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Patterns of Error in College Students Resulting from Semantic Generalization on Two Measures of Word Association

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Patterns of Error in College Students
Resulting from Semantic Generalization on
Two Measures of Word Association

by
Helen Pugacz Appleton

A Thesis Submitted to the Faculty of the Graduate School
of Loyola University of Chicago in Partial Fulfillment
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CHAPTER I

INTRODUCTION

Recent research findings reported by Mourer (1973) offer support for a theory of schizophrenic thought disorder presented by Chapman, Chapman, and Miller (1964). This theory states that a person responds to a word with a hierarchal sequence of meanings, each expressing an aspect of the word's meaning. Chapman et al. hypothesized that normals use both the first and later statements of meaning when interpreting a word, while schizophrenics tend to rely on and overuse the first or dominant meaning, oftentimes neglecting the later or weaker meanings. Because of this neglect of weaker meanings, schizophrenics may misinterpret the contextual meaning of a word. For example, "a noise", "whole and in good condition", and "a wide channel linking large bodies of water" are all statements of meaning for the word "sound". "A noise" is the first statement of meaning in the hierarchal sequence, i.e., the dominant meaning response of the three definitions. In the sentence, "The building is sound", the schizophrenic may rely on the dominant meaning and interpret the sentence as stating that the building is noisy. The normal person is able to use later statements of meaning, so is more likely to understand
"sound" as meaning "whole and in good condition", the correct definition in this context.

When two words share the same first statement of meaning, they are said to have the same "strong meaning response". Chapman et al. hypothesized that when words of similar meaning also shared the same strong meaning response, schizophrenics would judge them to be synonymous more often than when similar meaning words shared weaker meaning responses. Several studies have presented results that support this theory (Chapman et al., 1964; Chapman & Chapman, 1965; Gruber, 1965, as cited by Mourer, 1973).

In an investigation of the theory presented by Chapman et al. (1964), Mourer (1973) predicted that schizophrenics would demonstrate excessive generalization errors in a task of semantic generalization when responding to test words that shared the same strong meaning response with training words as compared to the errors made to test words that shared weaker meaning responses with training words. In addition, he predicted that the average difference in generalized errors between the test words that shared strong meaning responses with training words and those that shared weaker meaning responses with training words would be significantly greater for schizophrenics than for normal subjects. Mourer's research data supported these predictions.

Mourer's study included a comparison of schizophrenic and normal error patterns with test words that had a low or
moderate rated similarity with training words. Using rated similarity as a measure of word association, there was no significant difference in subject group performance and no interaction between subject group and amount of rated similarity.

Mourer discussed his results as they relate to a theory of heightened drive in schizophrenia offered by Mednick (1958). Using a learning theory approach, Mednick predicted that schizophrenics, because of increased drive from high anxiety, would make as few and possibly fewer errors than normals on simple tasks and significantly more errors than normals on complex tasks that had a number of possible competing responses. Mourer concluded that the significantly greater amount of generalized errors by the schizophrenic group on words sharing strong meaning responses than on words sharing weak meaning responses did not support Mednick's theory as this error pattern was not consistent when a different measure of word association, rated similarity, was used. The ratio of generalized errors to moderate and low rated similarity words was similar for normals and schizophrenics.

As there was a significant difference in error pattern between schizophrenics and normals when meaning response strength was the measure of word association in Mourer's study, and as there was no significant difference in error pattern between the two groups when rated similarity was the
measure, Mourer suggests that studies which have used only similarity or associative connection as an independent variable measure of semantic closeness have neglected to control for an influential variable, meaning response strength. Mourer suggests that failure to control for meaning response strength may account for contradictory findings in the investigation of semantic generalization by schizophrenics.

This present study used a college student population to investigate two points raised by Mourer (1973). The first point is whether or not his data have implications for Mednick's (1958) theory. Applying Mednick's theory in a task of semantic generalization, students with high anxiety would be predicted to show more errors than students with low anxiety as the difficulty of the task increases, i.e., as the word association becomes stronger. Specifically, it was hypothesized that a high anxiety student group would make significantly more errors on test words sharing strong meaning responses with training words than on test words sharing weak meaning responses with training words. Additionally, it was predicted that a low anxiety group would show no significant difference in the amount of error made to strong versus weak meaning response test words.

The same predictions were made with rated similarity as the measure of semantic closeness. It was hypothesized that a high anxiety group would make significantly more
errors on test words having a moderate rated similarity with training words than on test words having a low rated similarity with training words. Additionally, it was predicted that a low anxiety group would have no significant difference in the amount of error made to moderate versus low rated similarity test words.

The second point raised by Mourer (1973) was that meaning response strength was a significant independent variable as a measure of word association and may be superior to similarity in demonstrating schizophrenic generalization. The present study investigated meaning response strength as a measure of semantic closeness in comparison to rated similarity with normal subjects.

In addition to investigating the two points raised by Mourer, this study attempted to replicate the error patterns he found for normal subjects in a task of semantic generalization. It was predicted that normal subjects would not perform significantly differently on test words that shared strong versus weak meaning responses with training words, but would perform significantly better on test words that had a low rated similarity with training words than on test words that had a moderate rated similarity with training words.
CHAPTER II

REVIEW OF RELATED LITERATURE

Meaning Response Strength - Chapman and Chapman

An early explanation of schizophrenia that stimulates research and influences theories to this day was developed by Bleuler (1950). He believed that behavior is guided by numerous influences and that in schizophrenia many of the associative threads between appropriate influence and behavior are ineffective. Thus, he believed that schizophrenics are guided by only a part of the total context of a situation. Those associative threads that remain effective may be deviant or unimportant; however, they are related to the situation. Bleuler thought that schizophrenic associations tend to be related rather than unrelated. Bleuler termed the weakening of associative threads as "apparently haphazard" and did not attempt to predict which associative threads would be weakened.

Chapman, Chapman, and Miller (1964) hypothesized a pattern by which schizophrenic thought deviates from that of normals, i.e., a pattern in the weakening of the associative threads. Chapman (1958) reported research involving the sorting of words according to concepts. He found that associative intrusions were the major type of error made by
both normal and schizophrenic subjects. The finding that schizophrenics make the same errors as normals, except to a greater extent, has been supported in tasks requiring the sorting of cards according to instructed conceptual categories (Chapman, 1958, 1961; Chapman & Taylor, 1957) and in multiple choice tests of syllogistic reasoning (Gottesman & Chapman, 1960). The most common errors made by schizophrenics and normals tended to be the same for both groups in the above studies.

These findings led to the conclusion that schizophrenic error is an aggravation of normal associative biases. In seeking a principle of schizophrenic deviation based upon this conclusion, Chapman et al. (1964) presented word pairs to normals and schizophrenics and found that schizophrenic subjects tended to judge similar words as being the same more often than normal subjects. Spontaneous comments by the subjects indicated that both normals and schizophrenics used the same first meaning in defining the words, but that normals also used additional meanings that differentiated the words before they made a decision of "sameness". As Bleuler suggested, associative threads appeared to be lost by the schizophrenics. Chapman et al. suggested that the associative threads apparently lost are those which occur later in a sequence of normal thought, the earlier associations remaining effective.

Chapman and Chapman (1965) proposed that the apparent
losing of associative threads was related to the strength of the "meaning response" for a word. Theoretically, a "meaning response" is defined as a "hypothetical internal event which mediates a person's overt behavioral response to a word" (Chapman et al., 1964, p. 52). For experimental purposes, a "meaning response" is defined as "a short statement that tells what a thing is or what it is like". For example, "is used for food", "is dirty", "has four legs", and "is an animal" are all meaning responses to the word "pig". "Is an animal" is the dominant or preferred meaning response for "pig" as it is the one ranked first by the most judges (college students) who were asked to order the meaning response statements according to their importance for telling the meaning of the word or describing it. According to the theory (Chapman & Chapman, 1965), schizophrenic error in the use of words is partially the result of mediation of an overt behavioral response to a word according to a dominant or preferred meaning response of that word, neglecting weaker meaning responses. Normals are hypothesized to be able to make use of both dominant and weaker meaning responses as the situation dictates.

The suggestion that schizophrenics tend to neglect weak meaning responses was arrived at through the use of word pairs that had been rated according to meaning response strength. The strength of a meaning response was experimentally defined as the percentage of judges (college stu-
dents) who rank-ordered a meaning as being the first or primary response to both words, presented individually, of a word pair. For example, 62% of the judges rated "animal" as the most important meaning for the words "dog" and "pig". The two words therefore share a dominant meaning and have a high meaning response strength.

