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# *DERIVED STIMULUS RELATIONS UNDER CONTEXTUAL CONTROL PRODUCE ASSOCIATION AND MEDIATED PRIMING*

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A common method of assessing the nature of semantic relations in cognitive psychology is by means of a lexical decision task, in which two stimuli are presented, and the participant must decide whether both are "valid" stimuli or not. The first stimulus is called the "prime" and the second stimulus is called the "target". Association priming refers to the tendency of a response time (RT) to be faster if the target is related to, or associated with, the prime. Mediated priming occurs where recognition of the target is facilitated through a mediating stimulus; for example, LION-STRIPES, where lion is assumed to prime the unrelated word stripes through the word tiger.

The concepts of Relational Frame Theory (RFT; see Hayes, Barnes-Holmes, & Roche, 2001) may provide an explanatory framework for priming phenomena. It is suggested that RFT can describe not only a subject's performance in a lexical decision task, but also the history of relational responding that made the performance possible. The present study examined whether stimuli in relational frames would prime each other, relative to previously-seen, but unrelated, stimuli.

Phase one of the preparation consisted of relational pretraining that brought subjects' responses to the non-arbitrary stimulus relations of sameness and opposition under contextual control. Phase two involved training on a series of conditional discriminations with arbitrary stimuli, with each discrimination being made in the presence of one of the two contextual cues. This relational training established responding in accordance with relations of sameness and opposition between certain arbitrary stimuli (i.e., A1 same as B1 and C1, and A1 opposite to B2 and C2). Other, unrelated, stimuli were employed in the relational training phase as foils (N1, N2 etc.), which were then used during a subsequent lexical decision task. The RFT model predicts that the relational training described above would yield derived same relations between B1-C1 and B2-C2, and derived opposite relations between B1-C2 and B2-C1. Upon reaching criterion for the relational training phase, Subjects 1 and 2 were exposed to relational testing (i.e., conditional discriminations with no feedback). Subjects 3-7 were not exposed to a relational testing phase, to control for the possibility that priming might occur because certain stimuli were paired together in testing.

The lexical decision tasks commenced immediately after the completion of the relational training (and testing where applicable). The subjects' task was to evaluate whether they had seen both stimuli previously (i.e., press "Y" if both stimuli were seen previously, or press "N" if one or both were novel stimuli). The crucial comparisons were between RTs to pairs of stimuli comprising members of the relational network (e.g., B2-C1), and RTs to "control pairs" composed of one stimulus from the relational network and one stimulus that the subject had been exposed to earlier in the relational training phase, but that did not enter into the relational network (e.g., A1-N1).

In the lexical decision task, all subjects who had reached criterion on the relational training phase responded more quickly to related pairs, relative to control pairs – the characteristic association priming pattern. The mean across-subjects RT for related pairs was 792 ms (SE = 31 ms), in contrast to 1162 ms (SE = 101 ms) for control pairs. Results also suggest that mediated priming occurred: the mean RT for combinatorially entailed pairs was 808 ms (SE = 66 ms). The error rate for related pairs was 2.4%, whereas the error rate for the control pairs was 40%. The higher error rate for unrelated pairs, in comparison to related pairs, is indicative of priming.

In conclusion, it seems that association and mediated priming can be demonstrated through both directly trained and derived multiple stimulus relations, thereby making more plausible the idea that relational frames provide a functional analysis of semantic relations.

REFERENCES

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# *THE IMPACT OF CLASS-SPECIFIC REINFORCERS ON CONDITIONAL DISCRIMINATION ACQUISITION AND EQUIVALENCE CLASS PERFORMANCES*

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Over the past decade, many researchers have attempted to identify variables that affect the emergence and stability of equivalence classes (e.g. Sidman and Tailby, 1982). This laboratory has used reversal studies to examine emergent relational stimulus control (Pilgrim, Chambers, & Galizio, 1995; Pilgrim & Galizio 1990; 1995). In these reversal studies, match-to-sample procedures were used to train a series of arbitrary conditional discriminations and test for the emergence of equivalence classes. The original reinforcement contingencies were then altered and effects on the emergent properties of equivalence were assessed.

