Investigating Acquired Equivalence in Conditioned Pleasant and Unpleasant Stimuli

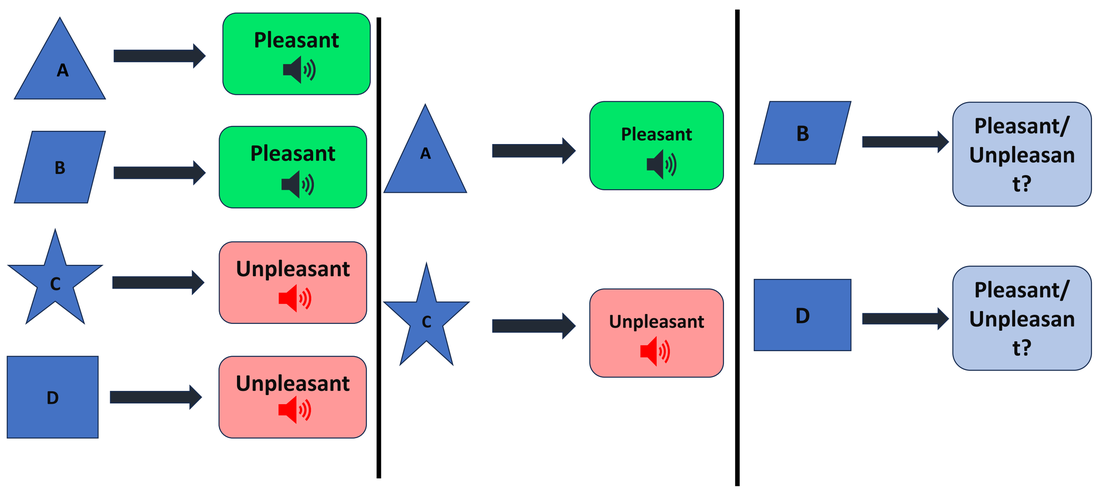
Vidisha Maithani[1] and Manish Kumar Asthana[1,2]

[1]*Department of Humanities & Social Sciences, Indian Institute of Technology Roorkee, India*

[2]*Department of Design, Indian Institute of Technology Roorkee, India*

INTRODUCTION

- Acquired Equivalence: a type of conditioning that occurs when **two dissimilar stimuli** get associated if they are followed with **the same consequence** (Hall et al., 2003).
- Any change in the consequence of one stimulus may also **transfer** to the other stimulus.
- When an association of **A-B** and **C-B** is formed, the presentation of **A or C produces an internal representation of B**. If another association of **A and D** is formed, a link **A-(B)-D** is generated.
- When C alone is presented, B acts as a mediator to generalise D to C and thus create **C-(B)-D association**.
- Thus, **B**, a common mediator between A and C, facilitates **the acquired equivalence effect** (Urcuioli, 1996).

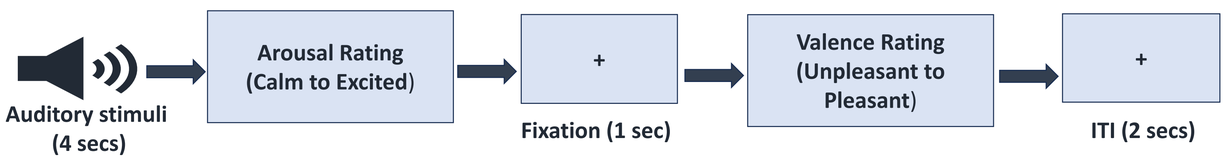


. **Figure 1.** Acquired Equivalence design

METHODOLOGY

Experiment 1 A

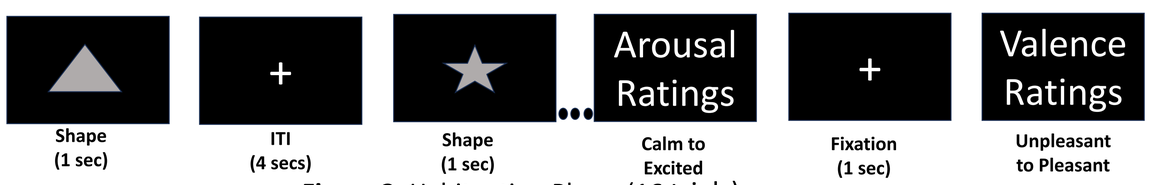
- Stimulus-selection of auditory stimuli across valence and arousal dimensions for experiment 1 B.
- For pleasant stimuli sound no. 809, description= “Harp”, and for unpleasant stimuli sound no. 276, description= “FemScream2” were selected.