Using meaning response strength as a measure of closeness of meaning, Chapman and Chapman (1965) presented word pairs to subjects in a multiple choice format which controlled for random responding. For example:

7. "Pig" means the same as
   A. stocking.
   B. dog.
   C. neither of the above.

Schizophrenics not only judged more word pairs as being the same than did normals (p < .01), they judged more word pairs with high meaning response strengths as being the same than they did word pairs with weak meaning response strengths (p < .03). The normal subjects did not follow this error pattern. Schizophrenics appeared to rely on a dominant or preferred meaning response, failing to use weaker meaning responses for greater discrimination in making their choices.

The words used in the above study were also rated for degree of similarity. It was found that rated similarity had little relation to meaning response strength for these words and that the differences between schizophrenics and
normals on the task was independent of the rated similarity of the word pairs.

An important assumption of the theory of Chapman et al. (1964) stated that the meaning responses and their hierarchal sequences to a word are similar for normals and schizophrenics. This was investigated in a study in which the subjects were asked to state the meaning of 20 words, 15 of which had more than one meaning, the remaining five words having a single meaning. In 19 of the 20 words, the most frequent first statement of meaning was the same for both the schizophrenic and normal groups. These findings indicated that meaning responses and hierarchal sequences of meaning responses are much the same for normals and schizophrenics.

Following this preliminary research, three significant studies led Chapman and Chapman (1965) to the latest formulation of their theory. The first experiment involved the presentation of multiple choice items. The subjects were requested to choose the correct contextual meaning of a multi-meaning word when it was used in a sentence. There were items for each word in which a dominant meaning response and in which a weaker meaning response was appropriate to the context of the sentence. For example, the word "pen" was used in the following two items:
21. When the farmer bought a herd of cattle, he needed a new pen.
A. He needed a new writing implement.
B. He needed a new fenced enclosure.
C. He needed a new pick-up truck.

40. The professor loaned his pen to Barbara.
A. He loaned her a pick-up truck.
B. He loaned her a writing implement.
C. He loaned her a fenced enclosure.

The contextual cues in the sentences were intentionally weak, but strong enough to indicate the correct choice to normal subjects. The unrelated alternatives were provided to control for random responding. A determination of which definitions of words were strong or weak was made by having judges (college students) list definitions of multi-meaning words in the order of which they thought of them. These definitions were weighted according to position (one, two, three) and averaged to obtain an index of strength for comparison.

In this experiment, it was predicted that schizophrenics would make more errors mediated by dominant meaning responses than normals when a weaker meaning response was indicated by the context of the sentence. For example, as "writing implement" had been judged to be the dominant meaning response for "pen", it was predicted that schizophrenics would choose "A" in item 21., above, rather than the correct answer, "B", more often than normals. Because of individual differences and lack of complete agreement among judges as to which definition was dominant, schizophrenics were also
expected to make errors mediated by meaning responses which were judged to be weak by the group; however, this trend was to be weaker than the former prediction.

Two measures were obtained for each group: 1) the mean of the number of errors mediated by dominant meaning responses minus the random errors on those items; 2) the mean of the number of errors mediated by the weaker meaning responses minus the random errors on those items. As predicted, schizophrenics made significantly more errors than normals on items requiring the mediation of a weaker meaning response by marking items indicating mediation of the dominant meaning response ($p < 0.001$). They also made significantly more errors than normals on items requiring the mediation of a dominant meaning response ($p < 0.02$). The difference between the two kinds of error was significantly greater for schizophrenics than for normals ($p < 0.001$), the first type of error being prominent in both groups. The results supported the hypothesis that schizophrenic subjects tend to rely on dominant meaning responses to a greater extent than normal subjects.

The second significant study in formulating Chapman and Chapman's theory involved the task of sorting cards marked with the name of an object into two piles consisting of those objects which belonged to a specified conceptual class and those that did not belong. The conceptual classes for the four tasks were things that have a "head", "legs",
"teeth", and "skin". These concepts had been interpreted by judges (college students) primarily in terms of animate examples. The names on the cards were of animate objects (considered most dominant), inanimate objects which fit into the conceptual class, e.g., pin (head), chair (legs), (considered to be weaker meaning responses), and irrelevant objects to control for random responding.

In this experiment it was predicted that the schizophrenics would tend to sort according to the animate or dominant meanings of the concepts, relatively neglecting the inanimate or weaker meanings, to a greater extent than normals. This was borne out with the schizophrenics excluding significantly more inanimate objects from the appropriate class than normals ($p < .01$). In addition, the difference between the number of exclusions from the appropriate conceptual class for inanimate and animate objects was significantly higher for schizophrenics than for normals. Again the results support the hypothesis that schizophrenics rely on dominant meaning responses to the neglect of weaker meaning responses (Chapman et al., 1964).

The third significant study investigated the influence of strong contextual cues (Chapman et al., 1964). If a schizophrenic has an absolute loss of the ability to respond appropriately to the weaker meanings of words, then strong contextual cues should not influence performance. The basic assumptions of Chapman et al.'s theory did not specify
whether mediating responses are evoked by a word only or by a contextual cue as well. It would seem that if the contextual cue for a weak meaning response to a word was quite strong and the cue for the dominant meaning response was weak, the originally weak meaning response would become the preferred meaning response for that situation. In this case, the schizophrenic should be able to use the weak meaning response to a word appropriately. According to Chapman et al.'s predictions, strong contextual cues should influence performance. The items in this experiment were presented as follows:

28. The word "bear" may mean:
A. to carry.
B. to command.
C. neither of the above.
D. I don't know.

There were two items for each multi-meaning word, one with the dominant meaning and one with the weaker meaning among the response choices. The fact that a weak meaning response was provided as the only correct choice was defined as being a strong contextual cue. Therefore, whether a word mediates a strong or weak meaning response when used alone, each task item is constructed so as to provide a strong contextual cue for the meaning response, making it the preferred meaning response for that situation. There were also filler items with no correct meanings so that subjects would not reduce their set to only marking the first two alternatives.

As the scores in this study were found to be related
to the Stanford-Binet Vocabulary score, subjects were matched on this measure. There was no significant difference between the schizophrenic and normal median error on items requiring a weak meaning response to mediate a correct choice or on items requiring a strong meaning response for mediation. This indicated that schizophrenics do have access to weaker meaning responses when there are strong cues. Although schizophrenic and normal performance did not differ, the findings supported the theory that "schizophrenics' overt responses, more than those of normal persons are mediated by the strongest meaning responses, regardless of whether they are aroused by the stimulus word or by contextual cues" (Chapman et al., 1964, p. 79).

To summarize, in their theory of schizophrenic thought disorder, Chapman and Chapman (1965) hypothesized that there are hierarchal sequences of meanings to words which are essentially the same for all people. However, the schizophrenic relies heavily on and is overinfluenced by the strongest meaning response, often unable to utilize weaker meaning responses even though they may be appropriate to the situation. Normals are able to use both strong and weak meaning responses.

A Learning Theory Approach to Schizophrenia - Mednick

Mednick (1958) proposed a learning theory approach to the study and interpretation of schizophrenic behavior. His theory focused on the degree of anxiety present in
discussing the conditioning, learning and generalization of schizophrenics compared to normals. Mednick suggested that pre-schizophrenics are anxiety prone individuals who are aroused by a greater number of stimuli than normals and who recover from this arousal much slower than normals. Such a person would be likely to encounter anxiety-provoking stimuli when he is already in a state of arousal more often than a normal person, allowing greater opportunity for anxiety and drive strength to climb to extremes.

Mednick's (1958) theory is based on the Hullian (1943) hypothesis that anxiety contributes to and increases reaction potential and drive strength, postulated to be the motivating force of behavior. The greater the anxiety, the greater is the increase in reaction potential. During heightened drive, response strengths of habit tendencies associated with a present situation increase. According to Mednick, during heightened drive the strengths of competing responses conditioned to similar stimuli are raised above the responses' evocation thresholds. These competing responses thus may interfere with correct responses, depending upon the moment to moment oscillation in excitatory potential. This interference, or generalization, is associated with heightened drive.

In Mednick's theory, the chronic schizophrenic differs from the acute schizophrenic in that the former has learned to avoid anxiety-provoking stimuli by focusing his thoughts
on remote, irrelevant and tangential associations. He is basically a very anxious person, but his defenses, however bizarre, function to remove the anxiety-provoking stimuli from his awareness and thus reduce anxiety. As his illness continues, the patient increases his use of these techniques and becomes less emotional and more detached from the real world. His affect therefore appears quite flat.

