Attitudinal maintenance of cognitive categorization*

JOHN W. REICH† and JOEL H. PAINTER††

Arizona State University, Tempe, Arizona 85281

Two experiments were performed that investigated attitudinal influences on cognitive categorization. The studies assessed categorization as a dynamic process with a multiple-sort (MS) technique, having Ss recategorize sentences until they ran out of meaningful categories. Condition I allowed Ss to use any dimensions they chose, and Condition II imposed the restraint of the "favorable-unfavorable" dimension. No effects of involvement were found when unrestricted sorting was allowed but were found when the evaluative dimension was imposed. There appeared to be a tendency for attitudinal involvement to maintain complexity across sorts. Results were discussed in terms of the influence of dimensions and the possible effects of certain stimulus properties on the maintenance of categorization complexity.

Categorization techniques have been used for a number of years to detect the relationships among cognitive and affective components of judgmental scaling processes. Categorization appears to be uniquely suited for this end. The S is told to respond to a stimulus domain either in a preset fashion, such as 11 categories in the Thurstone technique (Thurstone & Chave, 1929), or he is allowed to categorize the stimuli more or less in any way he chooses (Sherif & Hovland, 1953; Gardner, 1953).

With both techniques, when Ss feel personally involved and socially committed to the stimulus domain, they tend to use or create fewer categories than uninvolved Ss; they generate more biased or less uncertain (in the information theory sense) distributions; they overuse disliked categories; and they have significant runs of unused categories. Involvement, thus, is considered to be a major influence on categorization behavior that acts as a decremental factor and supposedly has wide-ranging effects.

While these results generally are quite consistent and reliably detected, the general knowledge we have in this area is subject to considerable limitations.

On the stimulus side of the issue, it cannot be determined if results similar to those listed above would be obtained if a different stimulus context for judgment were provided. Interestingly, with only one exception, all previous research in this area has instructed Ss to scale the stimuli in terms of their degree of "favorableness-unfavorableness" to the referent or has left the dimension up to the Ss. The one study concerned with this dimensionality issue (Reich & Farr, in press) showed that involvement's effects are

dimension tied: Some dimensions result in decrements, others in increments, but this operates in interaction with the personal involvement of the Ss.

On the response side, the only behavior actually manifested by the S is the placing of sentences into categories (sometimes attendant agreement-disagreement is also assessed). The behavior itself is quite simple in its topography. Only one-time measures for a particular stimulus referent domain are taken and only a single dimension of judgment is followed, as discussed above. Both methodological and substantive questions about these limitations arise: Would the S judge the same way again, given a second opportunity? How rigid or flexible are his cognitive processes? Does personal involvement sustain, enhance, or hinder a given cognitive judgmental process when it is repeated? The entire question of reliability in repeat-responding judgment tasks, thus, has not been investigated relative to the effects of involvement.

Scott (1962, 1963) and Vannoy (1965) in repeated-responding tasks without involvement have had Ss categorize concept instances, then change their groupings in as many ways as they could until they ran out of meaningful groupings. Scott found that this behavior correlated significantly with measures of cognitive complexity, and Vannoy reported a strongly negatively skewed distribution of the number of groups created.

Several studies have measured categorization complexity across more than one domain of stimuli for the same Ss (Glixman, 1965; Ward, 1965; Larsen, 1971). In these studies, the Ss were presented with several different domains of sentences, preselected to vary in involvement. Categorization complexity was found to decrease as involvement increased. However, the Es did not parametrically vary dimensionality, and it is quite possible that the Ss generated different dimensions as they dealt with the different domains, confounding domain-dimension effects.

In an attempt at an initial exploration into two of the issues discussed, stimulus dimensionality and response consistency, a methodology was developed that employs

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†Requests for reprints should be sent to John W. Reich, Department of Psychology, Arizona State University, Tempe, Arizona 85281.

††Now with Veterans Administration Hospital, Atlanta, Georgia.

a dynamic multiple-sorting (MS) procedure. After discussion of the variables that are most relevant to the questions posed, two experiments employing the procedure are presented.

BEHAVIORS ASSESSED

Involvement Variables

Of major importance in research on affective involvement is the selection of the Ss. For this research, a sample of highly involved Ss was selected for comparison with an equal-sized sample of uninvolved Ss. Involved Ss chosen were young adults who currently held active membership in the Church of Jesus Christ of Latter Day Saints (Mormons). Uninvolved Ss were persons of similar age and educational background who were not members of the LDS Church.