In order to examine how equivalence relations are formed, changed, and maintained, at least two conditional discriminations must be acquired and stable prior to any baseline manipulations. However, several researchers have reported difficulties in teaching arbitrary conditional discriminations to young children (e.g. Lipkens, Hayes, & Hayes, 1993; Zygmont, Lazar, Dube, McIlvane, 1992; Pilgrim, Jackson, & Galizio, 2000). As a result, a variety of special training procedures have been employed in effort to facilitate conditional discrimination acquisition (e.g. stimulus-control shaping, instructions, sample-naming, pre-training sequences). When researchers have successfully established the original conditional discriminations, findings for post-reversal probe performances have been mixed. In the only two published studies with children, participants have demonstrated erratic responding where patterns were consistent with neither the original nor the reversed contingencies (Pilgrim, Chambers, & Galizio, 1995), and results that were mostly, although not perfectly, consistent with the original contingencies (Saunders, Drake, & Spradlin, 1999).

In the majority of stimulus-equivalence studies, a single reinforcer has been used to reinforce all responses deemed correct. According to recent theoretical treatments of equivalence-class formation (Sidman, 2000), this may be problematic. Several studies have demonstrated that the reinforcer can actually become a member of the equivalence class (e.g. Dube & McIlvane, 1995). If each of several equivalence classes shares a common reinforcer, and the reinforcer is actually a member of the classes, there may be a class collapse or merger. What should be separate classes may become one large class via the relation between each stimulus and the common reinforcer (Sidman, 2000). Such a collapse could potentially interfere with successful conditional discrimination and equivalence-class formation. To avoid such difficulties, Sidman suggested that training procedures use class-specific reinforcers.

The present research examined the effect of class-specific reinforcement (CSR) on children's conditional discrimination acquisition and equivalence probe performances. Eight children ages 4-10 years learned two arbitrary conditional discriminations (AB and AC) using match-to-sample procedures. Given A1, A2, or A3 selections of B1, B2, or B3 produced Reinforcer 1, Reinforcer 2, or Reinforcer 3, respectively. Likewise, given A1, A2, or A3, selections of C1, C2, or C3 produced R1, R2, or R3, respectively. Following mastery of baseline training, unreinforced probe trials were introduced to test for the properties of symmetry, transitivity/equivalence, and reflexivity. Once three three-member equivalence classes were demonstrated, reinforcer-probe sessions were given to determine whether or not the reinforcer had become a member of the equivalence classes. The reinforcement contingencies for the AC conditional discriminations were then reversed (given A1, A2, or A3, selections of C2, C3, or C1 produced R1, R2, or R3, respectively), and probe trials were presented again to test for class flexibility. A control group of six children was trained using procedures identical to those used with the experimental group, except that during the initial conditional discrimination training control participants were presented with a single reinforcer for each correct response. If no acquisition trend was demonstrated following 10 sessions with single-reinforcer training, class-specific reinforcers were introduced.

Unlike participants in past studies, seven out of eight children in the CSR condition readily acquired the baseline discriminations without the aid of any other special training techniques (i.e., pre-training, naming, instructions). In contrast, none of six control-group children showed signs of acquisition, but all mastered the conditional discrimination readily when CSR was introduced. After mastering the conditional discriminations, six of six participants quickly demonstrated the emergence of equivalence classes (A1B1C1, A2B2C2, A3B3C3). For all but one of the participants who completed reinforcer probes, reinforcer-probe response patterns indicated that each reinforcer had become a member of its respective equivalence class.

Upon reversal of the AC contingencies, five children once again mastered the baseline conditional discriminations. For the three children who completed the post-reversal probe condition, performances were unlike those seen in previous studies involving children (Pilgrim, Chambers, Galizio, 1995), in that patterns were indicative of three distinct equivalence classes. Two of the participants required the minimum number of sessions to meet stability on the reversal probes; however, their probe response patterns were quite different. The youngest (age 5) of the two participants demonstrated reversal-probe and reinforcer-probe response patterns consistent with the original contingencies, despite the reversed AC conditional discrimination. The oldest participant (age 10), however, showed reversal-probe and reinforcer-probe performances in accordance with the reversed contingencies. The third participant (age 7) required more sessions to meet reversal-probe stability criterion. Her initial response patterns were largely consistent with the original contingencies. However, following several cycles of testing, modified (reversed) patterns of responding emerged. Although the final post-reversal pattern differed across individuals, all three children showed evidence of three distinct equivalence classes. These data suggest that class-specific reinforcement enhances the acquisition of arbitrary conditional discriminations and provides the basis for distinct equivalence classes.