Mednick based the formulation of his theory on the observation that many of the findings reported in studies of conditioning and generalization that used high and low anxiety normal subjects were similar to those reported when schizophrenic and normal subjects were compared. There is a considerable amount of research with normal subjects concerned with the level of anxiety and task performance. One of the first studies, a now classic experiment by Taylor (1951), concluded that anxious subjects condition faster than non-anxious subjects. This study involved the conditioning of an eye blink in subjects whose group membership was determined by scores on the Taylor Manifest Anxiety Scale. An eyeblink was stimulated by a puff of air, the unconditioned stimulus. The air puff was paired with an increase in brightness of a circular disc, the unconditioned stimulus, so that an eyeblink was conditioned to the increase in brightness. The anxious group developed the conditioned response more quickly than the non-anxious group and at a higher rate, supporting the hypothesis that anxiety
operates as a drive, increasing reaction potential. Results indicating that anxious normals condition or learn tasks with minimal interfering responses faster than non-anxious normals have been repeatedly found (Baron & Connor, 1960; Spence, 1954; Spence & Beecroft, 1954; Spence & Farber, 1953; Spence & Taylor, 1951; Spence & Weyant, 1960; Spielberger, 1966; Taylor & Chapman, 1955).

Research with schizophrenics suggests that, like high anxiety subjects, on simple tasks they condition faster or at least as fast as normals. Taylor and Spence (1954) and Spence and Taylor (1953), using a method similar to that used by Taylor (1951) with normal subjects, found that schizophrenics conditioned faster than normals (p < .05). Similar results were found in conditioning the psychogalvanic response in normals and schizophrenics (Mays, 1934; Shipley, 1934). There have been studies with contradictory results (Howe, 1958; O'Connor & Rawnsley, 1959; Peters & Murphree, 1954; Pishkin & Hershiser, 1964), but as Broen (1968) has pointed out, all of these studies used chronic schizophrenics which Mednick (1958) hypothesized to be at a low arousal level due to the facility of their defenses in avoiding and reducing anxiety.

When task difficulty has been an independent variable with normal subjects, it has generally been concluded that anxiety facilitates performance in relatively simple types of learning, such as conditioning, but interferes with
performance on more complex tasks of learning. In tasks of serial verbal learning, Lucas (1952) and Montague (1953) found that the performance of high anxiety subjects decreased relative to the performance of low anxiety subjects as intralist similarity increased, i.e., as the number of possible competing responses increased and the task became more difficult.

In studies that investigated performance by normal subjects on complex serial maze tasks, Farber and Spence (1953) and Taylor and Spence (1952) found that high anxiety subjects performed inferior to low anxiety subjects. In addition, the high anxiety subjects performed relatively worse than the low anxiety subjects at their individual maze choice points as a function of their difficulty (defined as the number of possible errors that could be made). In tasks of paired-associate learning, high anxiety subjects were found to be superior to low anxiety subjects when the association between the two words in each pair was strong (Taylor & Chapman, 1955), but inferior to low anxiety subjects when there were strong competing responses because of a high degree of synonymity among stimulus words (Spence, 1953). When Farber and Spence compared the same subjects on a simple learning task, eyelid conditioning, and a complex task, stylus maze learning, the high anxiety subjects were superior to the low anxiety subjects on the eyelid conditioning, but inferior on the maze learning task. In
another study, Spence, Taylor and Ketchel (1956) found that high anxiety subjects performed more poorly than low anxiety subjects on a paired-associate task with words that had a high degree of synonymity. The above studies all support the prediction that anxiety facilitates relatively simple types of learning, but interferes with complex learning tasks.

Research with schizophrenics suggests that, like with high anxiety subjects, the learning of complex tasks is impeded, but simple conditioning is facilitated. Mednick and DeVito (reported by Mednick, 1958) designed a study using a paired-associate verbal learning task in which the word lists were controlled for strength of associative connection. A value of associative connection was obtained from the norms developed by Russell and Jenkins (1954, as reported by Mednick, 1958), who used the Kent-Rosanoff stimulus words to elicit associates from over 1000 college students. Mednick and DeVito found that schizophrenics learned lists in which the two words of a pair were strongly associated with each other faster than normals, but learned lists in which the strong associate of a stimulus word was paired with a different word slower than normals. In another study, Hunt and Cofer (1944) investigated schizophrenic deficit on a number of variables and measures and concluded that schizophrenic performance deteriorates as the complexity of the task increases. The results of a study by
Ludwig, Wood and Downs (1962) suggests that schizophrenic deficit increases with task complexity. They required subjects to respond to one auditory stimulus and to ignore another. Both stimuli were auditory. Schizophrenics performed significantly poorer than normals, having more difficulty separating the stimuli. However, when asked to respond to a visual stimulus during auditory interference, the schizophrenic group performed as well as normals although their distribution of scores was significantly different. This study was replicated (Ludwig, Stilson, Wood & Downs, 1963) and an analogous study was run in which visual interfering stimuli and visual test stimuli were used (Stilson & Kopell, 1964; Stilson, Kopell, Vandenbergh & Downs, 1966). The results of all four studies indicate that schizophrenics perform as well as normals when there are no interfering stimuli or when the interfering stimulus is in a different modality from the test stimulus, but schizophrenics perform significantly poorer than normals when the test stimulus and the interfering stimulus are in the same modality, i.e., when there are viable competing responses.

Mednick (1958) also hypothesized that as schizophrenics are in a state of heightened drive, they will have heightened generalized responsiveness. Mednick (1958) cited a study by Garmezy (1952) to support his hypothesis that schizophrenics show elevated generalization responsivity. Garmezy's study investigated stimulus differentiation of
pitch by schizophrenics and normals. He trained subjects to pull a lever to one tone and to push it to all other tones under varying conditions of reward and punishment. He concluded that schizophrenics had significantly greater difficulty in distinguishing pitch. Mednick interpreted Garmezy’s results as indicating that schizophrenics show more generalization to tones other than the trained stimuli than do normals and noted that this effect was particularly strong under conditions of stress (high drive arousal).

Chapman and Chapman (1974) criticized Mednick’s interpretation of Garmezy’s results, noting that the study is one of differentiation rather than generalization. They stated that one must demonstrate that subjects have the ability to differentiate stimuli before generalization can be concluded to have occurred. They did not feel that the ability to differentiate was shown in Garmezy’s study. However, Chapman and Chapman confine their comments to the portion of Garmezy’s study in which he only administered reward for correct responding. Mednick (1958) specifically cited the portion with conditions of stress as supporting his hypothesis of greater generalization in schizophrenics.

Mednick also cited a study by Dunn (1950) in support of the hypothesis of heightened generalization in schizophrenics. Dunn investigated visual discrimination in schizophrenics using social and nonsocial materials. He found poorer discrimination in schizophrenics as compared
to normals on social materials. Mednick interpreted these results as demonstrating greater generalization by schizophrenics with social materials.

In summary, Mednick (1958) offered an approach to the study and understanding of schizophrenic behavior based upon Hull-Spence learning theory. He hypothesized that acute schizophrenics are quite anxious and cited literature in which their performance was relatively characteristic of that predicted in high drive subjects.

**Prediction of Schizophrenic Error Patterns - Mourer**

Mourer (1973) investigated patterns of schizophrenic error resulting from semantic generalization. He derived predictions from a theory of thought disorder offered by Chapman, Chapman and Miller (1964). Chapman et al. hypothesized that there are hierarchal sequences of meanings to words that are much the same for all people. However, the schizophrenic tends to be overinfluenced by the first statement of meaning, neglecting later or weaker meanings. Normals make use of both the stronger and weaker meanings for understanding and interpreting words. Chapman et al. predicted that schizophrenics would tend to judge similar words that shared strong meaning responses as synonymous more often than similar words that shared weak meaning responses. They confirmed this prediction in a study in which word pairs that shared strong or weak meaning responses were equated for mean rated similarity (Chapman et al., 1964).
Noting that strength of word association between test words and training words had been shown to be a variable in tasks of semantic generalization, Mourer (1973) suggested that one could apply Chapman et al.'s theory to predict the words on which schizophrenic subjects would exceed normal subjects in generalized errors on a task of semantic generalization. Specifically, he predicted that schizophrenics would make significantly more generalized errors when responding to test words that shared the same strongest statement of meaning with training words than when responding to test words that shared weaker statements of meaning with training words. In addition, he predicted that the average difference in generalized errors between the test words that shared strong meaning responses with training words and those that shared weaker meaning responses with training words would be significantly greater for schizophrenics than for normal subjects.

Mourer (1973) used a task of semantic generalization with four sets of word pairs to test his hypothesis:

a) strong shared meaning response - low similarity.
b) strong shared meaning response - moderate similarity.
c) weak shared meaning response - low similarity.
d) weak shared meaning response - moderate similarity.

