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Transfer of fear measured with blink-startle modulation.

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Disclosures:

Miguel Rodríguez-Valverde, Mónica Hernández-López.

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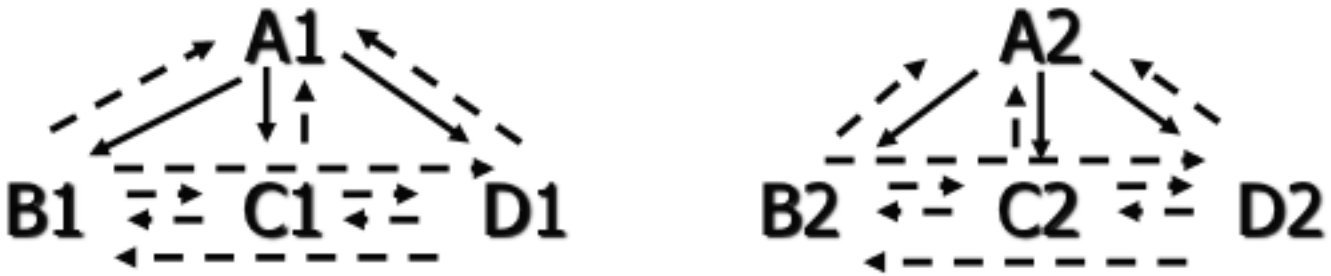
- Research on the transfer/transformation of respondent functions is deemed to be crucial for a functional-contextual analysis of human emotional responding, particularly anxiety and its disorders.

- This process accounts for the emergence of emotional responses to stimuli that have not been directly paired with an unconditioned aversive stimulus.

- In spite of its relevance, very few studies have been published on this topic. Most studies on the transfer of emotional responding have focused on avoidance responses, rather than on the respondent/Pavlovian component.

- The first study on the topic was conducted by Dougher et al. (1994) with a very small sample.



Differential aversive SCR conditioning (6 trials)

B1 (CS+) B2 (CS-)

Mild shock (UCS)

TRANSFER (probe trials in extinction)

C2 C1 D2 D1

C.E.R. (higher SCRs to C1 and D1 than to C2 and D2)

- Since then, only a handful of studies have extended this research with contemporary standards in psychophysiological research on aversive conditioning and larger samples.
  - Rodríguez-Valverde et al. (2009): within-subject replication of the transfer effect.
  - Vervoort et al. (2014): concurrent measurement of expectations.

- All of these studies were conducted using electrodermal activity (skin conductance responses) as their main dependent variable.

- The validity of SCRs as a psychophysiological measure of fear has been questioned.
- SCRs reflect general arousal (both appetitive and aversive) and attention.
- Fear-potentiated-startle (FPS) appears to be a more adequate measure:
  - Very sensitive to the affective valence of stimuli.
    - Unpleasant stimuli potentiate startle
    - Pleasant stimuli attenuate startle
  - Difficult to influence it voluntarily (experimenter demands): brainstem reflex mediated by a very limited number of synapses.
  - Increasingly used in psychophysiological research on fear conditioning and generalization.

