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# Semantic Differential Relationships as a Determinant of Clustering

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# SEMANTIC DIFFERENTIAL RELATIONSHIPS AS A DETERMINANT OF CLUSTERING

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# CHAPTER I

# INTRODUCTION

In recent years, free recall has become a popular experimental technique for investigating the processes which underlie memory. The E presents the Ss with a list of items for recall, e.g., a thirty-word list. He may present the list once or a number of times; the items are randomized for each presentation of the list. After the presentation of the items, he instructs the Ss to recall the items in the order that they occur to them. Invariably, the Ss will not recall the items in the same order as they were presented. In the process of recalling, the items are rearranged or reorganized.

Researchers, of late, have shown considerable interest in trying to explain the underlying processes responsible for this reorganization. The differing theoretical explanations seem to fall quite naturally along a continuum (Kendler, 1966). At one extreme of the continuum lie the associationistic or the S-R models. Upholders of the S-R models maintain that the determining factor in the organization of mental events is temporal pairing of verbal elements, i.e., temporal contiguity (Deese, 1965). The recalling of one verbal element leads to the recall of a second with which the former had been temporally paired in the past

experience of the perceiver. The frequency with which the two items have been paired in the past determines the probability that the recall of one word will lead to the recall of the other.

At the other extreme of the continuum is the organizational or categorical explanation of the memory processes which underlie free recall. The rearranging of the items in recall is attributed to the cognitive processes of the learner rather than resulting from external contingencies as the associationists maintain. The learner consciously or unconsciously seeks out relationships among verbal elements that allow him to place the items into categories, which may or may not be conceptual in nature. These categories are in turn labeled or coded by the learner. Recalling one of the category members elicits the recall of the category label. The category label then functions as a mediator which stimulates the recall of the other verbal elements subsumed under the category label.

It can be readily seen that these two contrasting views of the organization and structure of memory offer alternate positions as to the general nature of memory processes. The associationist or the S-R model offers a direct, simplistic theory of memory. The learner is viewed as being essentially passive--an automatic recorder of external verbal contingencies. Recall is a matter of reproducing these verbal contingencies in accordance with the dictates of probability (Deese, 1965). In contrast, the organizational or categorical model portrays short-term

memory as being a complex, indirect process in which mental processes of the learner actively reorder the verbal stimuli during recall. Between these two extremes lie the vast majority of the explanations for short-term recall that hold that both categorical and associational relationships are necessary to explain the organizational processes which underlie short-term memory. In summarizing the results of a member of experiments in free recall, Cofer (1965) concludes:

> In free recall, our evidence suggests subjects will use either or both these bases to accomplish their recalls and will find ways to organize recalls even though the experimenter has not provided means in the list he presents [p. 271].

Thus it can be seen that although the associationistic and the categorical explanations are vastly different in their assumptions concerning memory, the two explanations are far from being mutually exclusive in the sense that acceptance of one view necessitates the rejection of the other. It is generally accepted that both types of relationships play an important role in the organizational processes which exert their influence on free recall.

## Clustering Analysis

In recent years, one method of free recall, clustering analysis, has proved to be particularly effective in testing hypotheses derived from the differing models of short-term memory processes. In clustering analysis, the E develops a list of items which can be placed into categories. The types of relationships between task-words vary. In some

instances they are conceptual, and in others they reflect pre-experimental associative strength between items as defined by normative free recall data. In any case, the E presents the task-words one or more times to the Ss. The order of the words for each presentation is randomized. After the presentation of the list, the E instructs the Ss to recall the items in the order which they occur to them. Next, the E statistically examines the recalls to see whether or not the sequences in which the Ss recalled the items parallel the predetermined categories which the task-words had been placed in prior to the presentation of the task-list. If in recalling the items, the Ss do restore the items to the predetermined categories, the E concludes that he was correct in assuming the relationships used to define the categories do play an important role in the organization of memory. In essence, clustering provides researchers with a simple method for testing the relative importance of different types of relationships as determining factors in short-term memory.

## The History of Clustering

The initial research employing clustering analysis was reported by Bousfield (1953). It was Bousfield's hypothesis that conceptual relationships among words could serve as a basis for association in free recall. To test this hypothesis, he presented his Ss with a randomized list of sixty items. Each of the sixty items could be classified into one of four conceptual categories: animals, names, professions, and vegetables. Immediately following the presentation of the items, the Ss were

asked to recall the items in the order in which they occurred to them. Analysis of the data revealed that the Ss tended to group the items in clusters, i.e., words in a particular category appeared in sequences on the list of recalled words at a much higher level than would be expected by chance. Bousfield suggested that the observed clustering resulted from mediation of the category name. Recalling one of the members of a particular category activated a conceptual superordinate, the category name. For example, recalling the word "dog" would activate the superordinate "animal," which in turn increased the probability that other members of the category "animal" would be recalled, thus facilitating clustering. Bousfield concluded that conceptual relationships were important mediators in memory. Further research by Bousfield and others suggested that the clustering observed by Bousfield might well have been accounted for by pre-experimental association norms. Basically, the pre-experimental associative level is found by establishing the frequency at which list members evoke each other in free recall and/or the frequency at which list members evoke other words as common responses. If in fact pre-experimental associative relationships could be shown to be highly related to the obtained clustering, then Bousfield's conceptual mediation hypothesis would not be needed to account for the clustering.