The development of word pairs and Mourer's procedure are detailed elsewhere in this paper (see Chapter III, pp. 37-40, and Appendix A, pp. 70-73). Mourer's subjects consisted of
Mourer's results supported his predictions in that schizophrenics made significantly more generalized errors in responding to test words that shared strong meaning responses with training words than in responding to test words that shared weak meaning responses with training words \((p < .01)\). Normal subjects made fewer generalized errors on test words that shared strong meaning responses with training words than on test words that shared weak meaning responses with test words, but the difference was not significant. In regard to Mourer's second prediction, the average difference in generalized errors between test words that shared strong meaning responses with training words and test words that shared weak meaning responses with training words was significantly greater for schizophrenic than for normal subjects \((p < .05)\). In an additional analysis of generalized errors on words rated on similarity, there was no significant difference between schizophrenic and normal performance. Both groups made fewer generalized errors to test words that had a low rated similarity with training words than to test words that had a moderate rated similarity with training words.

Mourer (1973) concluded that his results offer support for the theory of Chapman et al. and increase the range of
predictions that may be derived from the theory's basic assumptions. He noted that test words that shared strong meaning responses with training words were the only items that discriminated between the schizophrenic and normal groups. Consequently, he suggested that contradictory results in studies of semantic generalization in schizophrenics may be the result of a failure to control for meaning response strength. He did not argue that meaning response strength is a better measure of semantic closeness, but suggested that it appears to be a better predictor of generalized errors in schizophrenics than rated similarity. He suggested that further study be done to investigate whether other psychiatric groups or normals under varying conditions also demonstrate a differential response to words that share first statements of meaning.

Mourer discussed the significance his results may have for Mednick's (1958) theory of heightened drive in schizophrenia. The finding that schizophrenics made significantly more errors than normals when test words shared strong meaning responses with training words, but fewer (not significant) errors than normals when test words shared weaker meaning responses with training words supported Mednick's theory in that schizophrenics demonstrated increased generalization when the task was more difficult. However, Mourer concluded that his results as a whole did not support Mednick's theory as there was no significant interaction be-
tween subject group and degree of similarity. There was a uniform, non-significant schizophrenic deficit for both low and moderate rated similarity words. Mednick would predict that the schizophrenic deficit would be greater for the moderate rated similarity test words as there is a competing response. The results were not consistent for the two measures of semantic closeness.

In summary, Mourer (1973) offered support for Chapman, Chapman and Miller's (1964) theory that schizophrenics are biased toward interpreting two words as the same if they share first statements of meaning. He concluded that his results did not support Mednick's theory of heightened drive in schizophrenia. In addition, he raised the question of the possibility that studies with schizophrenics that have used rated similarity as a measure of semantic closeness without controlling for meaning response strength have neglected an influential variable.

**Hypotheses**

This study attempted to replicate the pattern of error for normals resulting from semantic generalization that was found by Mourer (1973). It was predicted that normals would not differ significantly in the amount of error on test words that shared strong versus weak meaning responses with training words. In addition, it was predicted that normals would make significantly more errors on test words that had a moderate rated similarity to training words than on test
words that had a low rated similarity to training words.

The present study also investigated the implications that Mourer's study may have for Mednick's theory of increased drive in schizophrenia. Mourer concluded that his results did not support Mednick's theory as the schizophrenic and normal subjects did not perform as the theory would predict when rated similarity was the measure of semantic closeness. They did perform as Mednick's theory would predict when meaning response strength was the measure. As part of Mourer's data appears to support Mednick's theory and part does not, this study directly evaluated the role of heightened drive in the semantic generalization task used by Mourer. Normal subjects, college students, were divided into low, middle and high anxiety groups on the State - Trait Anxiety Inventory (Spielberger, Gorsuch & Lushene, 1970). If anxiety does contribute to disordered thought because of heightened drive as Mednick suggests, one would expect high anxiety subjects to show increased generalized error in comparison to low anxiety subjects as a task becomes more complex. It was predicted that a high anxiety group would make significantly more errors on test words sharing strong meaning responses with training words than on test words sharing weak meaning responses with training words. Additionally, it was predicted that a low anxiety group would have no significant difference in the amount of error made to strong and weak meaning response test
words.

The same prediction was made with rated similarity as the measure of semantic closeness. It was hypothesized that a high anxiety group would make significantly more errors on test words having a moderate rated similarity with training words than on test words having a low rated similarity with training words. Additionally, it was predicted that a low anxiety group would not differ significantly in the amount of error made to low versus moderate rated similarity test words.

The present experiment also investigated meaning response strength as a measure of semantic closeness in comparison to rated similarity to see whether differential responding was elicited by the two measures from the low, middle and high anxiety groups. No predictions were made concerning which measure would best differentiate the low, middle and high anxiety subject groups.
CHAPTER III

METHOD

Subjects

The subjects (n = 70) were undergraduate college students (37 male and 33 female) fulfilling research participation requirements for introductory psychology courses at Loyola University of Chicago. Subjects ranged in age from 18 - 26 years with the estimated mean being 20 years of age. Three subjects were eliminated as English was not their language of origin.

For analysis, subjects were divided into three groups according to scores obtained on a self-report measure of trait anxiety. The means and standard deviations for subject groups on state and trait anxiety when level of trait anxiety is the criterion for group placement are presented in Table 1. The same subjects were also analyzed as divided into three groups according to scores obtained on a self-report measure of state anxiety. The means and standard deviations for subject groups on state and trait anxiety when level of state anxiety is the criterion for group placement are presented in Table 2.

Design

The design of this experiment was a 3 x 2 x 2 analysis
Table 1

Means and Standard Deviations on Trait and State Anxiety
for All Subjects Combined and for Subjects Divided into Groups According to Level of Trait Anxiety

<table>
<thead>
<tr>
<th></th>
<th>Trait Anxiety</th>
<th>State Anxietya</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Means</td>
<td>Standard Deviations</td>
</tr>
<tr>
<td>All Subjects (n=67)b</td>
<td>37.81</td>
<td>7.94</td>
</tr>
<tr>
<td>Low Trait (n=21)</td>
<td>29.95</td>
<td>3.44</td>
</tr>
<tr>
<td>Medium Trait (n=21)</td>
<td>36.95</td>
<td>1.29</td>
</tr>
<tr>
<td>High Trait (n=21)</td>
<td>46.71</td>
<td>6.55</td>
</tr>
</tbody>
</table>

aThe state anxiety scores were not used in the statistical analysis when trait anxiety was the criterion for group assignment.
bThe means and standard deviations for the all subjects group above were computed including the scores of those subjects eliminated from the low and high trait anxiety groups as explained in the Design section (p. 33).
Table 2

Means and Standard Deviations on State and Trait Anxiety

for All Subjects Combined and for

Subjects Divided into Groups According to Level of State Anxiety

<table>
<thead>
<tr>
<th></th>
<th>State Anxiety</th>
<th></th>
<th>Trait Anxiety(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Means</td>
<td>Standard Deviations</td>
<td>Means</td>
</tr>
<tr>
<td>All Subjects (n=67)(^b)</td>
<td>39.51</td>
<td>9.59</td>
<td>37.81</td>
</tr>
<tr>
<td>Low State (n=22)</td>
<td>30.14</td>
<td>4.14</td>
<td>33.22</td>
</tr>
<tr>
<td>Medium State (n=22)</td>
<td>37.64</td>
<td>2.31</td>
<td>37.77</td>
</tr>
<tr>
<td>High State (n=22)</td>
<td>50.77</td>
<td>6.28</td>
<td>42.23</td>
</tr>
</tbody>
</table>

\(^a\) The trait anxiety scores were not used in the statistical analysis when state anxiety was the criterion for group assignment.

\(^b\) The means and standard deviations for the all subjects group above were computed including the scores of the subject eliminated from the medium anxiety group as explained in the Design section (p. 33).
of variance (Anxiety Level x Meaning Response Strength x Rated Similarity) with repeated measures on the last two factors. One subject was randomly eliminated from the middle state anxiety group during the analysis of the data with state anxiety as the criterion for group assignment; and two subjects were randomly eliminated from each of the low trait anxiety and high trait anxiety groups during the analysis of the data with trait anxiety as the criterion for group assignment, so that group size would be the same within each analysis in order to ease the statistical procedure.

**Materials**

A Stoelting memory drum, model number 21137, was used for the presentation of all lists of words. All words were presented at two second intervals. There was no intertrial interval.

