Verbal transfer in repaired paradigms as a function of $S_1 - R_2$ and $S_2 - R_1$ similarity

ROBERT F. SHOULDIS, Jr., DEPARTMENT OF PSYCHOLOGY, UNIVERSITY OF PORTLAND, Portland, Ore. 97203

Two predictions from Houston's (1965) repaired transfer surface were tested using 30 Ss in a within subject design. Three two-list paired associate paradigms (AB-BAr, AB-B'Ar, AB-BA'r) were compared with the control condition AB-CD. In accordance with the predictions, it was found that the three experimental paradigms produced significant negative transfer, with the AB-BAr paradigm producing the most and the AB-B'Ar and AB-BA'r paradigms producing intermediate levels of negative transfer.

Houston (1965) described a surface which summarizes the transfer effects expected in two-list paired associate paradigms when the first-list units are repaired in the second list. Using $S_1 - R_2$ and $S_2 - R_1$ similarity as the relevant dimensions, the surface predicts that negative transfer will increase as $S_2 - R_1$ similarity increases, and that this increase will be greater when $S_1 - R_2$ similarity is high than when it is low.

In a subsequent test of these predictions, Houston & Morony (1966) found that significant negative transfer did occur as $S_2 - R_1$ similarity increased. However, they failed to support the prediction that the degree of transfer would differ with various levels of $S_1 - R_2$ similarity. One possible explanation for this failure to find significant differences lies in the fact that Houston and Morony used a between subject design, in which each of four groups received lists comprising a different paradigm along the $S_1 - R_2$ dimension. Since a small within group variance is crucial to the establishment of significant experimental group differences, and a between subject design characteristically raises within group variance, it is possible that, with small differences between the groups differing in $S_1 - R_2$ similarity, this design masked any differences which may have actually occurred.

In accordance with the above reasoning, the present study proposes to examine the repaired paradigms using a within subject design, which characteristically reduces within group variance, thus increasing the probability of detecting small differences between groups.

Using this design demands that each S receive each of the paradigms under study, thus mixed lists must be used. In changing procedure from unmixed to mixed lists it could be argued that a relevant experimental variable is being introduced. However, Twedt & Underwood (1959), in a direct test of the effect of mixed vs unmixed lists, concluded that there is no indication of differential effects caused by this variable. Therefore, it seems that the statistical advantages of the within subject design warrant its application to this situation.

The present study will compare the transfer effects in the AB-BAr, AB-B'Ar, and AB-BA'r paradigms against the control condition AB-CD, with each S receiving each paradigm. The repaired surface predicts that all three experimental paradigms will produce negative transfer, with the BAr paradigm producing the most and the B'Ar and BA'r paradigms producing intermediate and, perhaps, equivalent amounts of negative transfer.

Subjects. The Ss were 30 undergraduates enrolled in the Introductory Psychology course at the University of Portland. All Ss participated in partial fulfillment of a class requirement.

Lists. The usual procedure for balancing second list difficulty in the between subject transfer studies is for all Ss to receive the same second list, with each group receiving a different first list. Since each S in the present study received two lists comprising all paradigms, it was not possible to balance difficulty in this way; therefore, two conditions were employed. Each condition consisted of two paired associate lists which were constructed in the same manner for each condition. The combining of results from each condition should serve to balance second-list difficulty.

The two lists in each condition consisted of 12 pairs of common adjectives chosen from Haagen's (1949) list. In each second list, three pairs were constructed to conform to each of the paradigms under study.

The AB-BAr paradigm consisted of identical units in both lists. The two lists differed only in that the A and B units from the first list were not paired in the second list. The AB-B'Ar paradigm was constructed such that similar B and B' units were not paired with the same A units, and in the AB-BA'r paradigm, similar A and A' units were not paired with the same B units. The control paradigm AB-CD was constructed so the second list bore no recognizable relationship to the first-list units.