Bousfield, Cohen, and Whitmarsh (1958) obtained experimental results which supported this conclusion. Using a controlled free association task, he obtained pre-experimental norms which established the

associative strength between category names and category members. Bousfield then presented his subjects with two lists of words: one contained category members which were highly associated with the concept name; the other contained words whose association with the category name was low. He found that both recall scores and clustering were greater in the high associative list than in the low associative list. Deese (1959), in order to obtain additional knowledge on the effect of pre-experimental associative relationships on clustering, used inter-item association to measure existing associative relationships between list words. Inter-item associative strength is the average relative frequency with which all items in a list tend to elicit all other items on the same list. Deese's results suggested that category clustering depends upon the inter-item associative strength within the category.

Another measure of pre-experimental associative strength that has been shown to facilitate clustering is response dominance (Underwood & Richardson, 1956). Response dominance is an associative index derived from a restricted free recall task in which the S is instructed to respond with a sense impression to the stimulus item, e.g., the stimulus items "bone," "lint," and "frost" often evoke the sense impression "white." Sense impressions that are frequently evoked by a given stimulus are high dominance associates for that particular stimulus, while those that are evoked infrequently are low dominance responses. Bousfield and Puff (1964), using categories from the Underwood and Richardson list, found

significant clustering for high dominance words, but not for low dominance words. Bousfield and Puff interpreted the results as being supportive of the conclusion that clustering is largely a function of pre-experimental associative relations.

From the results of the previous studies, it is clear that pre-experimental associative strength between task-words is an important mediator of clustering. Kendler (1966) states:

> The clearest examples of these mediating links are seen when behavior agrees with the norms of word-association tests. But it would be the height of optimism to believe that these associations gathered in the conventional word-association manner, will provide information to describe all, or even a large segment of mediating processes [p. 200].

Thus it is not clear to what extent categorical relationships, for example, mediate clustering.

Cofer (1965) presented a number of studies which clarified the role of categorical mediators in clustering. He reported a study done by Marshall and Cofer (1963) in which lists of categorized and uncategorized items were presented to Ss for recall. Categorized pairs were those in which the pair members shared a common conceptual relationship, e.g., both were pieces of furniture. In the non-categorical pairs, no conceptual relationship existed. He found that at high levels of association there was no difference in clustering between the two, but at intermediate levels of association and to some extent at low levels of association there was a difference in favor of the categorized pairs.

Cofer reported an additional study by Marshall and Cofer (1961). Marshall used mixed lists of categorized and uncategorized items at differing levels of association. The items were presented under a set and a no-set condition. The set was induced by telling Ss that they might notice relationships among items, and that these relationships might help the Ss recall the items. The results indicated that the set enhanced clustering for both categorized and uncategorized items at the high association level, but that it had no differential effect on these kinds of pairs at the low association level. The results of Marshall's study suggested to Cofer that the associative strength between pair members had to be sufficiently great before the Ss could recognize relationships between the two words, and to use this knowledge to mediate clustering.

Hudson (1967) obtained data that suggested that inter-item association did not have to be high for clustering to occur. Hudson employed items of low inter-item association while varying the level of information available to his Ss. The information groups possessed the knowledge that the task-words could be categorized according to sense impressions. The control groups were not given this information. He found that the information groups clustered at a significantly higher level than the no-information group. Hudson's study alone provides direct, unambiguous evidence that categorical relationships can mediate clustering, for the only possible explanation of the increased clustering on the

part of the information groups is that they used the knowledge that the items could be conceptually categorized in organizing them for recall.

In addition to associational and categorical relationships, the manner in which the task-list itself is presented to the Ss has proven to be an important determinant of clustering. Cofer, Bruce, and Reicher (1966) found that presenting items of a given category together--block presentation--augmented clustering. Increasing the length of time between the presentation of each item also increased clustering. Bousfield (1953) found that the number of times the task-list is presented before recall is positively related to the amount of clustering observed. Generally, the greater the number of presentations of the task-list, the greater the clustering. Hudson (1967) found that increasing the number of presentations of the task-list had a tendency to increase clustering in the information groups, while the clustering in the no-information groups remained unaffected by the increased number of presentations.