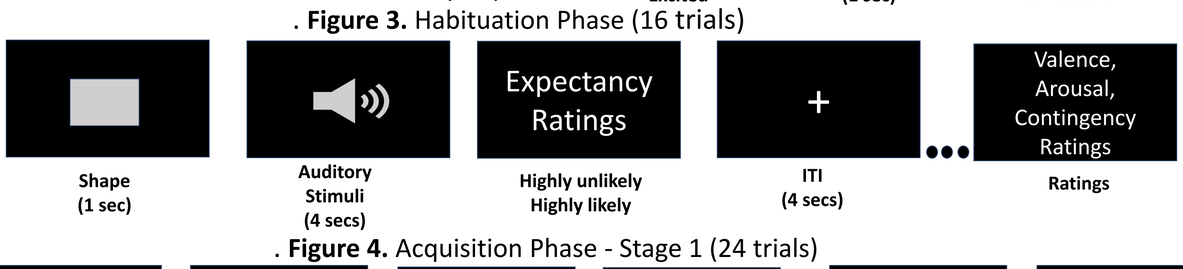
. **Figure 2.** Schematic diagram of Experiment 1 A (20 trials)

Experiment 1 B

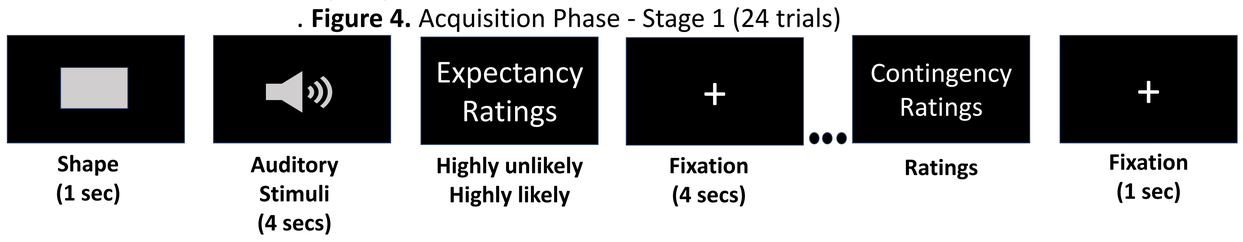
- The acquired equivalence effect with human participants for the pleasant and unpleasant auditory stimuli was evaluated.
- The experiment was divided into 3 phases- Habituation, Acquisition (Stage 1 & 2) and Transfer Testing phase.



. **Figure 3.** Habituation Phase (16 trials)



. **Figure 4.** Acquisition Phase - Stage 1 (24 trials)

