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Effects of trait anxiety and of stress on speech predictability

Richard Edward Fuhrer

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THE EFFECTS OF TRAIT ANXIETY AND OF STRESS
ON SPEECH PREDICTABILITY

By
Richard E. Fuhrer

B.A., College of Great Falls, 1966

Presented in partial fulfillment of the requirements
for the degree of

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UNIVERSITY OF MONTANA

1970

Approved by:

[Signatures]

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CHAPTER I

INTRODUCTION

In the last twenty years a vast number of studies have dealt with the effects of anxiety on performance. The bulk of this research has been concerned with the effects of anxiety, usually defined by a paper and pencil test such as Taylor's Manifest Anxiety Scale (MAS) on performance in learning situations. Generally, the findings have been that Ss scoring high on the MAS perform better on simple learning tasks than Ss with low MAS scores, whereas on complex learning tasks the reverse is usually true. In many of these experiments, two levels of stress were used with complicated results. In general, it appears that stress disrupts the performance of high MAS Ss more than that of low MAS Ss, although numerous exceptions have been reported (Taylor, 1964).

Although most studies have dealt with the effects of anxiety on learning, some investigations have been concerned with the effects of anxiety on language behavior. Some interest has been shown in relationships between a person's language and his personality. For example, studies of the relationship between effective speech and
effective personality have shown differences between the results of personality questionnaires of good and poor speakers (Murray, 1936).

Other studies have been made in an attempt to discover more specific diagnostic characteristics of language. Buseman (1925) introduced the verb/adjective quotient as a verbal measure of "emotional instability" of adolescent children, the criterion measure being teachers' ratings. He also reported that the relative number of adjectives in speech showed an inverse relationship to "emotional instability." Consistent with this finding, Balkan and Masserman (1940) reported that when psychoneurotic patients were classified on the basis of clinical impressions into groups varying with respect to the degree of overt anxiety present, formal differences in their oral responses to TAT pictures were found. Patients with the highest degree of manifest anxiety showed a higher verb/adjective quotient than did patients with a moderate amount of manifest anxiety, who in turn showed a higher quotient than did patients with minimal manifest anxiety. The opposite relationship was found with respect to relative number of adjectives. However, when Benton, Hartman, and Sarason (1955) divided college students, on the basis of their Taylor MAS scores, into a high-anxious (upper 17 per cent) and low-anxious (lower 26 per cent) group, an examination of the S's responses to TAT cards revealed only slight and
insignificant differences between the high- and low-anxious groups with respect to both verb/adjective quotient and relative number of adjectives, and both of these normal college groups showed a much higher verb/adjective quotient than did any of the Balkan-Masserman psychoneurotic groups.

Osgood and Walker (1959) compared suicide letters with ordinary letters (written by different persons). They reported that suicide letters, assumed to be written under conditions of high drive, showed evidence of greater stereotypy as measured by vocabulary diversity (type/token ratios), number of repetitions, use of qualifying phrases, and noun-verb/adjective-adverb ratio, and cloze scores (a measure of predictability). No difference was found between groups on frequency of structural disturbances such as awkward constructions and grammatical errors.

In an experiment by Meisels (1967), two levels of S anxiety and two levels of experimentally induced stress were used to study a number of verbal characteristics which had been interpreted as indexes of transitory anxiety. High- and low-test anxious Ss were placed in high- and low-stress conditions under which responses to ten TAT cards were scored on each verbal category. One of the verbal categories studied was the verb-adjective ratio, which was found to be higher in the high-anxious groups but did not vary significantly with stress. Another measure examined in this study was the type-token ratio, defined as the number
of different words (types) over the total number of words (tokens). This measure failed to differentiate between groups. Meisels' findings in this experiment regarding two other verbal categories--speech disturbances and intrusions--will be discussed later.