The word lists were the same as those used by Mourer (1973). Mourer summarized the preliminary development of the word lists and the procedures for obtaining a value of rated similarity and meaning response strength for each word pair (see Appendix A for details). This development involved the construction of four types of word pairs that are related as follows: a) strong shared meaning response - moderate similarity; b) strong shared meaning response - low similarity; c) weak shared meaning response - moderate similarity; d) weak shared meaning response - low similarity. The word pairs and their shared value of meaning response
strength were selected from those previously used by Chapman and Chapman (1965) and Gruber (1965). The sets of word pairs with strong and weak meaning responses were equated on rated similarity and the sets of moderate and low rated similarity word pairs were equated on meaning response strength. (see Table 3 for clarification). This allows an analysis of the relationship of both meaning response strength and rated similarity to the pattern of generalized errors.

During the semantic generalization task subjects were requested to push one of two buttons. The buttons were imbedded in a black block of wood measuring 15 inches long and four inches wide. The buttons were approximately six inches apart. Both buttons were white and about 5/8 of an inch in diameter. The right-hand button had a sign directly beneath it marked "yes" and the left-hand button had a sign marked "no". The wooden block was movable so that subjects could comfortably position themselves. The subjects were requested to hold their hands at least a few inches away from the buttons unless they were pushing them so that accurate observations could be made.

The State - Trait Anxiety Inventory (STAI) (Spielberger, Gorsuch & Lushene, 1970) was selected as the measure of anxiety level because it provided a measure of proneness to anxiety as well as a measure of situational anxiety. Proneness to anxiety, or trait anxiety (A-Trait), is described by Spielberger et al. (1970) as a relatively stable
TABLE 3

Meaning Response Values and Mean Rated Similarity for Strong and Weak Meaning Response Words

<table>
<thead>
<tr>
<th>Word pairs(^a)</th>
<th>Meaning response values(^b)</th>
<th>Mean rated similarity(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strong</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamp - Candle</td>
<td>48</td>
<td>Moderate 2.90</td>
</tr>
<tr>
<td>Coat - Dress</td>
<td>34</td>
<td>3.23</td>
</tr>
<tr>
<td>Shotgun - Rifle</td>
<td>68</td>
<td>2.35</td>
</tr>
<tr>
<td>Bottle - Jar</td>
<td>78</td>
<td>2.37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(\bar{X}_1= 2.71)</td>
</tr>
<tr>
<td><strong>Strong</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bicycle - Automobile</td>
<td>70</td>
<td>Low 4.00</td>
</tr>
<tr>
<td>Pig - Dog</td>
<td>62</td>
<td>4.28</td>
</tr>
<tr>
<td>Tree - Weed</td>
<td>62</td>
<td>4.16</td>
</tr>
<tr>
<td>River - Puddle</td>
<td>46</td>
<td>4.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(\bar{X}_2= 4.18)</td>
</tr>
<tr>
<td><strong>Weak</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newspaper - Magazine</td>
<td>8</td>
<td>Moderate 2.94</td>
</tr>
<tr>
<td>Affectionate - Friendly</td>
<td>14</td>
<td>3.29</td>
</tr>
<tr>
<td>Hand - Claw</td>
<td>7</td>
<td>2.65</td>
</tr>
<tr>
<td>House - Tent</td>
<td>20</td>
<td>2.94</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(\bar{X}_3= 2.95)</td>
</tr>
<tr>
<td><strong>Weak</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haircut - Shampoo</td>
<td>26</td>
<td>Low 4.18</td>
</tr>
<tr>
<td>Brassiere - T-shirt</td>
<td>26</td>
<td>4.20</td>
</tr>
<tr>
<td>Henpecked - Sissy</td>
<td>4</td>
<td>4.15</td>
</tr>
<tr>
<td>Rug - Grass</td>
<td>7</td>
<td>4.03</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(\bar{X}_4= 4.14)</td>
</tr>
</tbody>
</table>

\(^a\) The left-hand member of each word pair comprised the words in the initial learning stage. The right-hand members of each word pair were the generalization words on the recognition test.

\(^b\) These values represent the percentage of judges who rank-ordered the same meaning response as first in importance for both members of the word pair.

\(^c\) High values indicate weak similarity.

(From Mourer, 1973)
tendency of the individual to respond to situations with transitory anxiety (state anxiety). A person with a high A-Trait score would be expected to perceive more situations as threatening than would a person with a low A-Trait score and to respond to such situations with a greater intensity of state anxiety. State anxiety (A-State) is described as a transitory emotional state that is subjectively experienced as feelings of tenseness and apprehension. It is predicted to fluctuate with time and situations.

Much of the research concerned with testing the predictions of Hull - Spence learning theory that relate task performance and level of anxiety has used the Taylor Manifest Anxiety Scale (TMAS) (Taylor, 1953). The A-Trait scale of the STAI has a correlation of .79 (males) and .80 (females) with the TMAS for college students (Spielberger et al., 1970). The correlations of the two tests are nearly equal to the test-retest reliabilities within each test. This equivalence suggests that valid comparisons of research data using the two tests can be made.

The A-State scale provides a measure of anxiety that is predicted to fluctuate depending upon the individual and the situation. Spielberger et al. (1970) suggested that the A-State scale be used as an index of drive as defined by Hull (1943) and Spence (1958) as it has been shown to increase with experimental stress and to decrease with relaxation training. Anxiety related drive is the variable hypo-
thesized by Mednick (1958) to be a contributing factor to schizophrenic thought disorder.

**Procedure**

The experimental method was identical to that used by Mourer (1973) for the semantic generalization task and word lists. The semantic generalization task is a modified form of a procedure developed by Mink (1963). The subject is presented a list of words, the training list, on a memory drum followed by the presentation of a test list of words which contains the training words, related words and control words (unrelated words). The subject is requested to indicate, for each word of the test list, whether or not it appeared on the training list. A generalized error occurs when the subject indicates that a word appeared on the training list when it actually did not.

In order to distribute the potential acquiescence response bias and random error equally across both the control words and the generalization words, a corrected generalized error score was computed by subtracting one-half of each subject's "yes" responses to the control words from his "yes" responses to the eight strong and the eight weak meaning response test words. A high corrected generalized error score indicates that many errors have been made.

The task was presented in four stages: Practice Stages 1 and 2, the Initial Training Stage and the Recognition Test Stage. During Practice Stage 1 subjects were presented a
list of words and were requested to push the "yes" button if a word appeared in the memory drum window and the "no" button if an asterisk appeared. This latter instruction was to provide practice using the "no" button. The subjects were given instructions to look at the words carefully and to try to remember them as they would be asked to pick them out of a longer list of words. Practice List 1 was presented three times in differing random orders. The words on Practice Lists 1 and 2 were selected so as to have a minimal meaning response strength or rated similarity with words on the Initial Training List or the Recognition Test List. Practice List 1 consisted of the following words: mustard, ship, window, rope, money, pencil, shoes, doctor, day and fruit.

Practice List 2 consisted of the words on Practice List 1 and eight additional words. When presented with Practice List 2, subjects were instructed to press the "yes" button each time a word appeared in the memory drum window that had been on Practice List 1. The subjects were instructed to press the "no" button each time a word appeared that had not been on the first list. Practice List 2 was presented five times in differing random orders. The additional words included in Practice List 2 were: climb, gift, egg, hammer, wood, joke, pan and suitcase.

The Initial Training List was presented immediately following Practice Stage 2. The training list consisted of
the 16 words in the left-hand column of Table 3 and four asterisks. As in Practice Stage 1, the subjects were given instructions to look at the words carefully and to try to remember them as they would be asked to pick them out of a longer list of words. The subjects were instructed to push the "yes" button each time a word appeared in the memory drum window and the "no" button each time an asterisk appeared. The list was presented two times in differing random orders.

Following the Initial Training Stage there was a five minute rest period during which the experimenter changed the lists on the memory drum. The experimenter asked each subject his major and year in school and engaged the subjects in conversation to control for silent rehearsal of the word list.

The Recognition Test Stage began after the rest period. The Recognition Test List consisted of the 16 words in the Initial Training List, the 16 words in the right-hand column of Table 3, and 16 control words. During the presentation of the test list the subjects were requested to push the "yes" button each time a word appeared in the memory drum window which had been on the training list. The subjects were requested to push the "no" button each time a word appeared which had not been on the training list. The test list was presented five times in differing random orders. During all four stages of the semantic generalization
task, the experimenter sat behind the subject and recorded whether the subject pushed the "yes" or the "no" button.

The control words on the Recognition Test List were selected so as to have a minimal meaning response strength and rated similarity with any of the other words on the test list. The control words were: clock, telephone, lipstick, heaven, cigar, snow, arithmetic, vanilla, movie, thumbtack, tape, flag, elevator, banjo, pillow and mailbox.