Prior research (Glixman, 1965) has found significant sex differences in categorization behavior; this variable was, therefore, specifically manipulated in addition to the involvement variable.

A set of four variables assessing both actual involved behavior and subjective self-ratings of the strength of beliefs was chosen to reveal commitment differences, as listed below.

Information Test

This was assessed with the Mormon Information Test (Alter, 1967).¹ It is a 50-item true-false, multiple-choice test covering various aspects of LDS Church organization, doctrine, and history.

Number of Religious Activities Per Month

This was measured with an open-ended question asking, "About how many times do you attend religious service and activities per month?"

Rated Attitude Toward the Church

The S was asked to make a checkmark rating on a 90-mm line with the end points labeled "Dislike it very much" to "Like it very much."

Rated Attitude Toward Organized Religion

This item was measured exactly as the one concerning the Church itself but was intended to obtain a more global measure of the Ss' commitment on religious matters.

Categorization Variables

A series of dependent variables was chosen to obtain convergent measures on the effects of involvement on categorization. They are all essentially measures of complexity of categorization.

Baseline

First-sort behavior in this experiment provides a measure of Ss' baseline complexity. The information theory measure R (Attneave, 1959; Scott & Wertheimer, 1962) is the measure most adapted to this type of behavior. It measures departure from rectilinearity (equal category usage) and accounts for both the number of categories and the frequency of their usage. It is a relative measure, appropriate for procedures in which Ss create different numbers of categories. Its use in a MS procedure has been demonstrated in a study by Reich (1968). Based on previous research, it was expected in this experiment that involved Ss would have a lower score on the R variable than would uninvolved Ss for the first or baseline sort.

Multiple-Sorting Variables

Total Number of Sorts. This was simply the number of separate times the S completed categorization of the stimuli. It excludes the very last sort; that was treated separately, as explained below.

Total Number of Categories. This variable includes all distinct categories created by the S, including the baseline sort but excluding the categories created in the last sort.

Mean Number of Categories Per Sort. This variable was calculated from the Total Number of Sorts and Total Number of Categories variables, providing a fuller picture of the sort to sort behavior of the S.

Mean R. This variable is the average of a given S's specific Rs for all of his sorts, including the first sort but excluding the last.

Complexity Maintenance Variables

Two variables were devised to illuminate the influence of affective involvement on sorting as the S went through the experiment. Both variables give a measure of the amount of change or flexibility (or, conversely, rigidity) for Ss under MS conditions.

Sum of Absolute Changes in R. This variable is derived by summing the sort to sort differences in R for each S, then calculating a cell mean of the totals. The final sort R is excluded.

Mean Change Per Sort. Each S's total amount of raw change is divided by the number of changes to give an average change score, the mean of which for the entire cell constitutes this variable.

Sort of Category Labels²

This variable provides a measure of the overall

dimensional response system of the S as it is generated by the MS technique. Rather than analyzing just the raw number of dimensions created by the S or the raw number of categories, the more important aspect is the complexity of the total response system. As in previous variables, R was chosen as the best measure of this variable. To obtain it, the S was instructed to sort all of the label cards he had created throughout his sortings.

INSTRUCTIONS CONDITIONS

In terms of the actual administration of the experiment, two instructions conditions were administered, one leaving the dimensions for sorting open ended and at the S's choice, one imposing the traditional "favorable-unfavorable" dimension. The open-ended instructions were run first. Due to the difficulty of obtaining suitably committed adult Ss for the two instructions conditions, 1 year elapsed between the two administrations. It was, therefore, important to determine the comparability of the samples by assessing the degree of their commitment. For this purpose, the four variables assessing involvement were analyzed by three-way analyses of variance, testing for the effects of instructions, involvement, and sex.

Results of that analysis showed that the S samples in fact were not exactly comparable on two of the four variables. For the number of religious activities per week variable, the first condition instruction Ss had a significantly higher mean (11.07) than did the specific instruction Ss (mean = 8.38). For the rated attitude toward religion variable, the significant AB interaction also showed that the S samples were different for the two conditions; testing for the significance of the differences among the four means with Duncan's new multiple-range test (Edwards, 1960) in this interaction showed that the uninvolved Ss differed between the two conditions, both within themselves and from the involved sample.

