RESEARCH IN PROGRESS

EFFECTS OF FAST-RESPONDING REQUIREMENTS ON THE DEVELOPMENT OF EQUIVALENCE CLASSES IN A MATCHING-TO-SAMPLE TASK

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We currently are conducting some experiments to assess the emergence of stimulus equivalence relations when matching-to-sample responding is under severe time restriction. Training and testing for equivalence classes with requirements for very fast responding may help to evaluate the role of verbal mediation and naming in equivalence. This note will describe the procedures and summarize the initial results.

So far, we have completed data collection with two human adults, both 31 years old and with no clinical or developmental abnormalities. The apparatus was a computer with a touch-sensitive screen, and the stimuli were 12 Greek letters. The procedure was a 0-s delayed arbitrary visual-visual matching-to-sample task. On each trial, a sample stimulus was presented in the center of the computer screen. When the subject touched the sample, it disappeared and four comparison stimuli were presented in a 2 x 2 arrangement, with each comparison 7 cm from the center of the screen.

Subjects were given blocks of 144 trials, presented in four consecutive experimental phases:

In *Phase I,* baseline AB (i.e., Set-A samples and Set-B comparisons) and AC tasks were trained with no time limit for responding. Correct responses were followed by a high-pitched beep and increment of an on-screen point counter. The program simply advanced to the intertrial interval (ITI) following errors. The ITI was 0.5 s. The criterion for ending Phase I was accuracy above 90% and no more than one error for each trial type.

In *Phase II,* AB and AC baseline trials continued with differential consequences and with gradual decreases in both the maximum time available for responding and the intertrial interval duration. Time restrictions were applied to responses to both sample and comparison stimuli. If the maximum time elapsed without a response, then the stimulus or stimuli disappeared from the screen, followed by the intertrial interval and the next trial. Thus, errors could be due to an incorrect choice or an out-of-range response latency to either sample or comparison stimuli. After each block of trials, the response-latency distributions for responses to the sample and comparison stimuli were examined. The maximum time allowed for responding in the subsequent block of trials was either (a) adjusted to be equal to the 90th percentile of the latency distribution of the previous block (initially, when the distribution was broad) or (b) reduced by 0.1 s (when the distribution became narrow). The ITI was reduced by 0.1 s per block.

In *Phase III,* AB and AC baseline trials were presented with time limits for responding but with no differential consequences.

During Phases II and III, the criteria for decreasing the response time limits, decreasing the ITI, and for ending the phase were (a) accuracy above 90% and (b) no more than one error for each trial type.

In *Phase IV,* 72 equivalence (CB and BC) and 72 symmetry (BA and CA) test trials were interspersed among 72 baseline trials and presented in separated test blocks, with time limits for responding (see below) but with no differential consequences.

For both subjects, the response-latency reduction procedure resulted in responses to the sample within 0.4 s, responses to the comparisons within 1.2 s, and intertrial intervals of 0.4 s. Accuracy scores of at least 90% were not maintained with any further reductions. The test trials were presented with these time parameters.

During the first block of test trials, both subjects' latency distributions for baseline trials were maintained as in the final training phase. On the test trials, the distributions were altered and the latencies were longer. For one subject, the test data indicated the emergence of new conditional discriminations consistent with the formation of equivalence classes. This subject's errors were almost all failures to respond within the time limits. For the other subject, the test results were not consistent with experimental equivalence classes, and this subject made approximately equal numbers of incorrect choices and failures to respond. Further data analysis may show that incorrect choices and failures to respond often occur on the same type of trial. If so, then failures

to respond could indicate the absence of equivalence relations. At present, however, the emergence of equivalence relations has been evaluated by comparing correct and incorrect choices.

The data for one subject showing a positive equivalence outcome during the first exposure to test trials may indicate emergent behavior in a situation where there was no time for verbal mediation. This subject was completing blocks of 144 consecutive trials at a pace of one trial every 2 s, the fastest rate at which baseline accuracy could be maintained. Verbal mediation would require some intermediate verbal behavior, and it seems reasonable to speculate that this subject had no time for any additional behavior beyond that required to maintain the baseline performance.

Currently we are experimenting with procedural modifications (e.g., responding via keyboard) and training procedures to see if we can produce further reductions in response latencies. The 0.4-s time restriction for sample responses approximates most estimations of minimal human reaction time, and so the main question will be whether comparison response latencies can be reduced below 1.2 s. A related issue is how much time restriction would be necessary to provide convincing evidence that covert verbal mediation could not occur.

The data summarized above were presented in more detail at the 26th Annual Convention of the Association for Behavior Analysis, May 2000, Washington, D.C. The authors welcome suggestions, comments, and questions (tomanari@usp.br; msidman@aol.com; wdube@shriver.org)