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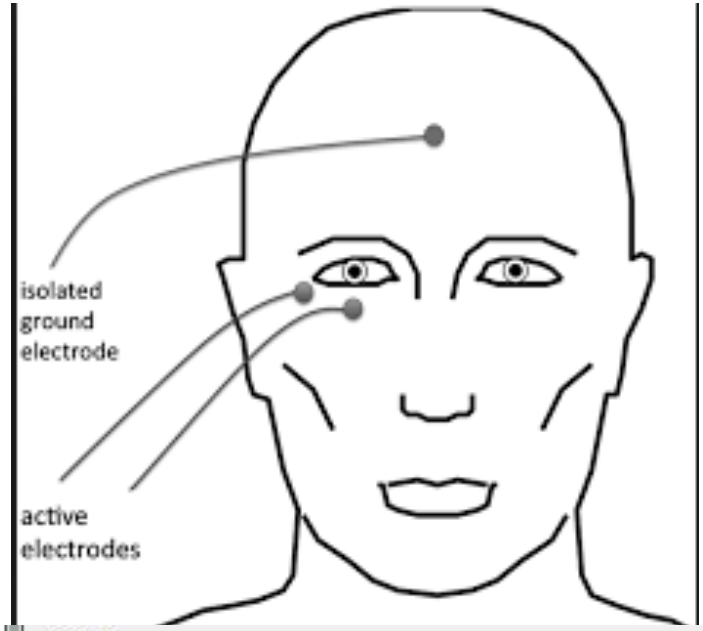
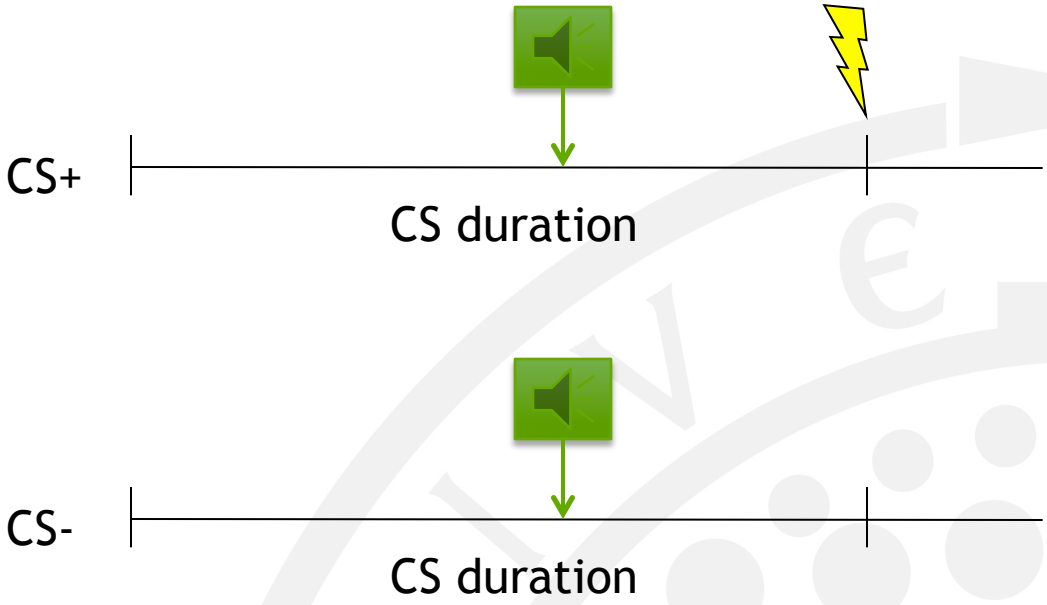
- Acoustic blink startle: produced by sudden burst of white noise.





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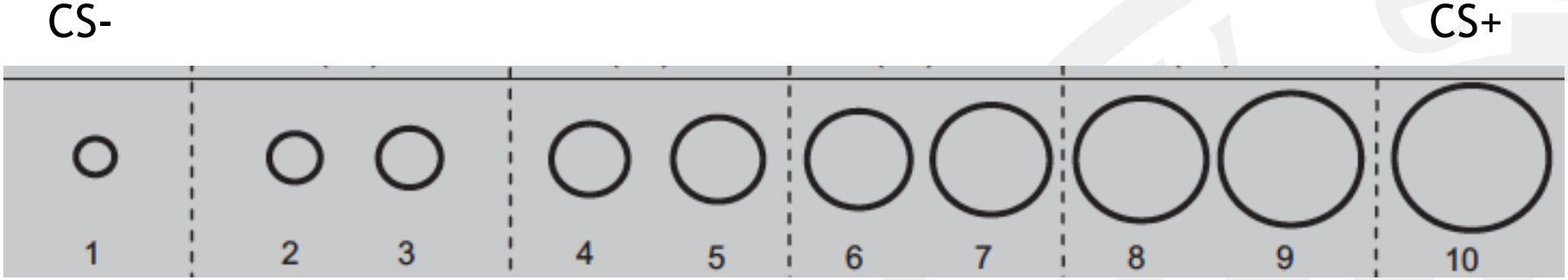
- Research by Lissek et al. (2008) showed that it is possible to obtain a generalization of fear potentiated startle along a continuum of physical similarity (generalization gradient).