These interadministration differences were considered significant enough that it would have been inappropriate to ignore them by combining the two conditions. Therefore, each instructions condition was considered a separate experiment, and they are reported below accordingly. Cross-experiment comparisons are considered later in the report. The open-ended instructions condition is labeled Condition I, and the instruction set specifying the "favorable-unfavorable" dimension is reported as Condition II.

CONDITION I

Method

Subjects

A total of 60 Ss were assigned to the four cells of the experimental design. There were 30 involved and 30 uninvolved Ss, with 15 males and 15 females assigned to each involvement group.

Materials and Procedure

The MS technique followed here closely resembled that employed in Reich (1968). Stimuli for the experiment were 50 statements about the LDS Church developed by Hardy (1949). They were originally developed to represent the full range of attitudinal evaluation about the Church and have been used in a number of previous studies (Bishop, 1964; White & Harvey, 1965; Alter, 1967). The statements were typed on white 3 x 5 in. cards for ease of sorting.

Each S was run individually. Following the own categories procedure, the S was presented a deck of items and typewritten instructions, the latter being modified versions of those given by Glixman (1965) and Reich (1968).

The Ss were requested to sort the stimuli into as many categories as they needed to represent the various opinions being stated in the sentences. The resultant categories were then labeled by the S, who then left the experimental room for E to tabulate the results. The S then returned for another sorting of the stimuli, having been left his previous sort's label cards to avoid duplication of categories. For the third and all subsequent sorts, S was left with a typewritten statement to the effect that he was to continue resorting the cards as many times as he could, being left his accumulated total of label cards to avoid duplication.

When S reported that he had run out of all groups and wished to terminate sorting, E removed the items and left the stack of label cards and a set of instructions to categorize the stack of label cards themselves. The categories of this set of stimuli also were labeled, following which the S filled out a questionnaire assessing personal information, information relevant to the involvement variables listed previously, then answered the information test; this completed the experiment. Average time for Ss to complete the total experiment was about 90 min.

Results

Statistical analysis for each of the variables was performed with a 2 by 2 analysis of variance, testing for involvement and sex effects. All F ratios to be reported have $df = 1/56$.

Involvement Variables

For all four variables assessing involvement, it was found that the only significant Fs occurred for the involvement variable; neither sex nor the interaction of the two variables was significant. Involvement was significant for all four variables, with the LDS sample scoring as significantly more involved than the non-LDS sample.

For the information test, the mean for involved Ss was 40.9 and for uninvolved Ss was 19.1 ($F = 238.41$, $p < .00001$). For the number of religious activities per month, the mean for involved Ss was 17.3 and for uninvolved Ss was 4.8 ($F = 34.17$, $p < .00001$). For the rated attitude toward the church, the mean for involved Ss was 87.9 and for uninvolved Ss was 34.8 ($F = 168.51$, $p < .00001$). Finally, for the rated attitude toward organized religion, the mean for involved Ss was 75.9 and for uninvolved Ss was 54.0 ($F = 9.31$, $p < .005$).

Table 1
Involvement Means and SDs and the F Ratios for the
Categorization Variables of Condition I

Variable	Involved		Uninvolved		F
	Mean	SD	Mean	SD	
Baseline R					
A	.86	.12	.90	.10	3.33
B					4.65*
AB					.64
Total Number of Sorts					
A	5.07	1.99	5.40	2.14	.38
B					.00
AB					.24
Total Number of Categories					
A	25.40	11.91	27.70	14.66	.45
B					1.92
AB					.37
Mean Number of Categories Per Sort					
A	6.26	2.40	6.57	3.58	.17
B					2.29
AB					2.55
Mean R					
A	.89	.06	.86	.07	2.31
B					.86
AB					3.24
Sum of Absolute Changes in R					
A	.42	.53	.62	.74	1.43
B					.43
AB					.56
Mean Change Per Sort					
A	.11	.08	.16	.11	3.08
B					.26
AB					2.06
Sort of Category Labels					
A	.93	.07	.94	.07	.01
B					1.64
AB					.90

* $p < .04$

Categorization Variables

Table 1 summarizes the means, SDs, and F ratios for the main dependent variables of the experiment; only involvement effects are shown, as neither sex nor the interaction was significant. Only one exception occurred.