## The Problem

In studying clustering research done in the past, one trend becomes very apparent. Researchers have constantly sought to determine the relationship between various measures of pre-experimental associative strength as determined by free recall studies and category clustering. Response dominance and inter-item associative level are two of the more prominent measures. It seems to this researcher that it would be of heuristic value to explore the possibility that quantifiable relationships

among words other than those established by free recall studies might be important determinants of clustering. One such alternative scaling technique is the Semantic Differential (SD) (Osgood, Suci & Tannenbaum, 1957).

It was the intent of the present study to determine under what conditions SD relationships serve as a determinant of clustering. SD relationships have both associationistic and categorical aspects. The SD is associationistic by definition, for SD meaning is derived from data produced by a controlled association technique, i.e., the Ss must restrict their responses to the stimulus item to the limits defined by the bipolar adjective scales. SD meaning is categorical or conceptual in the sense that Ss can recognize SD relationships among words and categorize them accordingly (Edwards, 1968).

The task-list in the present study consisted of twenty-eight items which can be divided into four categories: the high evaluative (HE), the low evaluative (LE), the high activity (HA), and the low activity (LA).

The major variable manipulated was the amount of information concerning categorization by SD meaning available to the Ss in the control and experimental groups. As in the case of Hudson's study, the items could be categorized, but the categorical relationships were not obvious. The information groups were given the basis for categorizing the items along with the category names. The no-information groups were

not informed as to the categorical relationships among the test items. In addition, the number of presentations of the task list was varied across information and no-information groups. In the present study, information group-one (IG-1) and no-information group-one (NG-1) had one presentation of the task-list before recall, while information group-four (IG-4) and no-information group-four (NG-4) had four presentations of the task-list before recall. The following hypotheses were tested:

1. Both information and no-information groups cluster the items into four SD categories: HE, LE, HA, and LA; however, clustering is significantly greater for the information groups than for the no-information groups.

2. Both information and no-information groups merge items at the extremes of the evaluative and the activity dimensions into single, composite categories, i.e., one inclusive activity category and one inclusive evaluative category. As in the instance of the four-category grouping, clustering is greater for the information groups than for the no-information groups.

3. Increasing the number of presentations increases clustering for the information group while not influencing the amount of clustering in the no-information groups.

4. Because factor analysis of the SD (Osgood, 1957) has shown the evaluative dimensions of the SD to be more dominant, there will be greater clustering within the evaluative category than within the activity category.

# CHAPTER II

# METHOD

## Subjects

A total of 102 Ss, all of whom were students in upper-division psychology and education courses at Central Washington State College during the summer of 1968, participated in the experiment. The E presented the task to six classes. Three of the classes received four presentations of the task-list, while the other three classes received one presentation of the task-list. In all, there were fifty Ss in the four-presentation groups and fifty-two Ss in the one-presentation groups. The experiment was presented in the classroom during the regularly scheduled class time.

## Materials

The hypotheses call for twenty-eight items which may be divided into four categories on the basis of their SD ratings. The items (see Appendix A) and their semantic profiles were drawn from a SD dictionary prepared by Heise (1965). Heise's list includes the standardized factor score for the listed words on each of three major semantic dimensions: evaluative, activity, and potency. The words used in the present study were selected on the basis of the following statistical attributes:

1. Each item selected had a standardized factor score greater than or equal to 1.15 on the defining dimensions, i.e., the dimension that corresponds to the category name. For example, all words in the high evaluative category had standardized factor scores of greater than or equal to 1.15 on the high evaluative dimension.

2. Each word selected was statistically neutral on the remaining two dimensions. For the purpose of this study, statistical neutrality was defined as having a standardized factor score of less than 1.10 on the other two dimensions.

In addition, the level of association between task-words was taken into account. It should be remembered that the level of inter-item association has been demonstrated to be an important variable in clustering experiments. From a study of the task-words, it appeared that they would elicit each other as free associates very rarely. To check this subjective impression, the Sharpiro and Palermo (1968) atlas of normative data was consulted. Nineteen out of the twenty-eight task-words were listed along with their primary associates, i.e., those words evoked most frequently in a free recall situation. In only one instance a task-word elicited another task-word as a primary associate. The task-word "fear" elicited the task-word "hate" at a .10 frequency level. The fact that in only one instance did a task-word elicit another task-word as a primary associate provides a good indication that the level of inter-item association for all twenty-eight items is low. It also suggests that the

associative overlap among the task-words is relatively low, i.e., the associations which any two task-words have in common as a proportion of all the associations that the two words elicit is small.

Standard 2"x2" slides with one word per slide were prepared. Two slides of each word were made, making a total of fifty-six slides.

A test booklet (see Appendix B) of three pages was used. On the first page of the booklet, the S was given information as to the nature of the experiment and was provided with spaces to write down information concerning his name, age, major area of study, and year standing. The second page informed the S that he would be presented a list of items which he would be asked to recall. The initial sentence on the third page instructed the Ss to "Write as many words as you can remember in the order that they occur to you." The next sentence requested the Ss to "Start in the upper left-hand corner and work down in a single column." For approximately half the Ss, the third page contained additional information as to how the words could be grouped into four categories and the names of the four categories. Ss receiving these booklets comprised the information groups.