- The present study employs a similar procedure in order to study the transfer of FPS across equivalence classes with physically dissimilar stimuli.

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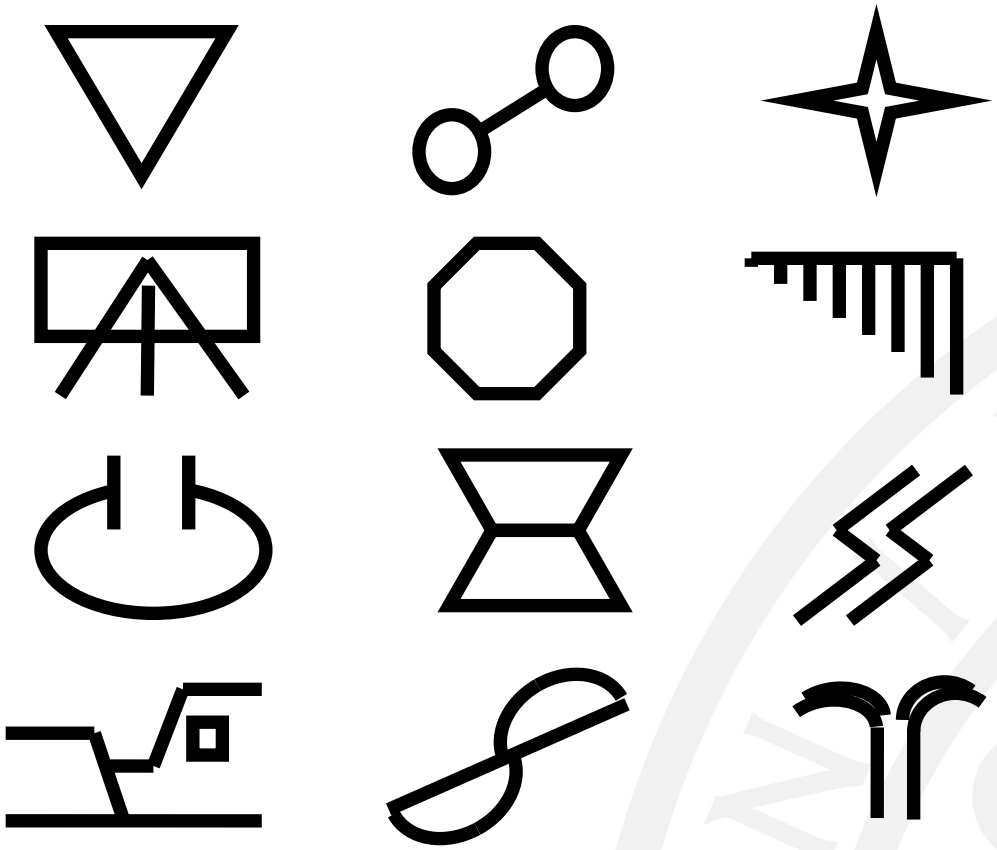
Method

- Participants:
- 31 healthy undergraduates from University of Jaén (23 female), mean age 20.04 years old (18-35). No previous experience with research on stimulus equivalence or transfer of functions.
- One participant did not pass equivalence class formation and the data of three further participants had to be discarded due to problems with the psychophysiological recordings.

Method

- Stimuli:



- 50ms white noise burst (102 dB).
- Electrocutaneous stimulation (shock) (50 ms).

Method

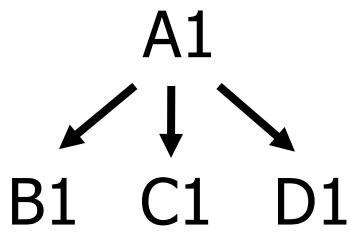
- Procedure:

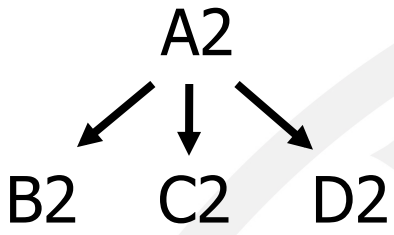
All the procedures in the study were approved by the Ethics Board of University of Jaén.