Immediately following the Recognition Test Stage, the subjects were asked to fill out the A-State portion of the State-Trait Anxiety Inventory (STAI) with instructions to answer according to how they felt during the recognition test a few moments earlier. The subjects were next requested to complete the A-Trait portion of the STAI according to how they generally feel.
CHAPTER IV

RESULTS

The first prediction was that normals would not have a significant difference in the amount of error on test words that shared strong versus weak meaning response strengths with training words. This prediction was not supported by the data. An analysis of variance indicated that the subjects made significantly more errors on test words that shared strong meaning responses with training words than on test words that shared weak meaning responses with training words ($p < .001$). The means and standard deviations of the corrected generalized errors on the strong and weak meaning response test words for all subjects combined and for subjects divided into groups according to level of state anxiety and according to level of trait anxiety are presented in Table 4.

The second prediction was that normals would make significantly more errors on test words that had a moderate rated similarity with training words than on test words that had a low rated similarity with training words. Although the results are not significant, the trend of the data was in the predicted direction ($0.05 < p < 0.10$). The means and standard deviations of the corrected generalized errors on
Table 4

Means and Standard Deviations of Corrected Generalized Errors on Strong and Weak Meaning Response Words

<table>
<thead>
<tr>
<th>Subject Groups</th>
<th>Strong MRS</th>
<th>Weak MRS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Means</td>
<td>Standard Deviations</td>
</tr>
<tr>
<td>State Anxiety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>4.02</td>
<td>3.17</td>
</tr>
<tr>
<td>Medium</td>
<td>2.84</td>
<td>2.52</td>
</tr>
<tr>
<td>High</td>
<td>3.91</td>
<td>3.80</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>3.29</td>
<td>3.00</td>
</tr>
<tr>
<td>Medium</td>
<td>3.40</td>
<td>3.14</td>
</tr>
<tr>
<td>High</td>
<td>4.19</td>
<td>3.39</td>
</tr>
<tr>
<td>All Subjects\textsuperscript{a}</td>
<td>3.55</td>
<td>4.26</td>
</tr>
</tbody>
</table>

\textsuperscript{a} The means and standard deviations of the all subjects group above were computed using all 67 subjects.
the moderate and low rated similarity test words for all subjects combined and for subjects divided into groups according to level of state anxiety and according to level of trait anxiety are presented in Table 5.

The prediction concerning the implications Mourer's (1973) research may have for Mednick's (1958) theory stated that the level of anxiety in college students would have a significant effect on the pattern of error resulting from semantic generalization. More specifically, it was predicted that the high anxiety group would make significantly more errors on the test words that shared strong meaning responses with training words than on the test words that shared weak meaning responses with training words, and that the low anxiety group would have no significant difference in the amount of errors made to strong versus weak meaning response test words. This prediction was not upheld by the data. The high anxiety group performed as predicted, but the low anxiety group also performed as was predicted for the high anxiety group. An analysis of variance (see Tables 6 and 7) indicated that there was no significant Meaning Response Strength x Subjects interaction for either trait or state anxiety (p > .25). Low, medium and high anxiety subject groups made significantly more errors on the test words that shared strong meaning responses with training words than on the test words that shared weak meaning responses with training words (p < .001). There was no sig-
Table 5

Means and Standard Deviations of Corrected Generalized Errors on Low and Moderate Rated Similarity Words

<table>
<thead>
<tr>
<th>Subject Groups</th>
<th>Moderate Similarity</th>
<th>Low Similarity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Means</td>
<td>Standard Deviations</td>
</tr>
<tr>
<td>State Anxiety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>3.07</td>
<td>3.36</td>
</tr>
<tr>
<td>Medium</td>
<td>1.93</td>
<td>2.46</td>
</tr>
<tr>
<td>High</td>
<td>1.23</td>
<td>4.21</td>
</tr>
<tr>
<td>Trait Anxiety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>1.86</td>
<td>3.04</td>
</tr>
<tr>
<td>Medium</td>
<td>2.31</td>
<td>3.46</td>
</tr>
<tr>
<td>High</td>
<td>2.33</td>
<td>3.92</td>
</tr>
<tr>
<td>All Subjects(^a)</td>
<td>2.06</td>
<td>3.55</td>
</tr>
</tbody>
</table>

\(^a\) The means and standard deviations of the all subjects group above were computed using all 67 subjects.
Table 6
Analysis of Variance Summary Table for
Generalized Errors on Strong and Weak Meaning
Response Words and Rated Similarity Words for
Low, Middle and High Trait Anxiety Subjects

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Between Subjects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>2</td>
<td>.75</td>
<td>.09</td>
</tr>
<tr>
<td>S(A)</td>
<td>60</td>
<td>8.67</td>
<td></td>
</tr>
<tr>
<td><strong>Within Subjects</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>242.10</td>
<td>44.84*</td>
</tr>
<tr>
<td>AB</td>
<td>2</td>
<td>4.11</td>
<td>.76</td>
</tr>
<tr>
<td>S(A)B</td>
<td>60</td>
<td>5.40</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>15.75</td>
<td>3.54</td>
</tr>
<tr>
<td>AC</td>
<td>2</td>
<td>.19</td>
<td>.04</td>
</tr>
<tr>
<td>S(A)C</td>
<td>60</td>
<td>4.44</td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>1</td>
<td>.89</td>
<td>.15</td>
</tr>
<tr>
<td>ABC</td>
<td>2</td>
<td>1.34</td>
<td>.23</td>
</tr>
<tr>
<td>S(A)BC</td>
<td>60</td>
<td>5.85</td>
<td></td>
</tr>
</tbody>
</table>

* p .001.

Note. Factor A refers to subjects, B to meaning response strength, C to rated similarity and S to error.
Table 7

Analysis of Variance Summary Table for Generalized Errors on Strong and Weak Meaning Response Words and Rated Similarity Words for Low, Middle and High State Anxiety Subjects

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Subjects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>2</td>
<td>3.89</td>
<td>.44</td>
</tr>
<tr>
<td>S(A)</td>
<td>63</td>
<td>8.83</td>
<td></td>
</tr>
<tr>
<td>Within Subjects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>259.78</td>
<td>49.18*</td>
</tr>
<tr>
<td>AB</td>
<td>2</td>
<td>5.91</td>
<td>1.12</td>
</tr>
<tr>
<td>S(A)B</td>
<td>62</td>
<td>5.28</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>14.56</td>
<td>3.27</td>
</tr>
<tr>
<td>AC</td>
<td>2</td>
<td>7.34</td>
<td>1.65</td>
</tr>
<tr>
<td>S(A)C</td>
<td>63</td>
<td>4.46</td>
<td></td>
</tr>
<tr>
<td>BC</td>
<td>1</td>
<td>1.46</td>
<td>.27</td>
</tr>
<tr>
<td>ABC</td>
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<td>.92</td>
<td>.17</td>
</tr>
<tr>
<td>S(A)BC</td>
<td>63</td>
<td>5.46</td>
<td></td>
</tr>
</tbody>
</table>

Note. Factor A refers to subjects, B to meaning response strength, C to rated similarity and S to error.

* p .001.
significant difference among low, middle and high anxiety
groups in either the number of mean corrected generalized
errors or in the pattern of error to strong and weak meaning
response test words. The results were the same whether
A-State or A-Trait scale scores were used as the criterion
for group assignment.

A corollary of the above prediction was that the level
of anxiety would have a significant effect on the pattern
of error resulting from semantic generalization according to
rated similarity of training words and test words. Specifi­
cally, it was predicted that the high anxiety group would
make significantly more errors on test words with a moderate
rated similarity with training words than on test words with
a low rated similarity with training words, and that the low
anxiety group would have no significant difference in the
amount of errors made to low versus moderate rated simi­
ilarity test words. This corollary prediction was not upheld
by the data. An analysis of variance indicated that there
was no Similarity x Subjects interaction for either state
or trait anxiety (p > .25). Rated similarity did not have
a significant effect on errors made to test words for either
group (p < .05). There was no significant difference among
low, middle and high anxiety groups in either the number of
mean corrected generalized errors or in the pattern of error
to low and moderate rated similarity test words.

It is clear from the analysis of variance that there
was no significant difference among the low, middle and high anxiety groups in either number of mean generalized errors or in patterns of errors to words according to meaning response strength or rated similarity. Anxiety did not significantly affect or interact with performance.