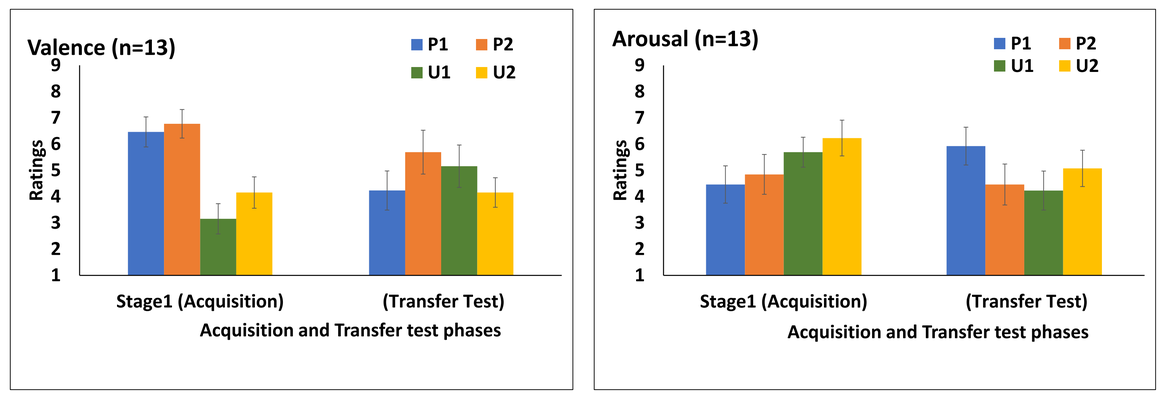


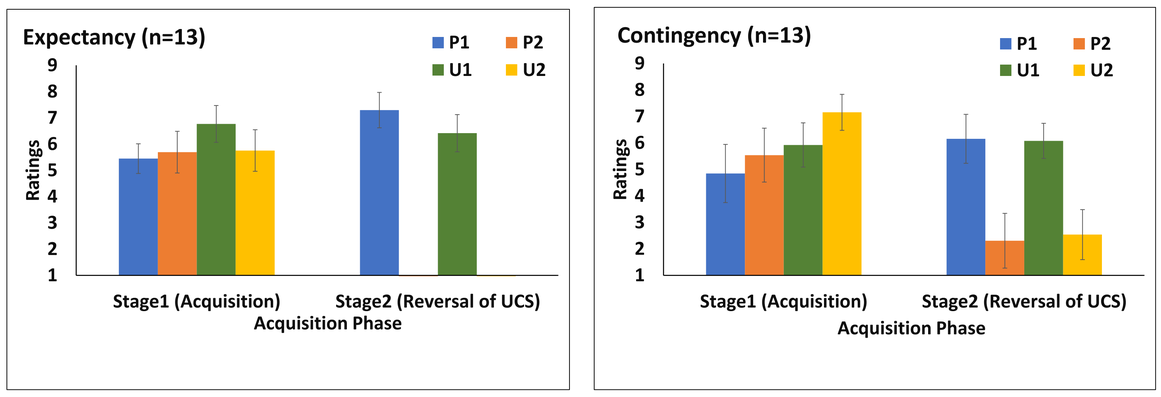
. **Figure 5.** Acquisition Phase - Stage 2 Reversal of UCS (12 trials)

. **Figure 6.** Transfer Testing Phase

RESULTS

- Wilcoxon signed-rank test indicated **significant differences in P1 valence ratings** (z=-2.413, p=0.016), **U1 valence ratings** (z=-2.466, p=0.014), **P1 arousal ratings** (z=-2.448, p=0.014) and **U1 arousal ratings** (z=-2.422, p=0.015) of the four shapes.
- No significant differences in the P2 and U2 valence and arousal ratings.
- Friedman test of differences among repeated measures was conducted for contingency ratings for stages 1 and 2 and rendered a χ^2=2.321 (p=0.509) for stage 1, and a χ^2=11.880 (p=0.008) for stage 2.
- For the expectancy ratings, the Friedman test rendered a χ^2=4.410 (p=0.220) for stage 1 and a χ^2=2.273 (p=0.132) for stage 2.
- A Wilcoxon signed-rank test indicated **significant differences in P1 expectancy ratings** (z=-2.005, p=0.045) and no significant difference in U1 expectancy ratings.





. **Figure 7.** Valence, Arousal, Expectancy and Contingency ratings graphs

DISCUSSION

- The results indicate that counterconditioning is an effective method to condition a stimulus from pleasant to unpleasant dimensions and vice versa (De Jong et al., 2000).
- The contingency ratings of stage 1 showed no significant differences, implying that the participants had similar and comparable awareness of conditioning of the 4 shapes.
- In stage 2, a significant difference in the contingency ratings showed that the participants were aware of the pairing of the present and absent shapes.
- Expectancy ratings of stages 1 and 2 showed no significant difference, indicating that the expectancy of the 4 geometric shapes (CS) presented were comparable and similar.
- A comparison of stage 1 and stage 2 P1 expectancy ratings implied that when the stimulus is conditioned from pleasant to unpleasant, the expectancy for the unpleasant affect significantly increases.
- In our study, we could not find substantial result for the acquired equivalence effect. However, assessing the acquired equivalence effect may require further in-depth research to unravel the underlying mechanism of such complex processes.

REFERENCES

Hall, G., Mitchell, C., Graham, S., & Lavis, Y. (2003). Acquired equivalence and distinctiveness in human discrimination learning: Evidence for associative mediation. Journal of Experimental Psychology: General, 132(2), 266–276. https://doi.org/10.1037/0096-3445.132.2.266

Urcuioli, P. J. (1996). 4 Acquired equivalences and mediated generalization in pigeon’s matching-to-sample (pp. 55–70). https://doi.org/10.1016/S0166-4115(06)80103-2

De Jong, P. J., Vorage, I., & Van Den Hout, M. A. (2000). Counterconditioning in the treatment of spider phobia: effects on disgust, fear and valence. Behaviour Research and Therapy, 38(11), 1055–1069. https://doi.org/10.1016/S0005-7967(99)00135-7

Hettich, D. T., Bolinger, E., Matuz, T., Birbaumer, N., Rosenstiel, W., & Spüler, M. (2016). EEG responses to auditory stimuli for automatic affect recognition. Frontiers in Neuroscience, 10. https://doi.org/10.3389/fnins.2016.00244

CONTACT: vidisha_m@hs.iitr.ac.in