- 1. Formation of two four-member equivalence classes.
- 2. Acquisition of conditioning with B1 (CS+) and B2 (CS-).
- 3. Transfer test with C1, D1, C2, and D2.

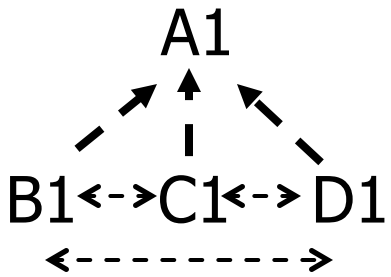
Method

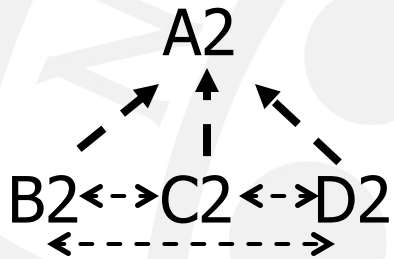
- Formation of equivalence classes:
- MTS training to criterion





- Symmetry test and equivalence test



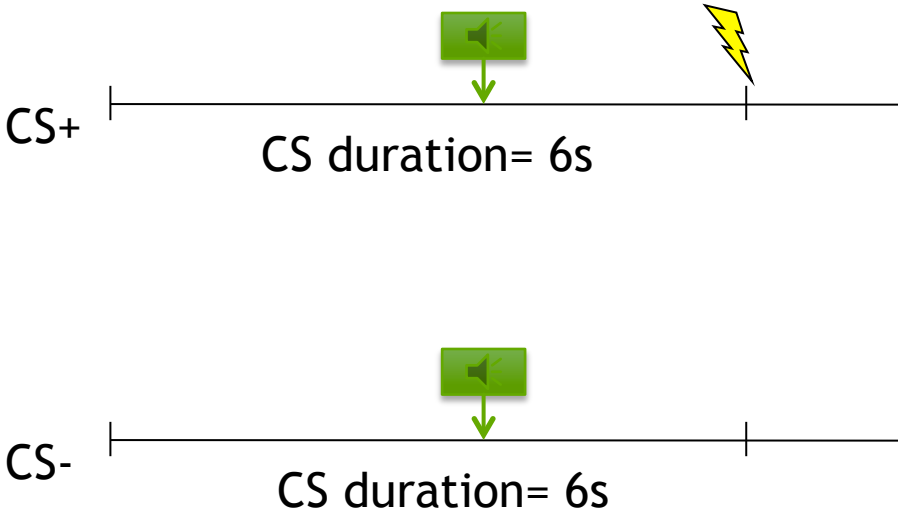


Method

- Procedure:

2. Classical conditioning: participants went through a differential aversive conditioning procedure with mild electric shock as the UCS (80%). 10 blocks: B1 (CS+), B2 (CS-), ITI.

Odd blocks: FPS



Even blocks: Expectancy ratings

Risk level?

1 None 2 Medium 3 Absolute

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Method

- Procedure:

3. Transfer test: 8 blocks with 7 trials each,

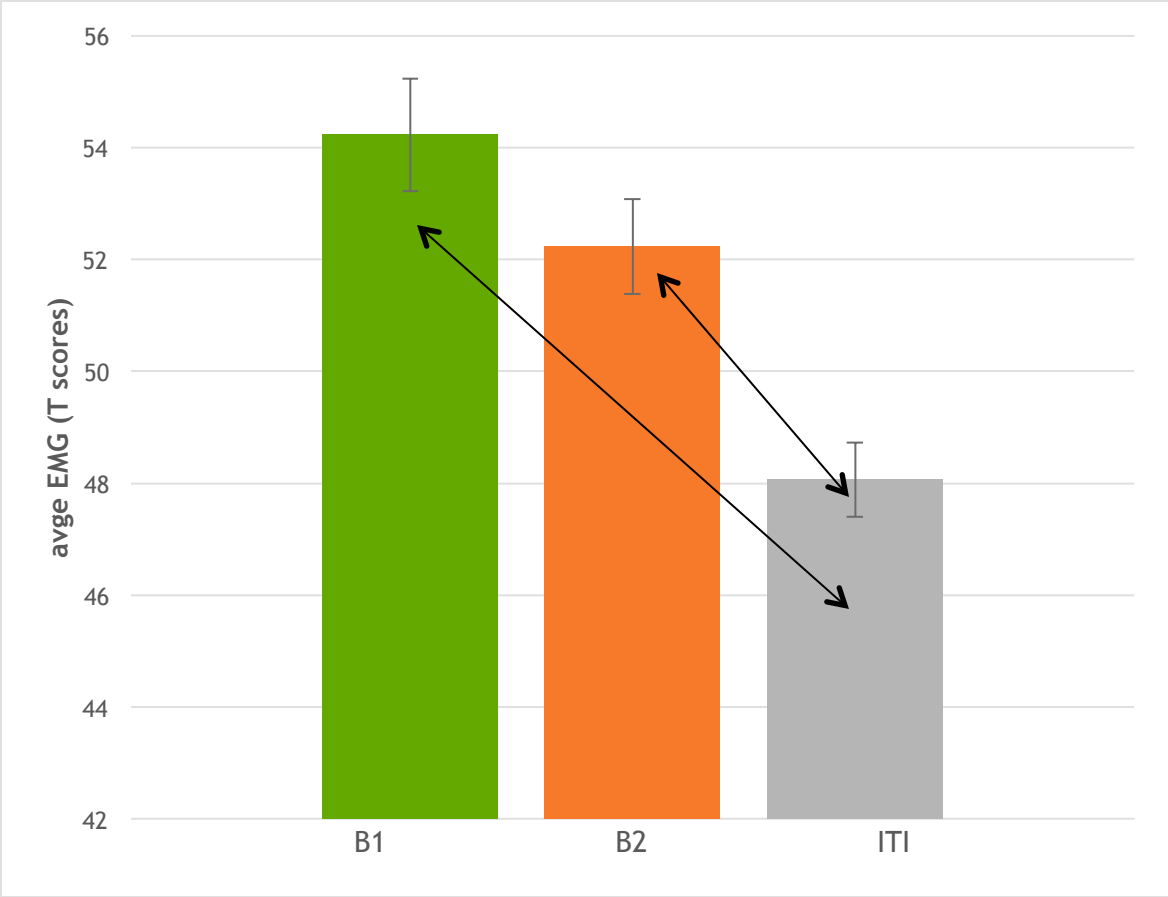
B1 (CS+), B2 (CS-), C1, C2, D1, D2, ITI.

CS+ shock contingency: 50%. All other stimuli in extinction.

- Data quantification:
  - EMG was rectified and smoothed based on a 20ms moving window.
  - Quantified amplitude of responses starting at least 20ms after noise and within a 150 ms interval.
  - EMG data were converted to T scores to minimize individual differences and normalize distribution.

Results

- 30/31 passed equivalence class training and assessment successfully.
- Blink startle, conditioning acquisition (N=27)