As shown in Table 1, the only significant result occurred for the baseline or first sort, and that was for sex only. For males, $\bar{X} = .91$, that for females = .85. No other differences between any of the variables were significant at the .05 level or less.

Discussion

As discussed earlier, all research in this area has required Ss to categorize on the dimension of "favorable-unfavorable" with the few exceptions noted. This study provided no specific dimension for sorting,

the intention being to allow as full an assessment of categorization complexity as possible. Given the extreme commitment differences between the two involvement samples, the only remaining variable that could account for the results would be the instructions which left the Ss free to choose any dimensions for sorting.

To investigate this issue further, a second experiment was performed, identical at all points with Experiment I except for the selection of new samples of Ss and a change in instructions, this time imposing the dimension "favorable-unfavorable" for sorting.

CONDITION II

Method

Subjects

Another set of 60 Ss was chosen, still with 30 involved and 30 uninvolved Ss, with 15 males and 15 females in each group.

Materials and Procedure

The same deck of Hardy items was once again employed. Instructions for this condition were identical in all respects to the Condition I instructions, with the exception that one phrase was added to have the Ss sort the sentences in terms of how favorable or unfavorable they were to the Church. The imposed dimension was mentioned in the later instructions concerning the continuation of resorting until all categories had been exhausted, as well as the sorting of the label cards.

Results

The same variables that were investigated in Condition I were investigated here and were given identical statistical analysis.

Involvement Variables

For all involvement variables, the expected differences once again strongly were evident. No sex or interaction terms were significant. For the information test, the mean for involved Ss was 43.0 and for uninvolved Ss was 19.3 ($F = 513.22$, $p < .00001$). For the number of religious activities per month, the mean for involved Ss was 14.7 and for uninvolved Ss was 2.0 ($F = 99.84$, $p < .00001$). For the rated attitude toward the church, the mean for involved Ss was 87.4 and for uninvolved Ss was 37.2 ($F = 181.06$, $p < .00001$). Finally, for the rated attitude toward organized religion, the mean for the involved Ss was 85.5 and for the uninvolved Ss was 43.8 ($F = 83.28$, $p < .00001$).

Categorization Variables

Table 2 summarizes the means, SDs, and F ratios for the main dependent variables. With the exception of the mean change per sort variable, which will be discussed below, none of the variables was influenced significantly by sex or interaction effects, so only means and SDs for

the involvement variable are presented.

Three of the four measures of categorization complexity showed that involvement led to a decrement in performance. The involved Ss made significantly fewer sorts, significantly fewer categories, and had a lower mean level of complexity across all regular sorts. For the mean number of categories per sort, the means were in the same direction, but extreme scores generated by a few Ss in each of the cells contributed to a relatively large error variance.

The mean change per sort variable produced more complicated results; the Involvement by Sex interaction was significant. The mean for involved males was .06 and for involved females was .10. Testing for the significance of the differences among the means by Duncan's new multiple-range test (Edwards, 1960) with α set at .05 revealed that involved males had a mean significantly smaller than that for the uninvolved males; no other means were significantly different.

A clearer picture of the effects of involvement on

Table 2
Involvement Means and SDs and the F Ratios for the Categorization Variables of Condition II

Variable	Involved		Uninvolved		F
	Mean	SD	Mean	SD	
Baseline R					
A	.83	.21	.94	.05	9.08††
B					.15
AB					1.92
Total Number of Sorts					
A	4.27	1.82	5.63	2.28	6.56††
B					1.72
AB					.10
Total Number of Categories					
A	18.93	12.18	30.23	18.86	7.45††
B					.19
AB					.69
Mean Number of Categories Per Sort					
A	5.55	2.69	7.09	5.36	1.97
B					1.01
AB					.99
Mean R					
A	.84	.12	.90	.06	5.51†
B					.37
AB					.10
Sum of Absolute Changes in R					
A	.21	.24	.37	.42	3.44
B					.01
AB					.11
Mean Change Per Sort					
A	.10	.10	.11	.07	.23
B					2.09
AB					4.27
Sort of Category Labels					
A	.93	.08	.91	.07	1.74
B					3.01
AB					.22

* $p < .05$

** $p < .03$

† $p < .02$

†† $p < .005$

Fig. 1. Mean levels of complexity across sortings.

complexity across sorts can be gained from inspection of Fig. 1, which shows the mean complexity scores for the experimental groups for four sorts. Because Ss differentially terminated sorting, different Ns occur across the sorts. Sample sizes become rather small by the fourth sort, particularly for involved Ss, so only for those sorts are means shown. For involved males, the Ns are 15, 13, 9, and 4. For involved females, samples are 15, 15, 8, and 4. For uninvolved males, the Ns are 15, 15, 15, and 12, and, for uninvolved females, they are 15, 15, 13, and 7.