Recently, much research has been devoted to studying the relationship of anxiety to the non-lexical aspects of speech which Mahl (1958) called the "expressive" aspects. Mahl was referring to those non-content aspects of speech which carry no semantical meaning, such as "flustered" or "disturbed" speech. Mahl's basic premise was that one effect of anxiety is the disruption of all complicated ongoing behavior. Therefore, speech disturbances should reflect anxiety. Along these lines, Dibner (1956) tallied and intercorrelated several speech characteristics that he believed were scorable and related to situational anxiety. From this, he developed two cue scales, one reflecting primarily speech disruption (unfinished sentence, breaking in with a new thought, interrupted sentence, repeated words or phrases, stuttering, blocking, and saying "I don't know") and the other cue scale composed of cues related to non-verbal voice characteristics (sighing, laughing, voice change). Dibner (1956) reported that in an earlier study (1953), the cue scales and three other indices of anxiety (skin conductance curves, clinicians' global ratings, and patients' self-reports) had been used to measure anxiety.
in reaction to structured and ambiguous interview techniques. The cue scales showed significant relationships to degree of ambiguity, just as did the other measures. The only significant correlations were between the two cue scales and the anxiety ratings of transcripts by clinical judges. Dibner states that:

The speech disturbances measured by the cue scales are clearly related to situational anxiety and not to anxiety as a personality trait, for the patient groups showed significant differences in reaction to varied interview techniques, although they were randomly selected and equated for diagnosis and several other pertinent variables \( p. 478 \).

Mahl (1958) categorized "flustered" or disturbed speech. His categories included: repetition, stutter, omission, sentence incompletion, tongue slips, correction in form or content, and intruding incoherent sound. These categories are collectively called "non-Ah" disturbances. A separate category—"Ah"—is scored whenever the "ah" sound or some variant such as "eh" or "uh" occur. To test his hypothesis that the speech disruptions reflect the anxiety of the speaker, Mahl (1959) conducted a study with a single patient whom Mahl had treated approximately two years earlier. Interview transcripts with all disruptions edited out were divided into phases based on content judged as anxiety arousing or not anxiety arousing for this particular patient. Speech disruptions were independently scored from unedited transcripts. It was found that non-Ah speech disturbances increased when the patient talked about
content that had been assessed as anxiety arousing. However, Boomer and Goodrich (1961) attempted to replicate this study using two patients. The anxiety judgment for one patient made by her therapist supported Mahl’s finding; but, in the second case, the judgments made by the therapist failed of replication. Anxiety judgments made by five additional judges who were not the patients’ therapists uniformly failed to show the hypothesized relationship to the speech disturbance measures. In a second study by Mahl (1959), speech disturbance ratios of thirty-one outpatient clinic applicants in their initial interview were correlated with mean global ratings of manifest anxiety by two independent observers of the "live" interview. For the twenty women in the sample, there was a significant correlation of .59 between the non-Ah ratio and the mean anxiety ratings. For the eleven men, however, there was a negative correlation of -.47. Mahl suggests that the judges may have been rating defensive behavior in the men but manifest anxiety in the women.

More direct evidence is reported by Panek and Martin (1959). In their study, synchronized GSR and verbal recordings of four interviews from each of four psychotherapy clients provided the basic data. Only Ahs and repetitions were scored as speech disruptions. It was found that speech disturbances were maximal at times coincident with GSR deflections (i.e., within a 30-second
interval surrounding the GSR deflection) and decreased in frequency on either side of GSR deflections. No significant differences were found between mean speech disturbance scores obtained in the five-minute segments of highest GSR activity as compared with those obtained in five-minute segments of lowest GSR activity.

Further support along these lines comes from a study by Kasl and Mahl (1965) in which anxiety was manipulated in an interview setting. Under anxiety conditions, the frequency of speech disturbances (Mahl's non-Ah ratio) showed a sizable increase. Measurement of palmar sweat revealed modest positive association with the speech disturbances.