The Haagen (1949) similarity ratings of the similar words were 2.0 or better and no two words in any list began with the same letter. Unless intended, inter- and intralist similarity were minimal.

Procedure. The two conditions were presented alternately, that is, every other S received Condition 2, the conditions being different sets of lists.

Each list was arranged in three randomized blocks of four pairs per block, such that one pair from each of the paradigms appeared in each block of four pairs. Five such orders were prepared for each list in order to minimize serial learning, and each order was used equally often as the starting order.

For each list, the words in each pair were typed on white, 4 in. x 6 in. index cards in a manner appropriate for presentation by the anticipation method. A different set of cards was prepared for each order of the lists.

Presentation consisted of E showing S the appropriate word or words through a 1 in. x 3 in. hole cut in a plywood screen, 1 ft high, which separated E and S. Each card was shown to S for 2 sec, with approximately 1 sec between successive cards. A 5 sec intertrial interval was maintained by the presentation of two blank cards following each trial. A 1 min interval separated the learning of the two lists. All Ss received six anticipation trials on both lists.

Results. For each S, the total number of correct responses given in each paradigm was calculated. Thus, each S received four scores for each of the two lists. Since these scores represent repeated measurements on the same individual, a simple analysis of variance technique was inappropriate for testing the hypotheses of equal means; therefore, the Hotelling T^2 statistic was used to correct for the correlations between groups.

The mean number of correct first-list responses in the CD, BAr, B'Ar, and BA'r paradigms for the two conditions combined were 5.37, 5.83, 5.37, and 5.43, respectively. Analysis did not indicate significant differences among these means, $F < 1$.

The mean number of correct second-list responses in the CD, BAr, B'Ar, and BA'r paradigms for the two conditions combined were 10.67, 4.67, 6.60, and 6.47, respectively. Analysis revealed significant differences among these means ($F = 58.24$, $df = 3/27$, $p < .01$). Subsequent individual comparisons at the .01 level indicated that the CD mean was significantly higher than the other three, and that the B'Ar and BA'r means were significantly greater than the BAr mean. The B'Ar and BA'r means were not significantly different. (CD B'Ar BA'r BAr). These results indicate that all three repaired paradigms produced significant negative transfer, and that this negative transfer increased as $S_1 - R_2$ similarity increased. Thus, the results are in direct agreement with the predictions made from the repaired surface.

One of the assumptions underlying the predictions from the repaired surface is that backward first-list associations compete with forward second-list associations. As $S_1 - R_2$ similarity increases, interference from backward first-list associations should increase. In order to assess the validity of this assumption, the number of first-list stimuli given as second-list responses was calculated for each paradigm. For the AB-BAr situation, first-list A units were given to second-list B units 43 times. In the AB-B'Ar paradigm, first-list A units were given to second-list B' or C units. This data supports the assumption since the frequency of first-list A units given as second-list responses does increase as $S_1 - R_2$ similarity increases.

In summary, the present study confirmed exactly the predictions made from Houston's (1965) repaired transfer surface. It was

found that significant negative transfer did occur as S_1-R_2 similarity increased and that this negative transfer increased as S_1-R_2 similarity increased.

REFERENCES

- HAAGEN, C. H. Synonymity, vividness, familiarity, and association value ratings of 400 common pairs of adjectives. *J. Psychol.*, 1949, 27, 453-463.
- HOUSTON, J. P. A repaired S_1-R_2 and S_2-R_1 transfer surface. *Psychon. Sci.*, 1965, 3, 343-344.
- HOUSTON, J. P., & MORONY, L. D. Transfer in repaired S_1-R_2 and S_2-R_1 paradigms. *Psychon. Sci.*, 1966, 4, 83-84.
- TWEDT, H. M., & UNDERWOOD, B. J. Mixed vs. unmixed lists in transfer studies. *J. exp. Psychol.*, 1959, 58, 2, 111-116.