Discussion

Involved Ss scored significantly lower on their baseline R, bringing these results into line with those of previous studies. With this difference established, the results for the other variables generated by the MS procedure provide clearer insights into categorization processes. Decrements in performance as a function of involvement were revealed clearly, both in terms of raw quantity of output and the informational complexity of that output.

However, results for the complexity maintenance variables presented a more complicated picture. For the sum of absolute changes, the involved Ss underwent less overall change than the uninvolved Ss, but the F ratio for involvement (3.44) was significant at only the .06 level. For the mean change per sort, only the interaction of Involvement by Sex was significant. Generally, higher affective involvement appeared to maintain complexity, as the data in Fig. 1 show a fairly constant level of complexity. Means tests showed that involved males changed less than other groups but were significantly lower than only the uninvolved males. Overall change per se cannot be directly inferred from Fig. 1 because it represents only subsets of Ss and only four sorts.

Viewing Fig. 1 in a different light, t tests were

performed for the significance of the differences between the first and fourth means for each cell. The sample sizes were quite small, however, and none of the differences were significant.

Overall, the data can be seen as weakly supporting the conclusion that the involved Ss maintained a moderately consistent level of complexity across sorts, while uninvolved Ss were somewhat more changeable, with both findings being complicated by sex effects. Further, this held true in conjunction with the significant result that involved Ss had a lower mean R than uninvolved Ss.

For the sort of category labels, no intergroup differences occurred. It has been suggested (Harvey, Hunt, & Schroder, 1961; Scott, 1962) that it is the complexity of the category system, not the mere number of cognitive elements, that is the important factor in cognitive processes. This variable was intended to reveal such difference, if any, relative to involvement (and sex) effects in both conditions. In neither one did such occur, however. Any conclusions drawn from this will have to be restricted to the experimental procedures employed, of course, but it does seem clear that such cognitive differences, if they do exist in a categorization situation, are not detected by the dimensional variables employed here.

CROSS-CONDITION COMPARISONS AND CONCLUSIONS

The involvement differences revealed by the tests on the independent variables discussed earlier makes a comparison between the instructions conditions difficult, but inspection of the means for the dependent variables indicated that such would be useful. For example, in spite of the great involvement differences (both behavioral and attitudinal) between involvement groups within either condition, no significant categorization differences were found when free responding in Condition I was allowed. However, when the specific dimension of favorable-unfavorable was suggested in Condition II, then a number of differences did appear.

In order to assess this effect more fully, a series of post hoc analyses were performed. Each of the eight dependent variables was submitted to a three-way analysis of variance test, testing for the effects of the instructions variable *per se*. As the assumptions of analysis of variance were violated by the failure of random assignment of Ss to cells and also because of the lack of comparability of the S samples discussed earlier, the results of these tests can only be considered suggestive.

For the complexity maintenance variables themselves, the analysis revealed significant influence from both the instructions and the involvement main effects for the sum of absolute changes in R. For the instructions variable, $F = 5.67$, $df = 1/112$, $p < .02$. Mean for the open-ended instructions was .51 and for the specific instructions was .29. For the involvement variable,

$F = 3.72$, $df = 1/112$, $p < .05$. Involved Ss had a mean of .31 and uninvolved Ss had a mean of .50.

The mean change in R variable also showed significant influence from the instructions variable ($F = 3.66$, $df = 1/112$, $p < .05$). The mean for the open-ended instructions was .13 and for specific instructions was .10. The main effect of involvement was marginally significant ($F = 2.75$, $df = 1/112$, $p < .10$); the mean for involved Ss was .10 and for uninvolved Ss was .13. However, the interaction of Involvement by Sex was significant ($F = 5.87$, $df = 1/112$, $p < .02$). The mean for involved males was .08 and for involved females was .13; for uninvolved males the mean was .15 and for uninvolved females was .12. Testing for the significance of the differences among the means by Duncan's new multiple-range test (Edwards, 1960) with α set at .05 revealed that involved males had a mean significantly smaller than that for the uninvolved males; no other means were significantly different.