Some rather surprising results were found by Meisels (1967) in the study described earlier in this paper. Using two levels of subject anxiety and two levels of stress, it was found that for Mahl's non-Ah ratio only the interaction effect was significant. Under high stress, low-anxious Ss increased in non-Ah disruptions, but surprisingly, high-anxious Ss produced fewer disruptions under high stress conditions. Similar results were found with respect to intrusions such as sighs, coughs, etc. There were fewer intrusions in the high-stress condition, and high-anxious Ss produced fewer intrusions under high stress than under low stress.

In a study by Feldstein and Jaffe (1962), non-Ah
ratio (a measure of speech disturbances) correlated negatively ($r = .44; p < .05$) with the mean segmental TTRs (type-token ratios—a measure of vocabulary diversity), and positively ($r = +.51; p < .01$) with the variances of the mean segmental TTRs for a group of non-psychiatric patients. There was no significant correlation between the same measures for a matched group of schizophrenics.

Feldstein and Rogalski (1966) reported three experiments that were conducted to test the general hypothesis that disrupted spontaneous speech is less predictable than fluent speech. Predictability was measured by the cloze procedure and disruption by Mahl's non-Ah speech disturbance ratio. The hypothesis was not confirmed. Instead, the results indicated differences in predictability among speakers as a function of the degree of interaction (dialogue more predictable than monologue) and the topical focus of speech. Also, the speech of certain speakers was more predictable when it was highly disrupted, while that of others was less predictable when highly disrupted.

Thus it can be seen that Mahl's contention that speech disruptions reflect anxiety has received only mixed support. Other investigators have examined the effects of anxiety not on language per se, but on language as a communication process.

Gynther (1957) recorded the verbal responses of
high- and low-anxious Ss under high- or low-stress inter-
view conditions. Anxiety was determined prior to the inter-
view by the Ss' scores on the Welsh Anxiety Scale. Stress
level was manipulated by instructions. In the high-stress
condition, Ss were told that the interview served as a
sensitive personality test, while in the low-stress condi-
tion the importance of the interview was de-emphasized.
The Ss' verbal responses to the interview questions were
analyzed in terms of how relevant or irrelevant each "thought
unit" was to the stimulus question. Results indicated the
high-anxious Ss and Ss under the high-stress condition
showed more irrelevant "thought units." There was no inter-
action between anxiety level and stress condition.

Platz and Honigfeld (1965) designed a study to
test the effects of anxiety on the intelligibility of verbal
communication in psychotherapy. Speech samples from pub-
lished psychotherapy interviews were rated on "tension
level" by calculating the proportion of words which seemed
indicative of tension occurring in each speech sample. As
their measure of intelligibility, the authors chose the
Cloze Procedure developed by W. L. Taylor (1953), whereby
verbal productions with every nth word deleted are presented
to a panel of subjects who try to fill in or predict the
missing word from the remaining context. In this study,
the panel consisted of college students who had been
classified as high- or low-anxious depending on their Taylor
MAS scores. It was found that the tension level of the passages was significantly related to their difficulty. The MAS scores of the students were not related to the accuracy with which the blanks were completed.

I. STATEMENT OF THE PROBLEM

Platz and Honigfeld (1965) asked the question: "Is the intelligibility of a patient's speech related to his drive level?" They pointed out that previous research and theory suggest contradictory predictions concerning the effects of anxiety and stress on verbal behavior. Some theories suggest that anxiety would disrupt ongoing verbal behavior. For example, according to Sarason's (1959) formulations, high-anxiety states elicit task irrelevant responses, while Saltz (1961) maintains that high-anxiety levels break down the "differentiation" between learned stimulus-response connections. The Hull-Spence Theory (Spence, 1958) seems to lead to a contradictory prediction. Since drive multiplies with habit strength, the effect of increasing drive should be to make behavioral expression of the dominant habits even more probable relative to that of weaker habits. Therefore, verbal behavior should become more stereotyped and redundant, and consequently more predictable (Osgood, 1959).

