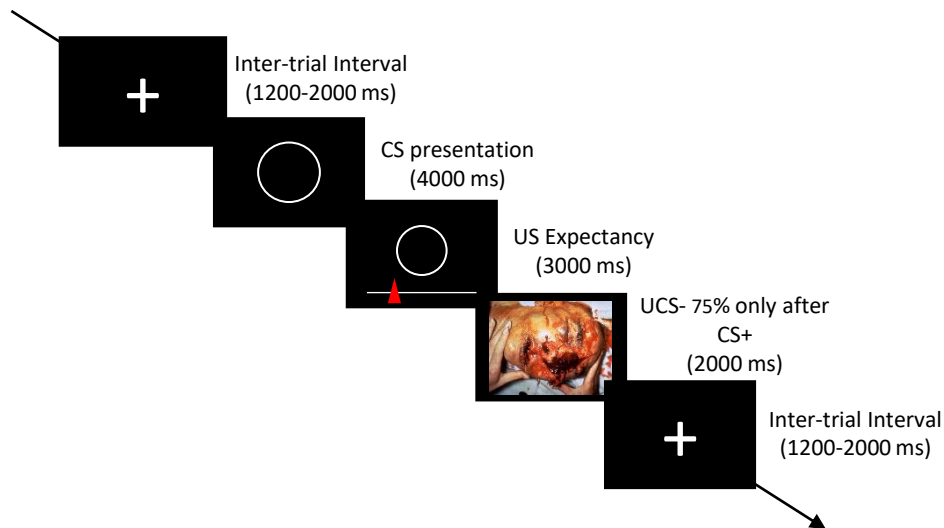


Figure 1: Schematic representation of experimental trials

MEASURES

Standardized Questionnaires

- State-Trait Anxiety Inventory-S (Spielberger, 1983)
- Behavioural Activation/ Inhibition Questionnaire (Carver & White, 1994)
- Intolerance of Uncertainty Scale (Carleton, Norton, & Asmundson, 2007)
- Positive and Negative Affect Schedule (Watson, Clark & Tellegen, 1988)