This experiment also investigated whether differential responding would be elicited by the two measures of semantic closeness, meaning response strength and rated similarity, from either low or high anxiety groups. An analysis of variance indicated that the strength of the meaning response shared by test words and training words had a significant effect on the amount of error ($p < .001$). Rated similarity had no significant effect on amount of error, although the results did approach significance ($0.05 < p < 0.10$) when trait anxiety was used as the criterion for group assignment. Neither measure of semantic closeness, however, significantly differed between the low and high anxiety groups. There were no significant Subjects x Meaning Response Strength or Subjects x Rated Similarity interactions. Tables 6 and 7 show that the only significant finding was a $\beta$ effect for meaning response strength.
CHAPTER V

DISCUSSION

This experiment failed to replicate the pattern of errors by normals on a task of semantic generalization reported by Mourer (1973), raising questions concerning the generalizability of his data. Mourer's normal subjects did not have a significant difference in corrected generalized errors to test words that shared strong versus weak meaning response strengths with training words. His subjects had a few more corrected generalized errors to test words that shared weak meaning responses with training words than to test words that shared strong meaning responses with training words (non-significant). Using the same procedure as Mourer, it was predicted that this study would obtain similar results. The data did not support this prediction. The normal subjects in this experiment, as a whole and when divided into groups according to level of anxiety, made significantly more errors to test words that shared strong meaning responses with training words than to test words that shared weak meaning responses with training words (p < .001). The normal subjects in this study demonstrated an error pattern quite different from Mourer's normal subjects, but similar to that of his schizophrenic subjects.
A graphical comparison of the data from the two studies is presented in Figure 1.

There are several possible reasons for the discrepant results obtained in the two studies. The most obvious is the vast difference in subject groups. Mourer's normal subjects were psychiatric aides with an average education of 10.9 years. The subjects in the present study were all college students. Intelligence and education are both possible correlates of performance in tasks of semantic generalization, usually thought to aide performance. However, the college students had a higher mean corrected generalized error score than the psychiatric aides on test words that shared a strong meaning response with training words (a high score indicates that more errors were made). The college students made more errors, not fewer as would be expected if intelligence and education were variables contributing to the different performance of the two groups.

One might suggest that the college students, with their assumed higher intelligence, may have been bored with or less motivated on the task than the psychiatric aides as the former group made more errors. However, the college students' mean corrected generalized error score to test words that shared weak meaning responses with training words was slightly lower than that of the psychiatric aides. In this case the college students made fewer errors than the psychiatric aides. Both scores were obtained from the same
Figure 1. Mean corrected generalized error scores for strong and weak meaning response words for all five trials combined for both normal and schizophrenic subjects from Mourer (1973) and for all normal subjects from the present study.
task with words of different meaning response strengths being presented at two second intervals. It is not likely that motivation would have varied at two second intervals with the presentation of different words.

The two subject groups also differed in age. The mean age for the psychiatric aides was 45.19 years and the estimated mean age of the college students was 20 years. There is no theory of aging or of changes in various kinds of intellectual abilities that adequately explains why middle-age persons would perform better than college students on some words in a recognition learning task and perform the same or worse on other words in the same task. However, several articles have been written concerned with the confounding of generational or cohort variables with the variable of chronological age and with the failure of much research to control for generational variables (Schaie, 1970; Wohlwill, 1970). It is possible that the meaning response strengths of words may have generational differences and that the subjects in the two studies may be responding in terms of differing meaning response strengths that have changed with time. Connotations and weaker meaning responses of words may change with historical time. However, the words used in the two studies are ordinary and do not have meanings that have been modernized or altered. It is unlikely that cohort variables would account for more than a very small portion of the vast difference in the
results of the two studies.

The variables of cultural background and gender may also contribute to the different results found by Mourer (1973) and in the present study. Mourer's subjects were all obtained at a rural Illinois hospital. The college students were from an urban university. It is possible that different locales and environments may have different connotations and different meaning response strengths for words. For example, a person who grows up in a rural environment may be more likely than a city person to know the finer distinctions between a shotgun and a rifle and therefore may have a greater abundance of weak meaning responses to use in distinguishing the two items. A male may have more weak meaning responses available than a female to make the distinction between a rifle and a shotgun. Mourer's subjects were all male. The subjects in the present study were approximately 50% males and 50% females.

It is likely that factors of group selection, i.e., variables of generation, cultural background and gender, contributed to the differences in results in this study and in Mourer's study. However, one must ask: if generational, cultural and sexual factors account for the difference between the performance of the psychiatric aides and that of the college students, how does one account for the fact that the college students' pattern of mean corrected generalized error was similar to that of Mourer's schizophrenic sub-
jects? The schizophrenic group was quite similar to the psychiatric aides on sexual, generational and probably cultural factors. One possible explanation is that middle-age, male schizophrenics do in fact differ in their thought processes from middle-age, male normals in such a way to show the error patterns demonstrated in Mourer's study and that, by coincidence, this is the same error pattern demonstrated by college age persons of a different generation. However, the factor of experimental bias cannot be ignored. The present experimenter did not know to which anxiety group each subject would belong and did not anticipate that her results would differ significantly from Mourer's results. Mourer apparently knew which of his subjects were psychiatric aides and which were patients and his results supported his predictions.

The questioning of the generalizability of Mourer's findings does not necessarily reflect contradiction with Chapman et al.'s (1964) theory. The results of the present study supported the hypothesis that normals are biased toward interpreting two words as the same if the two words share the same strong meaning response. In this study normals made significantly more errors on test words that shared strong meaning responses with training words than on test words that shared weak meaning responses with training words. The fact that this error difference was similar to that obtained for schizophrenic subjects by Mourer could
lead one to question the hypothesis that schizophrenics are more biased than normals toward interpreting two words as the same if they share the same strong meaning response. As no data were obtained within the present study using schizophrenic subjects, this hypothesis was not directly examined. Only Mourer's particular data in support of this hypothesis were challenged, not the hypothesis itself.

The second prediction in this study was that normals would make significantly more errors to test words that had a moderate rated similarity to training words than to test words that had a low rated similarity to training words. Although the results are not significant, the trend was in the predicted direction ($0.05 < p < 0.10$). Using rated similarity as the measure of semantic closeness, the results of this study were somewhat similar to those of Mourer's study. The mean corrected generalized error score tended to be higher for the college students than for the psychiatric aides (a high score indicates more errors), but the pattern of error was similar. A graphical comparison of the data from the two studies is presented in Figure 2. Generational, cultural and sexual factors did not appear to affect a significant difference in results between the two studies when rated similarity was the measure of semantic closeness.

The findings that college student subjects made significantly more errors on test words that shared strong meaning responses with training words than on test words
Figure 2. Mean corrected generalized error scores for moderate and low rated similarity words for all five trials combined for both normal and schizophrenic subjects from Mourer (1973) and for all normal subjects from the present study.
that shared weak meaning responses with training words but did not make significantly more errors on test words that had a moderate rated similarity with training words than on test words that had a low rated similarity with training words have import for research in which various measures of semantic closeness serve as independent variables. In this investigation of semantic generalization using a recognition learning paradigm, meaning response strength was a highly significant independent variable measure of semantic closeness. The findings suggest that performance on tasks of semantic generalization may be sensitive to changes in meaning response strength. It is important to determine whether meaning response strength is a significant measure of semantic closeness in other semantic generalization models than that of recognition learning. Such research models as the paired-associate learning or serial learning paradigms might be investigated comparing meaning response strength with other measures of semantic closeness. If meaning response strength proves to be a significant variable it may be necessary to reexamine and reinterpret contradictory findings in research in learning and generalization with both normals and other subject groups.

The first of the predictions concerned with the implications that Mourer's (1973) research may have for Mednick's (1958) theory of heightened drive in schizophrenia predicted that the high anxiety group would make signifi-
cantly more corrected generalized errors to test words that shared strong meaning responses with training words than to test words that shared weak meaning responses with training words, and that the low anxiety group would have no significant difference in the amount of error made to strong versus weak meaning response words. This prediction was not supported by the data in that both high and low anxiety groups made significantly more corrected generalized errors to test words that shared strong meaning responses with training words than to test words that shared weak meaning responses with training words. The two groups were not different in patterns of error. This suggests that anxiety does not contribute to heightened drive and increase generalization errors when competing responses are present.