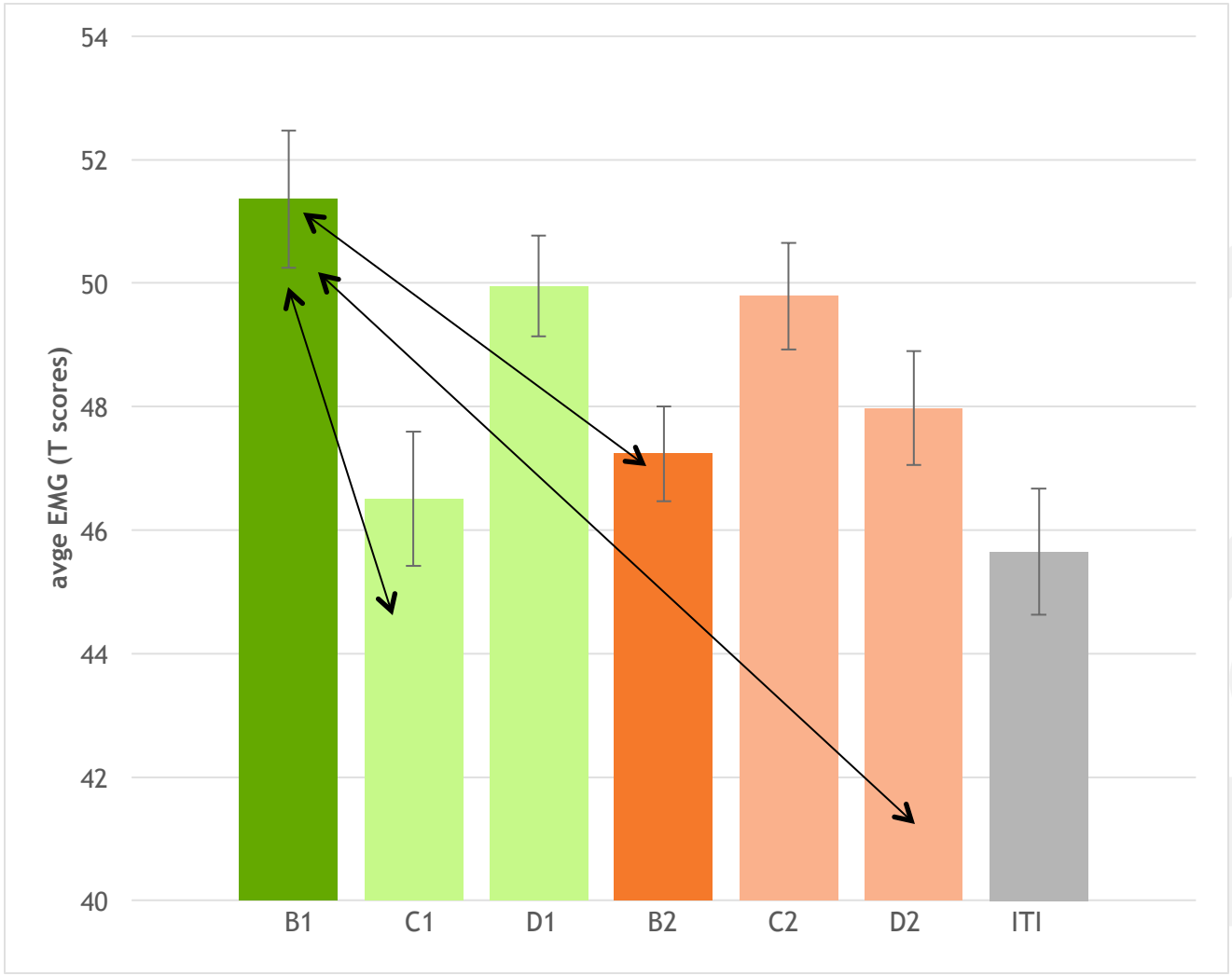
RM-ANOVA:
Significant effect for stimulus type.

Related samples t tests:
B1-ITI: $t(26)= 5.21$; $p<0.001$
B2-ITI: $t(26)= 4.03$; $p<0.001$
B1-B2: *ns*

NO CONDITIONING

Results

- Blink startle (transfer)