## Procedure

Before each presentation of the experimental task, the E introduced himself and informed the Ss that they were going to participate in an experiment E was doing for his thesis project. The E then distributed the test booklets. After giving the Ss time to read and fill out the first

page of the test booklet, E instructed the Ss to turn to the second page of the test booklet and read the instructions. The E then informed the Ss that he was going to begin the presentation of the words. The slides were presented, one by one, in a Kodak Carousel 800 projector, at an inter-item interval of 5 seconds, approximately 4.7 seconds of which was actual exposure time.

The items were presented the appropriate number of times for the Ss. Each presentation was in a different random order. Randomization was achieved by shuffling the slides thoroughly after each presentation. The use of two sets of slides permitted continuous presentation.

Immediately after the presentation of the words, the E instructed the Ss to turn to the last page in their test booklet and read it carefully. The E asked the Ss not to begin writing until he gave the signal. After allowing the Ss approximately twenty seconds to read the last page, the E informed the Ss they would have three minutes to recall the words and instructed them to begin writing. After three minutes had elapsed, the E collected the answer booklets and thanked the Ss for their cooperation.

# CHAPTER III

## RESULTS

Prior to the experiment it was decided that protocols with less than six items from the task-list would not be scores. Eight protocols fell within this category. In addition, six other protocols could not be scored because of the failure of the Ss to follow instructions; thus, the total number of protocols scored was eighty-eight. For statistical convenience, the number of protocols in each group was reduced to twenty by the following method. Each protocol within a particular group was assigned a number. The protocols for each group were numbered separately, beginning in each instance with one and numbering the protocols consecutively. The E then used a table of random numbers to determine which of the protocols should be withdrawn from each group. Repeated drawings were made from the respective groups until the desired number of twenty protocols per group was achieved.

Two clustering indices were computed for each S: one index for the amount of clustering into four categories--HE, LE, HA, and LA; and another for the amount of clustering into two categories--evaluative and activity. The clustering index used was one presented by Bousfield and Bousfield (1966) as modified by Hudson and Dunn (1968). This formula

focuses on the number of repetitions in a recall protocol, where repetition is defined as the occurrence of two words from a category in succession on the list of recalled items. Two words occurring together on the list of recall constitutes one repetition, while three words in succession constitutes two repetitions. The index is the observed number of repetitions minus the number expected by chance and divided by a standard deviation appropriate for the particular distribution. The index, then, is a standard score with an approximately normal distribution.

Table 1 presents the means and variances for both two-category and four-category clustering indices for two numbers of presentation by two levels of information.

Table 1

Means and Variances of the Clustering Indices for Four Categories and Two Categories

| Information Level | | Number of Presentations | | | |
|---|---|---|---|---|---|
| | | 1 | | 4 | |
| | | Categories | | Categories | |
| | | 4 | 2 | 4 | 2 |
| Information | $\bar{X}$ | .671 | .374 | 1.310 | .883 |
| | $\sigma^2$ | 1.696 | 1.655 | 1.806 | 1.461 |
| No-Information | $\bar{X}$ | .975 | -.19 | .421 | .306 |
| | $\sigma^2$ | 1.255 | .827 | 1.771 | .867 |

Note--Clustering index must be greater than 1.65 to be significant at the .05 level of confidence.

A two-by-two analysis of variance was computed for both the two- and four-group clustering data using the clustering index. For the four-category analysis, the F-ratio of 6.779 for the information condition was significant at the .05 level of confidence. (See Table 2.)

Table 2

Analysis of Variances for Four Category Clustering

| Source | df | MS | F |
|---|---|---|---|
| Information | 1 | 11.070 | 6.779* |
| Number-Presentations | 1 | 4.763 | 2.840 |
| I x P | 1 | .702 | .430 |
| Within Groups | 76 | 1.633 | |

* $p < .05$

As can be seen in Table 3, page 19, the number of presentation conditions and the interaction were not significant. In the two-category analysis, the F-ratio of 3.918 for the information condition was slightly less than required for significance at the .05 confidence level (3.968 is required for 1 and 76 degrees of freedom). Neither the number of presentation conditions nor the presentation information was found to be significant.

Table 3

Analysis of Variance for Two Category Clustering

| Source | df | MS | F |
|---|---|---|---|
| Information | 1 | 4.721 | 3.918 |
| Number-Presentations | 1 | 3.497 | .902 |
| I x P | 1 | .147 | .122 |
| Within Groups | 76 | 1.205 | |

Another clustering index, the ratio of repetition, was used to determine the amount of clustering within the activity and evaluative categories respectively. The ratio of repetition is merely the number of observed repetitions in a given category divided by one less than the number of words recalled from that category. The ratio of repetition was calculated for each S for both activity and evaluative categories. The t test for correlated observations was employed to test for a difference between the mean number of repetitions in the two categories. Averaged over both conditions, the obtained t score of .402 was insignificant at the .05 level of confidence. To obtain a more precise analysis of the clustering within each category, additional t tests were employed to test for differences between clustering in the evaluative and activity categories in each of the four groups: IG-1, NG-1, IG-4, and NG-4. In each instance, the differences between the evaluative and activity categories were insignificant at the .05 level of confidence.

