

## **ERP Correlates of Relational Learning: Testing a Behavioural Model of Word-Webs**

### **Results:**

Relational learning research has highlighted a close functional overlap between the outcomes of studies with pseudowords and natural language processing effects. The key phenomenon from relational learning research is called stimulus equivalence, which shows that after learning a series of inter-connected, conditional (i.e., if-then) unidirectional relations among physically dissimilar pseudowords, participants spontaneously reverse and relate novel, bidirectional combinations of these stimuli, without any further training.

In this research, we sought to investigate the behavioural and event-related potential (ERP) correlates of relational learning, in particular N400, using a novel, stimulus-pairing yes/no procedure. The stimulus-pairing yes/no procedure involves the presentation of a sample followed by a choice stimulus. Participants are taught, through feedback, to press one of two keys representing Yes (or Same) and No (or Different). For example, given the pseudowords labelled “A1” and “B1”, pressing the Yes key was correct, while given the pair A1-B2 pressing the No key was correct. Also, given A2-B2, pressing Yes would be correct, and given the pair A2-B1, pressing the No key would be correct. In this way, two “within-class” relations (A1-B1 and A2-B2) and two “between-class” (A1-B2 and A2-B1) relations were explicitly taught. Following this training, and maintenance under conditions of reduced feedback, participants were, in Experiment 1, tested for symmetry, transitivity and one-node equivalence relations, in the absence of further feedback. In Experiment 2, two, three-member relations were trained and tested using one-to-many (A-B/A-C). If participants passed these tests, expanded relations were trained (C-D) and all trial-types tested. EEG was recorded during this final test phase.

Overall, the modified training and testing protocol of Experiment 2 resulted in a higher pass-yield than Experiment 1. Behavioural results show that the stimulus-pairing yes/no procedure is effective with a combined one-to-many/linear-series training design as an efficient and reliable means of establishing arbitrary word-webs. The ERP analyses failed to reveal any significant differences between the trial types. This highlights that the procedure, while effective for establishing arbitrary word webs, was not effective for evoking the N400 ERP.

### **Published Works:**

Wang, T., & Dymond, S. (2013). Event-related potential correlates of emergent inference in human arbitrary relational learning. *Behavioural Brain Research*, 236(1), 332–343. doi: 10.1016/j.bbr.2012.08.033

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