From the literature reviewed in this paper, it can be seen that there is some support for Mahl's view that
anxiety disrupts the non-lexical aspects of speech (Dibner, 1956; Kasle and Mahl, 1965; Mahl, 1958; Panek and Martin, 1959). There have also been, however, some negative findings (Boomer and Goodrich, 1961; Meisels, 1967; Mahl, 1958; Osgood and Walker, 1959).

There is much less research on the possible disruptive effects of anxiety on lexical (i.e., content) aspects of speech. The findings of Feldstein and Jaffe (1962), and of Osgood and Walker (1959) suggest greater predictability of speech content produced under anxiety, while the results of Gynther (1957), and Platz and Honigfeld (1965) suggest the opposite.

The purpose of the present study was to investigate further the effects of stress and anxiety upon speech. If anxiety disrupts verbal behavior, as is predicted from the disruption theories, the verbal behavior should be less predictable (Platz and Honigfeld, 1965). On the other hand, if anxiety is a form of drive, as has been assumed by Spence (1958) and Taylor (1953), it should, according to the Hull-Spence theory, result in verbal behavior becoming more stereotyped and therefore more predictable (Osgood, et al., 1959). The method chosen to measure predictability was the Cloze Procedure, which will now be described.
II. THE CLOZE PROCEDURE AND SPEECH PREDICTABILITY

The "Cloze Procedure" was developed by Wilson Taylor (1953). In his words, it is a "psychological tool for measuring the effectiveness of communication. The method is straightforward; the data are easily quantifiable; the findings seem to hold up" (Taylor, 1953, p. 415).

The term "cloze" represents the Gestalt notion of closure—a tendency for observers to fill in or complete familiar forms that are incomplete. The essence of the Cloze Procedure is as follows. A source produces a message. The experimenter mutilates it by deleting every nth word and replacing each missing word with a blank, and then gives the mutilated form to a group of "receivers" ("decoders") to fill in or "cloze." The greater the success these receivers have in predicting the missing words, the higher the cloze score. In other words, the receiver utilizes what information he has, the context, as a basis for predicting the deleted words. According to Osgood (1959) the cloze score is an index of the overall correspondence or communality between the language systems of different individuals and gives a measure of the ease or difficulty of a particular message for a particular receiver. Platz and Honigfeld (1965) state that it is a measure of "intelligibility." To avoid semantical quarrels, the Cloze Procedure will be considered in this paper to be
a measure of predictability—a term that closely describes the measurement operation.

Validity

To test the validity of the Cloze Procedure, Taylor (1953) performed two experiments in which he compared the Cloze Procedure to the Flesch and to the Dale and Chall "readability formulas" which select only a few message indicators such as number of pronouns, length of words, etc. Taylor first selected three passages from Flesch's book (Flesch, 1959) on which both Flesch and Dale-Chall agreed in readability ranking. Cloze Procedure was applied to these passages, and an identical ordering was found. To demonstrate that the Cloze Procedure could discriminate when the other formulas could not, he then selected five more passages, three of which were hand picked in the belief that the other formulas would be "fooled" in ranking them—Erskine Cauldwell (intuitively very simple, but replete with long sentences), James Joyce's *Finnegan's Wake* (extremely difficult semantically), and Gertrude Stein (short, familiar words, and short sentences, but put together in unconventional ways). Both the Flesch and the Dale-Chall procedures ranked Stein the easiest, whereas the Cloze Procedure ranked the passages in the order one would expect them to be ranked by people familiar with the authors.
Reliability

The overall rank correlation between the performances on eight 175-word passages as expressed by their score subtotals on five-blank-fifths of twenty-five blanks yielded a Kendall coefficient of concordance of .56 (p<.01). Split half correlation was found to be .95.

Technique

Taylor found that taking out every fifth word yields a sensitive measure of difficulty without presenting an extremely difficult task for the reader. It was also found, in a study using three passages, that the order in which the passages were presented to the receivers had no significant effect.