# CHAPTER IV

# DISCUSSION

The purpose of this study was to determine under what conditions SD relationships among task-words would mediate clustering in free recall. The two major variables investigated were the amount of information available to the Ss concerning SD relationships and the number of presentations of the task-list before recall.

Previous clustering studies using various measures of pre-experimental associative strength to determine the relationship of one task-word to another have found a positive correlation between the amount of clustering obtained and the strength of association between task-words. It was also found that increasing the amount of information available to the Ss concerning the conceptual relationships among task-words resulted in significantly greater clustering, suggesting that the S's conscious awareness of the conceptual relationships is an important factor in the mediation of clustering. Within certain limits, increasing the number of presentations of the task-list before recall has also been shown to lead to increased clustering, indicating that repetition of the task-list leads to increased awareness on the part of the Ss as to the conceptual and/or the associative relationships among task-words.

In general, the results of the present study were consistent with the results of previous studies; the main difference was that the trends revealed in the present study were not nearly as pronounced as they were in previous studies. As in the past, increasing the level of information and the number of presentations of the task-list before recall tended to increase clustering. Only in one instance, however, was this tendency significant. To be more specific, the results indicated that information about the SD relationships between task-words lead to significantly greater clustering than no-information for the four-category division of the task-list but not for the two-category division, although there was a trend in this direction.

As evidenced by the obtained clustering, information apparently increased the S's awareness as to the similarities among words at the extremes of the evaluative and activity dimensions, thus facilitating the clustering of the words into four categories. Information did not, however, lead the Ss to group the words into single activity and evaluative categories per se. At first glance, these results appear illogical. It would seem that if information increased clustering at the four-category level, that it would automatically increase clustering at the two-category level because of the intimate relationship between the two-category and the four-category division of the words--the four-category division is merely a result of subdividing the two-category division. However, if one analyzes the possible ways in which the words can cluster, it may

be readily seen that it is possible to have perfect four-category clustering while having no two-category clustering, e.g., seven HE words followed by seven HA words followed by seven LE words followed by seven LA words. (There is then the possibility that four-category clustering can occur independently of two-category clustering.) The realization of this possibility is helpful in explaining the obtained results of the present study. It appears that four-category clustering, to a degree, occurred independently of two-category clustering. When given information, the Ss tended to cluster the words into four categories, but not into the two general categories. A possible explanation lies in the differences in the conceptual links between the words in the respective categories. The links among the words in the two general categories are more abstract, more inclusive, and perhaps too weak to serve as a basis for the organization of memory. From the results, it appears that one evaluative word is almost as likely to elicit an activity word as another evaluative word. Evidently, the conceptual relationships among evaluative words taken as a whole are so weak that they cannot be consistently recognized by the Ss regardless of the amount of information they possess. This is to be contrasted with the relationships among words found at the same ends of the evaluative and activity dimensions respectively. The links between these words, by definition, are less abstract and more restrictive than the relationships between activity and evaluative words taken as a whole, thus making it easier for the Ss to get from one word to another. The

greater ease with which Ss were able to recognize relationships among words at the same ends of the evaluative and activity dimensions accounts for the greater clustering that occurred at the four-category level.

Increasing the number of presentations of the task-list before recall from one to four did not lead to significant increases in clustering. There was, however, evidence of a trend in this direction at both the two- and four-category levels. Apparently, increasing the number of presentations of the task-list did not measurably help the Ss to organize the words into SD categories, providing further evidence that SD relationships are remote and extremely difficult to recognize--so remote that repeated presentation of the task-words under both information and no-information conditions resulted in an insignificant increase in clustering. Possibly for clustering to increase with increased presentations of the task-list, there has to be a minimal level of associative strength between task-words. The fact that clustering failed to increase significantly with increased presentations of the task-list before recall suggests that the conceptual bonds between task-words did not exceed this minimal level of associative strength needed to result in a significant increase in clustering.

To summarize, the results of this study paralleled the results of previous clustering studies. The main difference was that the trends revealed were not nearly as pronounced as they had been in the past. In the present study, increases in the level of information and the number

of presentations did not result in significant increases in the amount of clustering as they had in previous clustering studies.

Taken as a whole, these results suggest that SD relationships between words provide a weak basis for clustering as compared to the relationships established by measures of pre-experimental associative strength. The fact that clustering was not significantly above the level of chance under any presentation or information condition implies simply that SD associations are not a major factor in the organization of memory. Apparently the coding processes responsible for the organization of memory do not parallel the system of relationships between words defined by the SD.