On initial examination, this result appears to contradict the bulk of research concerned with the relationship of anxiety and performance. However, a very likely explanation for why this experiment did not obtain the hypothesized difference in task performance between high and low A-Trait anxiety groups is that the environmental atmosphere was relaxed and informal. Spence (1964) discusses how he made a deliberate attempt in eyelid conditioning experiments to establish a cold and formal laboratory setting so that a greater degree of emotionality would be elicited from the subjects. For his purposes, he defined what was measured by the TMAS as "emotional reactivity". In a nonthreatening
environment few subjects would be expected to react emotion­ally; in a stressful environment those subjects with high
TMAS scores (a high score indicates more anxiety) would be
expected to have a strong emotional reaction and an increase
in drive. Spielberger (1966) also discusses how he did not
obtain a significant difference between high and low anxiety
groups when using the TMAS as the criterion for group as­
signment in a relaxed and nonthreatening environment.
Spielberger (1966, 1972) explains that the significant dif­
ference between high and low anxiety subjects in task per­
formance in a stressful situation when the TMAS is the
criterion for group assignment is the result of the scale
apparently measuring proneness to anxiety rather than pre­
sent anxiety or tenseness. As the A-Trait scale of the STAI
correlates quite highly with the TMAS and is hypothesized
to measure proneness to anxiety, the failure to obtain a sig­
nificant difference between high and low A-Trait subject
groups is consistent with the research literature.

There are numerous possible explanations for why this
experiment did not obtain the predicted difference in task
performance between high and low A-State anxiety groups.
The possible reasons to be discussed are test reliability,
test validity, degree of anxiety present in subjects and the
interaction of A-Trait and A-State.

The test-retest reliability of the A-State scale is
quite low, ranging from .16 to .54 (Spielberger et al.,
It may be that the scale is not consistent enough to provide a reliable measure of state anxiety. However, the A-State scale is hypothesized to vary with time and situation. If a high test-retest reliability were found, the test would not reflect the influence of unique variables existing at the time of testing. Low reliability is consistent with the definition of A-State and does not detract from its meaningfulness.

The support for the validity of the A-State scale is somewhat weaker than that of the A-Trait scale. However, the content validity appears adequate. The scale assesses present feelings such as security, anxiety, calmness and worry. There is concurrent validity in research relating increases in A-State with increases in heart rate (Lamb, 1969) and systolic blood pressure (O'Neil, Spielberger & Hansen, 1969) in stressful situations. The construct validity appears the strongest with research which demonstrated that A-State scores decreased during relaxation training and then increased during an ego-threatening situation (IQ test) and during the viewing of a stressful movie (Spielberger et al., 1970). There seems to be no reason to cite A-State validity as a basis for dismissing the results obtained in the present study.

Another factor that must be examined is the degree of anxiety indicated by the A-State scores. The low state anxiety group was made up of the subjects in the bottom 33%
of the A-State distribution. The A-State scores for the low anxiety group ranged within about the bottom 50% of the norms established for undergraduate college students on the A-State scale. The high state anxiety group was made up of subjects in the top 33% of the A-State distribution and their scores ranged within the upper 20% of the norms established for college students (Spielberger et al., 1970). The wide range of the low state anxiety group in the percentile rank norms suggests that this group may not be sufficiently different from the high anxiety group in degree of anxiety to demonstrate a difference in task performance.

A final explanation of why this experiment did not obtain the predicted difference in task performance between high and low state anxiety groups is the possible interaction between state and trait anxiety. Spielberger et al. (1970) report a study (O'Neil, Hansen & Spielberger, 1969) in which those subjects who were not consistent in A-Trait and A-State scores produced unexpected results. High A-Trait, low A-State subjects were consistently superior to all other groups regardless of task difficulty. Low A-Trait, high A-State subjects were consistently inferior to other groups. O'Neil et al. (1969, reported by Spielberger et al., 1970) suggest that both A-Trait and A-State should be considered when investigating the relationship between anxiety and learning. In this study approximately 40% of the high A-State subjects had middle or low A-Trait scores. About
40% of the low A-State subjects had middle or high A-Trait scores. Unfortunately, not enough subjects were obtained to analyze the possibility of a multiple interaction between A-State, A-Trait and task difficulty.

The results obtained in this study challenge the support that may be found in Mourer's (1973) study for Mednick's (1958) theory of heightened drive in schizophrenia as the normals in this study performed similar to Mourer's schizophrenic subjects on amount of corrected generalized errors to strong and weak meaning response words. A further investigation by the present study to see whether the error pattern of the schizophrenic subjects in Mourer's study could be attributed to heightened anxiety was done by dividing college students into low, middle and high anxiety groups. No significant results were obtained. This study neither supported nor contradicted Mednick, but it did question the generalizability of those results by Mourer that may be interpreted to be in support of Mednick. The failure to find a significant difference between high and low anxiety groups on task performance was accounted for without contradicting Hull - Spence drive theory upon which Mednick's theory is based.
SUMMARY

An attempt was made to replicate patterns of errors by normal subjects resulting from semantic generalization that were found by Mourer (1973). He had concluded that the error patterns of his normal and schizophrenic subjects offered support for Chapman, Chapman and Miller's (1964) theory of thought disorder that stated that both schizophrenics and normals are biased toward interpreting two words as the same if the two words share the same first statement of meaning. In addition, the present study investigated the possibility that Mourer's research may have implications for Mednick's (1958) theory of heightened drive in schizophrenia by presenting the semantic generalization task to college students divided into groups according to level of anxiety. College students were requested to push a "yes" button during the test phase of a recognition learning task if they had seen the word in the memory drum window on a previous training list and a "no" button if they had not. An error was recorded if the subject indicated that a word had appeared before when it actually had not. A corrected generalized error score was computed from the errors to control words and test words.

The error pattern found for normals in this study was quite different from that found by Mourer, but it was simi-
lar to the error pattern of his schizophrenic subjects. Subject group differences and experimental bias were discussed as possible factors accounting for the discrepancy in findings. The error patterns of the present normal subjects are quite inconsistent with the support Mourer offered Chapman et al.'s hypothesis. The present study did not question Chapman et al., but it challenged Mourer's support.

There was no significant difference in error pattern found between subjects divided into groups using the STAI as the criterion for group assignment. There results were discussed without contradicting drive theory. Support was not offered for or against Mednick's theory.

Meaning response strength had a significant effect upon performance. Rated similarity did not significantly affect performance. It was suggested that meaning response strength be further investigated with other subject groups and learning paradigms as a sensitive measure of semantic closeness.
REFERENCES


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APPENDIX A
Formulation of Meaning Response Strength
Values and Rated Similarity Values

Chapman and Chapman (1965) developed a measure of meaning response strength in the following manner. They used 80 word pairs that had previously been rated by college students for similarity of meaning. The 160 individual words were presented to 100 judges, students in an introductory psychology course, with the instructions: "For each word below, first write very briefly, preferably in one or two words, what the thing is or what it's like. Then write two other very brief statements about what it is or what it is like." An example and additional explanation of the instructions were given. Because of the length of the task, the list was divided into two forms with each half of the judges receiving one-half of the words. Both words in a pair were presented to the same judge but were separated on the lists.

When the responses were tallied, those responses which were essentially the same but had minor variations in phrasing were combined. The five meaning responses most frequently given for each word were selected to be rated on importance by judges. For this rating, each word was presented followed by the five meaning responses in random
order with the instruction to number the meaning responses as to "their importance for telling the meaning of the word or for describing what it is". The judges were 100 students in an introductory psychology course and each judge was given one-half of the items.

Word pairs in which one of the meaning responses consisted of the other member of the pair for as many as eight out of 50 judges were dropped from further analysis as this occurrence indicated that meaning responses were shared on several levels by the words and that word pairs were therefore inappropriate for testing hypotheses concerned with high strength meaning responses. Forty-two word pairs were dropped. Of the remaining pairs, 19 word pairs had a shared meaning response which was ranked first in importance by 16 or more out of 50 judges.

Mourer (1973) used the percentage of judges who ranked the same meaning response as first in importance for both words in a pair as the meaning response value. Gruber (1965, as reported by Mourer, 1973) used the same technique for measuring meaning response strength as Chapman and Chapman (1965).

Mourer (1973) obtained a rated similarity value for the word pairs by requesting 21 first year graduate students to rate word pairs on degree of similarity on a five-point scale. A rating of "1" indicated "almost exactly alike", and a rating of "5" indicated "not at all alike". All word
73 pairs receiving a mean rated similarity of less than 4.80 were selected for additional rating. Seventy-three word pairs remained and were rated by 50 undergraduate students. The final 16 word pairs and their corresponding mean rated similarity value were chosen from these 73 items.

Words on the practice list were chosen so as to have a minimal meaning response strength or rated similarity with the words on the Initial Training List and the Recognition Test List.
The thesis submitted by Helen Pugacz Appleton has been read and approved by the following Committee:

Dr. James Johnson, Chairman
Associate Professor, Psychology, Loyola

Dr. Leroy Wauck
Professor, Psychology, Loyola

The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the thesis is now given final approval by the Committee with reference to content and form.

The thesis is therefore approved in partial fulfillment of the requirements for the degree of Master of Arts.

12-10-76
Date

Director's Signature