Self-Report and Behavioural Measures

- UCS Expectancy Ratings
- Valence and Arousal Ratings
- Approach-Avoidance Task

Physiological Measures

- Skin Conductance Response (SCR)
- Heart Rate Variability (HRV)
- Respiration

EXPERIMENTAL DESIGN

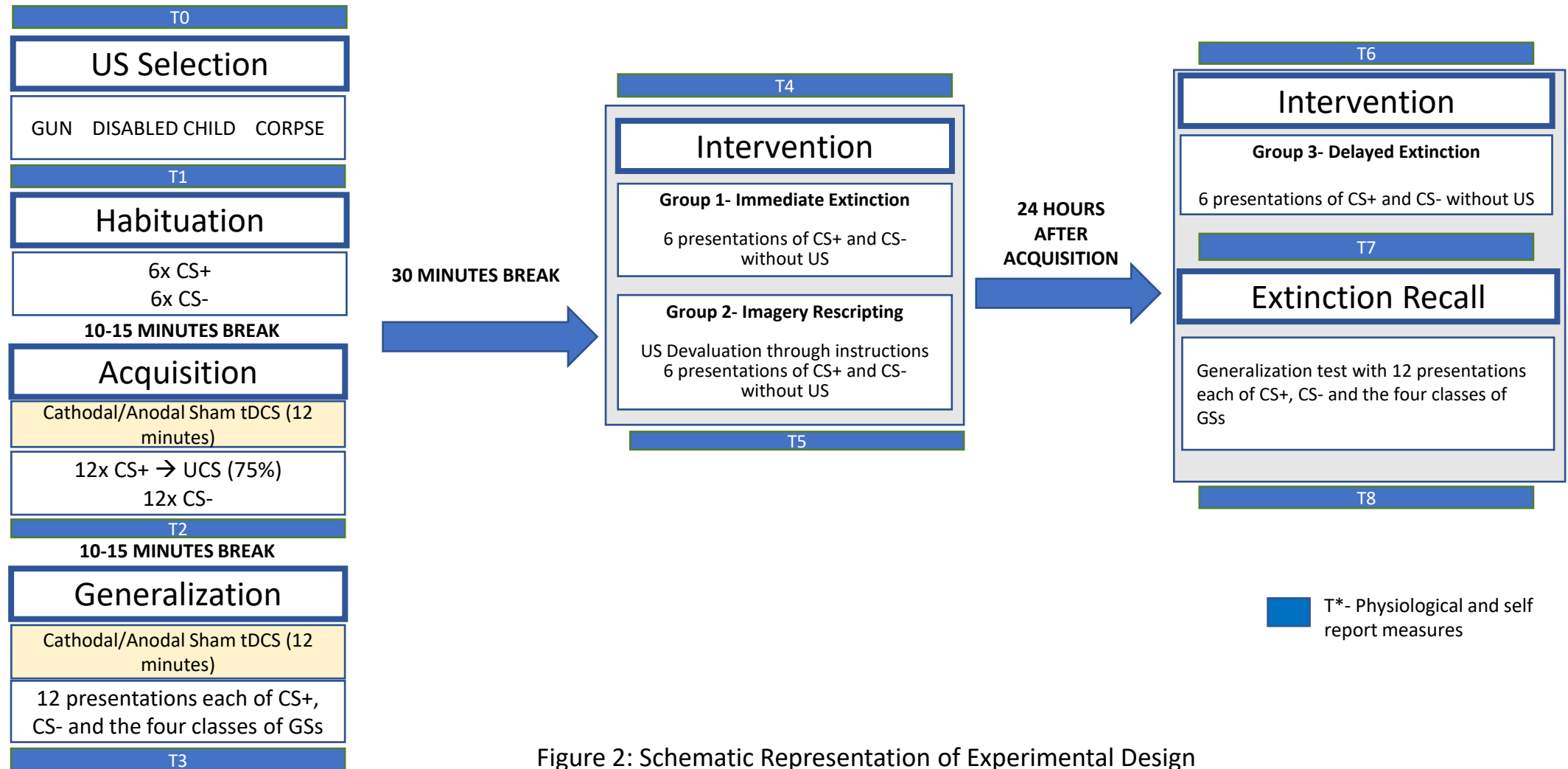


Figure 2: Schematic Representation of Experimental Design

tDCS PROTOCOL

1.5 mA cathodal, anodal or sham tDCS applied over the **left dorsolateral prefrontal cortex (dlPFC)** for 12 minutes



Acquisition Phase
(50% of the participants)



Generalization Phase
(50% of the participants)

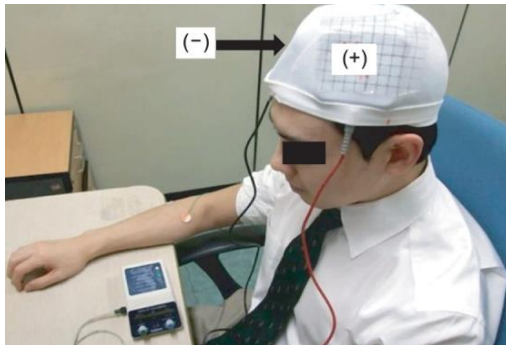


Figure 3: Transcranial direct current stimulation of left DLPFC (Kim et al., 2013)

EXPECTED OUTCOMES

- Combination of tDCS and Imagery Rescripting and Extinction may be more effective in reducing conditioned fear responses as it directly affects cortical excitability.
- Adding tDCS will be more effective as it targets the brain circuitry of both expectancy revaluation as well as UCS devaluation.
- Cathodal transcranial direct current stimulation (tDCS) applied over the left dlPFC for 12 minutes during the acquisition and generalization phase may result in reduced conditioned fear responses.
- tDCS may lead to increased efficacy of imagery rescripting and extinction in reducing conditioned fear responses.

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