In seeking new directions for future clustering research, it is helpful to remember that the overriding purpose of all clustering research is to gain insight into the psychological processes which underlie the structure and organization of memory. Previous clustering research, using the free recall definition of associative strength, has shown a clear relationship between the way in which Ss organize their responses in a short-term memory task and the way in which Ss respond in a free recall situation. This relationship is, however, by no means perfect, and many of the associations that appear in clustering studies cannot be accounted for by the normative free recall data alone.

It appears to this investigator that if clustering research is to continue to be fruitful, researchers need to explore the possibility that

associations among words other than those established by pre-experimental associative norms are important in the organization of memory. The present study marked a step in this direction. Even though this study failed to uncover an isomorphic relationship between the processes of memory and associations as defined by the SD, it did represent a departure from previous studies which have relied heavily on pre-experimental associative norms.

It is hoped that in the future researchers will build new models of memory based on innovative definitions of associative relationships among words. One possibility would be to define associative strength in terms of a S's GSR reactions. Words that elicit similar GSR ratings from a given S would have a high level of association for that S. Perhaps words of similar GSR ratings would cluster in immediate recall. In any case, it seems that there is a great deal to be gained in clustering research by exploring the possibility that a variety of different types of relationships among words might affect clustering. Hopefully, such divergent approaches will provide fresh insight into the organization of memory.

# CHAPTER V

## SUMMARY

In the past, clustering research has focused primarily on the effect of pre-experimental associations and/or conceptual relationships on clustering in free recall. The present study marks a departure from this trend in that it was designed to determine under what conditions SD relationships among task-items would mediate clustering.

A total of 102 Ss were presented a twenty-eight item task-list. Half of the Ss received one presentation of the task-list while the other half received four presentations of the task-list before recall. The degree of information the Ss possessed concerning the SD relationships among task-items was varied across the two presentation conditions. Those Ss receiving information were told that the items could be categorized according to their SD relationships and were given the names of the SD categories; the no-information Ss were not given this information. It was hypothesized that clustering would be greater for the information groups than for the no-information groups. Increasing the number of presentations of the task-list from one to four presentations was also hypothesized to augment clustering.

Two two-by-two analyses of variance were computed to determine the amount of clustering. One was to determine the degree to which the Ss clustered the words into four SD categories: high evaluative, low evaluative, high activity, and low activity; the other was to determine to what extent the Ss merged the two evaluative and activity categories into single activity and evaluative categories per se. In general, increasing the information and the number of presentations tended to increase clustering. Only in one instance, however, was this tendency significant. In the four-category analysis, information about the SD relationships lead to significantly greater clustering than no-information.

It was concluded that in general the SD relationships among words are too weak to mediate clustering. If it is assumed that the relationships which determine category clustering also play a role in the organizing processes which underlie memory, then it must be concluded that SD relationships are of limited importance in the structure of memory.

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# APPENDIX A

## RATINGS OF THE STIMULUS ITEMS ON THE THREE SD DIMENSIONS

# APPENDIX A

## RATINGS OF THE STIMULUS ITEMS ON THE THREE SD DIMENSIONS

| Stimulus Items | Extremity | | |
|---|---|---|---|
| | Evaluative | Activity | Potency |
| | High Evaluative | | |
| Fresh | 1.60 | -0.38 | -0.68 |
| Quality | 1.35 | -0.19 | -0.34 |
| Religious | 2.07 | 0.02 | -0.79 |
| Satisfy | 1.66 | 0.04 | 0.09 |
| Unite | 1.51 | -0.07 | 0.19 |
| Wise | 1.49 | 0.88 | 1.26 |
| Open | 1.15 | -0.27 | 0.25 |
| | Low Evaluative | | |
| Hate | -3.11 | 0.11 | -0.61 |
| Kill | -3.29 | 0.98 | -0.27 |
| Missing | -2.12 | 0.11 | -0.48 |
| Terrible | -3.26 | 0.33 | -0.26 |
| Difficult | -2.11 | 0.13 | 0.88 |
| Debt | -3.08 | -0.39 | 0.01 |
| Fear | -1.32 | 0.07 | -0.54 |

Note--The stimulus items were taken from a list compiled by Heise (1965).

# APPENDIX B

# TEST BOOKLET

# APPENDIX B

## Test Booklet: Page One

DO NOT TURN PAGES UNTIL ASKED TO DO SO AND TURN THEM ONE AT A TIME.

Please look only at your own paper. This is an experiment in short term memory and is no way related to intelligence, personality, etc. Please follow instructions as well as you can.

NAME_____ AGE_____ CLASS_____

SEX_____ MAJOR_____

IF YOU HAVE QUESTIONS OF ANY TYPE, PLEASE SAVE THEM UNTIL THE EXPERIMENT IS OVER.