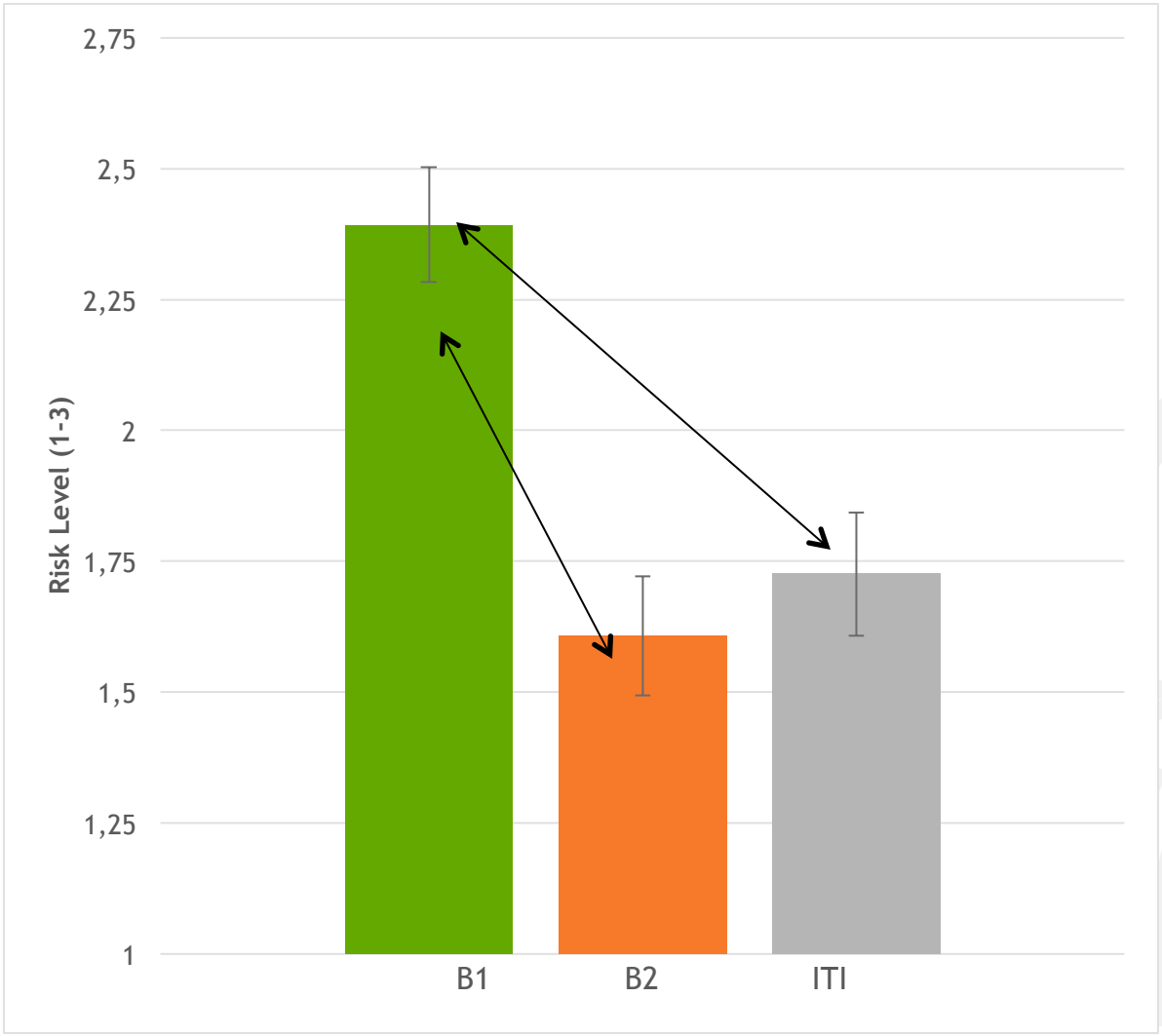
B1>B2 (conditioning)
B1>C1
B1>C2

C2>B2
C2>C1

NO TRANSFER

Results

- Online shock expectation (conditioning)