III. CONCEPTUALIZING ANXIETY

The term "anxiety" has been used for a long time by clinical psychologists; and while there is some common agreement as to its meaning in the clinical setting, probably every psychologist has his own preference as to what sorts of facts indicate anxiety. In attempting to define and measure anxiety, a large number of approaches have been taken, including self-reports, physiological measures, judges' ratings, and experimental manipulation of stressful situations. Unfortunately, these various measures of anxiety tend to correlate only slightly, if at all, and
inconsistently, both between and within individuals (Krause, 1961). So, while there has been a truly vast amount of research concerning anxiety in the last twenty years (Spielberger, 1966), the results have often been ambiguous or contradictory.

Cattell and Scheier (1961) have recently made an important and useful distinction between anxiety as a transitory state and as a relatively permanent personality trait. The distinction is derived from factor analytic studies that establish the factorial independence of state and trait anxiety. Spielberger (1966) has recently suggested that much of the controversy and confusion that abound in the anxiety literature stems from the failure to distinguish between the two anxiety constructs identified by Cattell and Scheier.

In the present experiment, Ss were selected on the basis of their extreme scores on the short form of the Taylor Manifest Anxiety Scale (see Appendix A). The MAS would appear to be a measure of trait anxiety. Examination of the items in this scale reveals that the subject is required to report symptoms or indicants of anxiety which he generally feels. Also, the MAS Scale correlated .75 to .85 with Cattell and Scheier's trait-anxiety factor (1961). In addition, the MAS is quite stable over periods of time as long as several months to a year (Taylor, 1953), and has been shown to be unaffected by stress interviews (Johnson,
The Affect Adjective Check List (see Appendix B) was also used in this experiment as an estimate of the Ss' state anxiety. The AACL, in contrast to the MAS, has been shown to vary daily, and to increase under stress conditions (Johnson, 1968; Zuckerman, 1960, p. 62).

IV. SOCIAL DESIRABILITY

A number of studies (e.g. Crowne and Marlow, 1969; Edwards, 1957; Fordyce, 1956) suggest that the results of personality tests are confounded by the desire of testees to "look good," that is, to present themselves as having socially desirable qualities. Therefore, to estimate the degree to which the MAS scores were confounded by social desirability, the Marlowe-Crowne Social Desirability Scale (see Appendix C) was administered with the intention of controlling for social desirability by analysis of covariance, if social desirability proved to be significantly related to the MAS scores.

V. OUTLINE OF THE STUDY

The purpose of the present study was to investigate how the predictability of verbal behavior, as measured by the Cloze Procedure, varies with the Taylor MAS scores of individuals and with the stress of the situation. This experiment extended the Platz and Honigfeld (1961) study.
by using subjects with differential MAS levels and by experimentally varying stress conditions.

Each subject was asked to talk about himself (see Method chapter). This interview-like request was designed to elicit "free responding" and to avoid one-word answers. The aspect of the situation chosen to be varied was the introduction made by the experimenter. In one case, the introduction was designed to increase ego involvement and to make the situation seem threatening. In the other condition, the importance of the situation was played down in an attempt to make the situation seem non-threatening.

High- and low-anxiety groups were chosen on the basis of the Taylor (1953) Manifest Anxiety Scale (see Appendix A). In addition, a measure of the subject's state anxiety during the experimental situation was taken by means of the Zuckerman (1960) Affect Adjective Check List (see Appendix B).

VI. HYPOTHESES

The primary hypotheses made in this experiment are concerned with the cloze scores. With respect to cloze scores, differential hypotheses were derived from disruption theory on the one hand and from Hullian drive theory on the other hand. Hypotheses derived from disruption theory are as follows:
Hypothesis 1

The cloze scores of the high-MAS subjects will be lower than those of the low-MAS subjects. A basic assumption is that MAS is a measure of trait anxiety. Therefore, high-MAS Ss should be more anxious in the experimental situations than low-MAS Ss. Assuming that anxiety disrupts speech, it was predicted that the speech of high-MAS Ss would be less predictable than that of low-MAS Ss.