# APPENDIX B

## Test Booklet: Page Two

You will be presented with several words one at a time. Your task is to remember as many words as you can. After the presentation you will be asked to write down as many words as you can remember in the order which they occur to you.

# APPENDIX B

## Test Booklet: Page Three

### Information Group

Write as many words as you can remember in the order they occur to you. Start in the upper left hand corner and work down in a single column. You may not have noticed but each word can be placed into one of four groups:

High Evaluative--words which have favorable or good overtones.

Low Evaluative--words which have unfavorable or bad overtones.

High Activity--words which suggest movement or activity.

Low Activity--words which suggest inactivity.

Do not start until I give the signal, after which you will have three minutes in which to recall the words.

# APPENDIX B

## Test Booklet: Page Three

## No-Information Group

Write down as many words as you can remember in the order they occur to you. Start in the upper left hand corner and work down in a single column. Do not start until I give the signal, after which you will have three minutes in which to recall the words.

# APPENDIX C

## RAW DATA

# APPENDIX C

GROUP: Information, one presentation

| S | Words | 4-CI | 2-CI | E (R-R) | A (R-R) |
|---|---|---|---|---|---|
| 1 | 10 | 2.598 | 1.730 | .833 | 1.000 |
| 2 | 14 | 1.968 | 1.058 | .424 | 1.000 |
| 3 | 14 | 2.265 | 2.301 | .833 | .833 |
| 4 | 8 | .230 | 1.437 | 1.000 | .750 |
| 5 | 14 | -1.104 | .000 | .500 | .500 |
| 6 | 14 | -1.104 | -1.726 | .333 | .167 |
| 7 | 7 | -1.265 | -2.814 | .000 | .000 |
| 8 | 8 | 1.258 | 1.187 | .800 | 1.000 |
| 9 | 12 | 1.321 | 1.214 | .600 | .800 |
| 10 | 8 | .789 | - .205 | .500 | .500 |
| 11 | 7 | .208 | -1.336 | .333 | .000 |
| 12 | 14 | 1.324 | 2.446 | .750 | .875 |
| 13 | 13 | 2.100 | .851 | .667 | .600 |
| 14 | 14 | .100 | - .801 | .428 | .200 |
| 15 | 7 | .950 | .969 | .750 | 1.000 |
| 16 | 16 | .076 | - .277 | .667 | .200 |
| 17 | 10 | - .188 | - .655 | .000 | .500 |
| 18 | 9 | .216 | .814 | .500 | .800 |
| 19 | 9 | .716 | .968 | .750 | .666 |
| 20 | 13 | .541 | - .313 | .667 | .400 |

APPENDIX C (Continued)

GROUP: No Information, one presentation

| S | Words | 4-CI | 2-CI | E (R-R) | A (R-R) |
|---|---|---|---|---|---|
| 1 | 11 | 2.476 | .631 | .667 | .333 |
| 2 | 12 | .921 | 1.213 | .800 | .600 |
| 3 | 18 | 1.392 | - .400 | .555 | .429 |
| 4 | 11 | 2.488 | 1.578 | .750 | .800 |
| 5 | 10 | .000 | .000 | .500 | .500 |
| 6 | 11 | .000 | .292 | .600 | .500 |
| 7 | 7 | -1.438 | -1.335 | .500 | .400 |
| 8 | 14 | .716 | .575 | .667 | .500 |
| 9 | 10 | - .184 | .670 | .500 | .250 |
| 10 | 7 | 1.582 | .160 | .750 | .000 |
| 11 | 14 | - .302 | - .808 | .400 | .571 |
| 12 | 11 | - .829 | - .350 | .500 | .400 |
| 13 | 10 | - .184 | 1.415 | .500 | .000 |
| 14 | 9 | - .756 | 1.628 | .800 | 1.000 |
| 15 | 12 | -1.320 | .967 | .250 | .500 |
| 16 | 12 | - .120 | - .137 | .250 | .667 |
| 17 | 12 | - .120 | .000 | .400 | .600 |
| 18 | 13 | - .136 | -1.178 | .667 | .000 |
| 19 | 12 | - .129 | .307 | .333 | .714 |
| 20 | 9 | - .522 | .814 | .800 | .500 |

APPENDIX C (Continued)