For the other six variables, the effect of the instructions variable was marginally significant in two cases. For the baseline R, the interaction of Instructions by Sex was marginally significant ($F = 2.60$, $df = 1/112$, $p < .10$), and for the total number of categories the interaction of Instructions by Involvement was marginally significant ($F = 2.80$, $df = 1/112$, $p < .09$).

Inspection of the means in Tables 1 and 2 is instructive. For involved Ss there was a decrease in value for seven of the eight variables when the favorable-unfavorable instructions were imposed; on one variable there was no difference. For uninvolved Ss, four of the eight variable means increased and four decreased under the specific instructions.

Overall, these results implicate the variable of dimensional influence on categorization processes. No direction of effect can be specified here, partly because of the methodological complications encountered in obtaining equivalent S samples. Nevertheless, the results showing an influence on complexity maintenance are important in terms of a full analysis of affective influence on categorization. Further, they are congruent with the results of the Reich and Farr (in press) study, in which it was found that both involved and uninvolved Ss behaved differentially as a function of the particular instructions (dimensions) provided for sorting. The dimensions partially used semantic differential factors and found cross-factor generalization and an interaction of Involvement by Dimensions. Of course, however, our knowledge of these processes is still quite limited; certainly the topic is now ready for a more formal investigation on instructions *per se*, as these interact with both S affective predispositions and the dimension of meaning being used for categorization.

A different view of these involvement effects is the result of the sort of label cards. In both instructions conditions, the involved Ss had as complex an overall response system as the uninvolved Ss. Thus, while the first sort or baseline showed a strongly significant difference between the groups, this is not necessarily the

most valid indicator of the total behavioral abilities of the Ss; given free responding until they run out of meaningful categories, involved Ss perform at levels equal in complexity to those of uninvolved Ss. The behavioral contexts differ, of course; for the first sort, the Ss are responding to involving statements and, for the sort of label cards, they are responding to their own previous responses.

Given this difference, however, the fact that the two groups did not differ on this variable must be incorporated into our understanding of involvement per se. It appears that affective influences must be seen as rather situation specific and not as generalized all-pervasive determinants of behavior.

For complexity maintenance itself, the results showed a tendency toward consistency in complexity across multiple sorts for involved Ss. Uninvolved Ss tended to change more drastically. Thus, involvement does appear to maintain behavioral complexity. Other research can be brought to bear on the consistency found here. Glixman (1965) had Ss categorize three domains of stimuli varying in levels of personal involvement. Significant positive intercorrelations were found, leading to the conclusion that Ss are consistent in categorization and that they have a general style or form for this kind of behavior.

The results of these MS results are in agreement with the conclusion of Glixman, but here it has to be considered "intradimensional consistency." It is not possible to tell from Glixman's study if Ss used the same dimensions for categorization across the different domains. But the research reported here raises the issue of inter- and intradomain and inter- and intradimension contexts of judgment. Consistency may change as the contexts change. Further, it was found here that involvement by Sex effects are operating, with involved males being especially consistent. At any rate, for the intradomain intradimension judgment task reported here in Condition II (in Condition I free responding leaves it ambiguous), a fairly strong tendency toward consistency was manifest.

This consistency is interesting for another reason. The MS task reported in Reich (1968) found a significant decline in complexity across sorts. The main difference between these studies is the stimulus domain chosen for study: In the 1968 study, the stimuli were small, simple, physical objects and their names. With multiple sorting of these stimuli, complexity declined to a low level. In both conditions reported here, however, such did not appear; complexity did not undergo drastic decrease. Stimulus properties seem to be the significant determinant of the differences between these studies. Simpler stimuli presumably have fewer mediational properties to sustain behaving across multiple situations. To the problem of dimensionality and affect as issues in categorization complexity must now be added the problem of stimulus properties.

The application of the MS technique to judgmental processes in the experiment reported here has widened

the scope of behaviors derived from the behaving S and, thus, has delimited a set of problems needing further investigation. Probably the first step would be to use both nondimensional and dimensional instructions on the same Ss. Categorization processes for specific Ss across both domains and dimensions need further investigation.

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NOTES

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