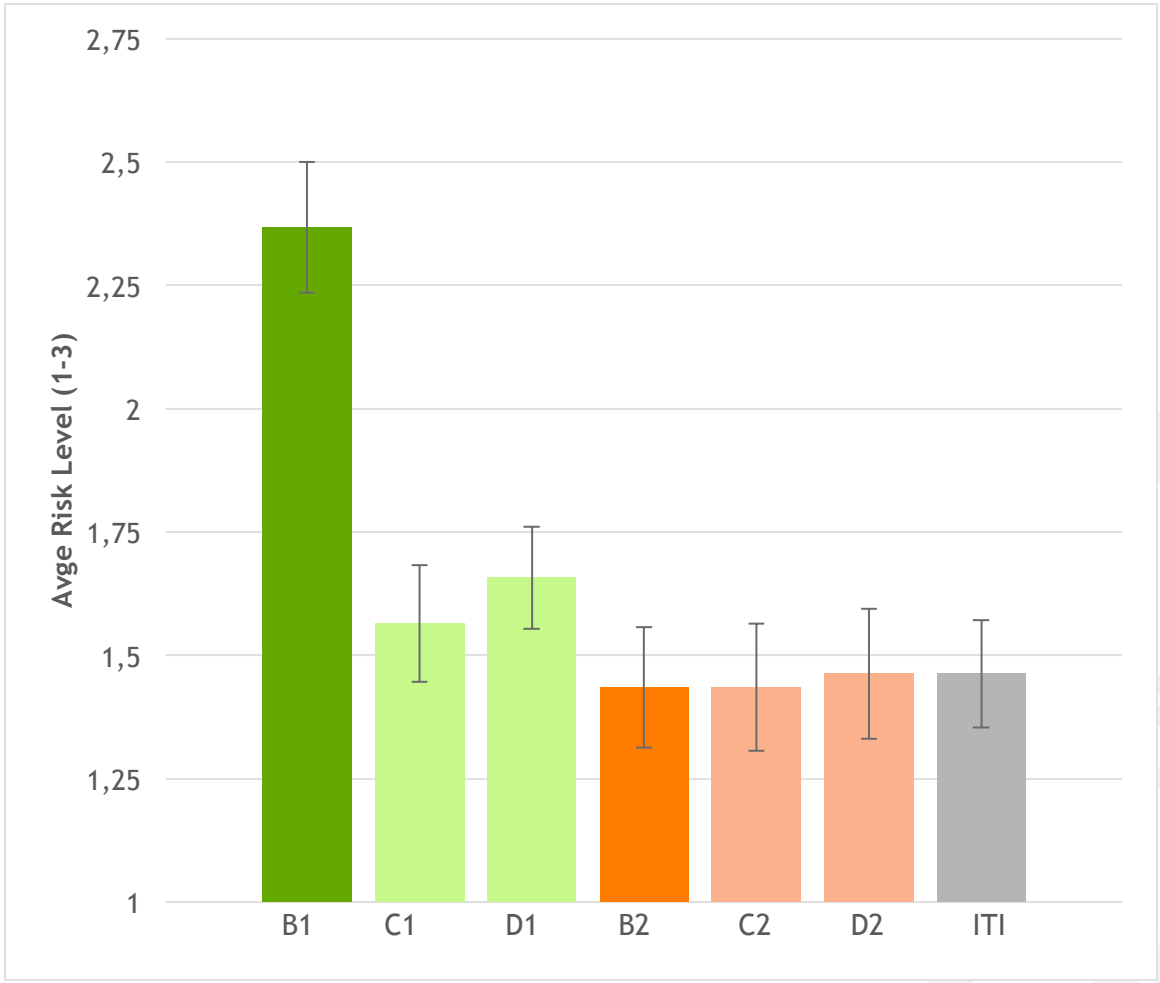


RM-ANOVA:
Significant effect for stimulus type.

Related samples t tests:
B1-B2: $t(26)= 5.11$; $p<0.001$
B1-ITI: $t(26)= 4.89$; $p<0.001$
B2-ITI: *ns*

Results

- Online shock expectation (transfer)



B1>everything else

↓

CONDITIONING

D1>(B2, C2, D2, & ITI)

↓

NO TRANSFER

DISCUSSION

- Some evidence of conditioning for FPS, but no evidence of transfer.
- Clear aversive conditioning for expectation measures, but no evidence of transfer.

- Possible “shift in contingencies” effect?
- Test trials are presented in extinction. Participants change their shock expectation once they see C1 and D1 are not followed by shock.
- Partial CS-UCS contingency does not seem useful to prevent this effect.
- Concurrent measurement of FPS and expectation might be a problem.

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DISCUSSION

- This is consistent with our own prior research on transfer of functions with SCRs (see Rodriguez-Valverde et al., 2009).
- Further methodological controls should be applied (e.g. conditioning with two members of each class) before jumping to conclusions regarding whether transfer of FPS can be obtained.

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