GROUP: Information, four presentations

| S | Words | 4-CI | 2-CI | E (R-R) | A (R-R) |
|---|---|---|---|---|---|
| 1 | 10 | 1.659 | 1.428 | 1.000 | .800 |
| 2 | 14 | 2.410 | 2.877 | .625 | 1.000 |
| 3 | 15 | 2.550 | .434 | .500 | .333 |
| 4 | 8 | 1.510 | 1.436 | 1.000 | .500 |
| 5 | 12 | .623 | .692 | .571 | .400 |
| 6 | 16 | 1.143 | 1.039 | .625 | .429 |
| 7 | 15 | - .045 | .112 | .625 | .400 |
| 8 | 11 | - .061 | - .350 | .600 | .250 |
| 9 | 9 | - .523 | .965 | .667 | .750 |
| 10 | 19 | 3.001 | 1.018 | .730 | .375 |
| 11 | 17 | 1.478 | .821 | .700 | .600 |
| 12 | 19 | 1.153 | .608 | .600 | .571 |
| 13 | 18 | 1.327 | .973 | .625 | .625 |
| 14 | 12 | 1.301 | 1.214 | .600 | .800 |
| 15 | 17 | 1.833 | .779 | .625 | .571 |
| 16 | 16 | -1.566 | -3.090 | .143 | .143 |
| 17 | 15 | .052 | .795 | .571 | .667 |
| 18 | 18 | 4.375 | 1.777 | .780 | .850 |
| 19 | 17 | 1.481 | 1.286 | .714 | .750 |
| 20 | 11 | 3.487 | 2.836 | 1.000 | 1.000 |

APPENDIX C (Continued)

GROUP: No Information, four presentations

| S | Words | 4-CI | 2-CI | E (R-R) | A (R-R) |
|---|---|---|---|---|---|
| 1 | 20 | 2.193 | .413 | .500 | .600 |
| 2 | 10 | 1.989 | .943 | .833 | .500 |
| 3 | 17 | 1.536 | - .280 | .429 | .500 |
| 4 | 17 | -1.833 | - .763 | .250 | .640 |
| 5 | 12 | - .123 | - .607 | .400 | .400 |
| 6 | 11 | .639 | .286 | .500 | .600 |
| 7 | 8 | 1.261 | 1.186 | 1.000 | .800 |
| 8 | 8 | 1.873 | .616 | .500 | .750 |
| 9 | 24 | .969 | 1.659 | .667 | .700 |
| 10 | 21 | 1.428 | .588 | .500 | .640 |
| 11 | 10 | 1.242 | .670 | .750 | .500 |
| 12 | 15 | .619 | - .448 | .400 | .500 |
| 13 | 13 | -1.934 | -2.647 | .167 | .000 |
| 14 | 20 | 2.200 | .418 | .500 | .600 |
| 15 | 17 | .829 | .934 | .750 | .600 |
| 16 | 17 | .985 | .122 | .714 | .500 |
| 17 | 11 | .497 | .934 | .500 | .600 |
| 18 | 18 | .729 | .324 | .571 | .556 |
| 19 | 18 | .864 | .686 | .571 | .667 |
| 20 | 15 | - .725 | 1.080 | .500 | .778 |

# SEMANTIC DIFFERENTIAL RELATIONSHIPS AS A DETERMINANT OF CLUSTERING

by

Burr R. Beckwith

August, 1968

The intent of the present study was to determine under what conditions Semantic Differential (SD) relationships would serve as a determinant of clustering in a free recall task. A list of words which may be categorized into either four specific or two general SD categories was presented to four groups of subjects under differing presentation and information conditions. It was concluded that in general SD relationships were too weak to facilitate clustering.

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CENTRAL WASHINGTON STATE COLLEGE

Graduate Division

Final Examination of

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B. A. in Ed., Central Washington State College

1967

for the degree of

Master of Education

Committee in Charge

Dr. Robert Hudson

Dr. Max Zwanziger  Dr. Warren Street

Samuelson Union Building

Room 205

Wednesday, August 14, 1968

10:00 a.m.

# BIOGRAPHICAL INFORMATION

BORN: [redacted]

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Central Washington State College, B. A. in Ed., 1967

PROFESSIONAL EXPERIENCE:

Teacher/Counselor: Royal High School, Royal City, Washington, 1968-1969

CERTIFICATION:

Three Year Provisional Elementary Certificate

Courses Included in Graduate Study

Required Courses

| | | |
|---|---|---|
| Education | 507 | Introduction to Graduate Study |
| Education | 570 | Educational Foundations |
| Psychology | 552 | Human Growth & Development, Advanced |
| Education | 600 | Thesis |

Field of Specialization

| | | |
|---|---|---|
| Psychology | 453 | Theories of Personality |
| Psychology | 560 | Theories of Counseling |
| Psychology | 559.2 | Counseling Practicum |
| Psychology | 598.1<br>598.2<br>598.3 | Seminar in Counseling & School Psychology |

Electives

| | | |
|---|---|---|
| Psychology | 449 | Abnormal Psychology |
| Special Ed. | 463 | Special Diagnostic Techniques |
| Psychology | 487 | Group Processes & Leadership |
| Psychology | 564 | Individual Testing: Child |
| Psychology | 562 | Theories of Learning |
| Psychology | 565 | Individual Testing: Adolescent & Adult |
| Psychology | 566 | Personality Assessment |
| Psychology | 559.1 | Practicum |