Hypothesis 2

The cloze scores of subjects in the high-stress condition will be lower than the cloze scores of subjects in the low-stress condition. The assumption made here is that the high-stress condition will be more anxiety-arousing than the low-stress condition for all subjects, and that the increased anxiety will result in less predictable speech.

An opposite pair of hypotheses is suggested by Hullian drive theory:

Hypothesis 1

The cloze scores of the high-MAS subjects will be higher than those of the low-MAS subjects. Assuming that anxiety contributes to general drive and that increasing drive increases the response tendency of stronger habits more than that of weaker habits, then it can be predicted that the speech of the high-MAS group will be more redundant.
and more stereotyped, and therefore more predictable than that of the low-MAS group.

**Hypothesis 2**

The cloze scores of subjects in the high-stress situation will be higher than the cloze scores of subjects in the low-stress condition. The high-stress condition was assumed to increase drive for all subjects more than the low-stress condition. Therefore, the speech of subjects in the high-stress condition should be more predictable.

A secondary set of hypotheses was made with respect to the AACL:

**Hypothesis 1**

The AACL scores of high-MAS subjects will be greater than the AACL scores of the low-MAS subjects. It seems reasonable that individuals who have high trait anxiety should show greater state anxiety under interview-like conditions.

**Hypothesis 2**

The AACL scores of subjects in the high-stress condition will be greater than the AACL scores of subjects in the low-stress condition. The high-stress condition should be more anxiety-arousing than the control condition, and this difference should be reflected in the AACL scores.
of the subjects.

**Hypothesis 3**

The increase in the AACL scores in the high-stress condition compared to the low-stress condition will be greater for high-MAS subjects than for low-MAS subjects. This prediction is made on the basis of studies in the literature (Hodges, 1968) which suggest that stress differentially affects high- and low-MAS subjects.
CHAPTER II

METHOD

I. SUBJECTS

The subjects were 60 undergraduates who were enrolled in the introductory psychology course at the University of Montana. They were selected on the basis of their MAS scores from a larger pool of 184 Ss given the MAS and the Marlowe-Crowne S-D scales. Subjects with MAS scores of 21 or higher were designated the high-anxiety (HA) group; those with MAS scores of 14 or lower were designated the low-anxiety (LA) group. These scores defined, approximately, the cutoff points for the upper and lower 30% of the MAS distribution. There were 30 LA and 30 HA subjects. The Pearson product-moment correlation between the Marlowe-Crowne S-D scores and the MAS scores of the 184 Ss in the initial subject pool was computed. Because the correlation was quite small (r = -.02), the Marlowe-Crowne S-D scores of Ss in the experiment were ignored in the analysis of the dependent variables.

II. EXPERIMENTAL DESIGN

HA and LA subjects were assigned in equal numbers
to either the low-stress or the high-stress condition. The subject assignment fell short of randomness in that an attempt was made to balance the proportion of males and females in each stress condition. There were 15 HA and 15 LA Ss in each stress condition.

The only difference between the high-stress and the low-stress conditions was the introductory statement read to each subject.

III. PROCEDURE

The appropriate experimental treatment was administered to each S individually. The S was seated at a long table in a room approximately seven by eleven feet in dimensions. A microphone was in place on the table in front of the S, and a portable tape recorder was in place on a chair on the opposite side of the table from the S. The E entered the experimental room and sat at the end of the table.

Low-Stress Condition

Subjects in this group were read the following introduction:

We are making a study of language and want a number of samples of people talking. Your name will not be connected with the interview in any way. We merely number the interviews and these numbers do not correspond with the names. This mike will be used for recording. Okay?
High-Stress Condition

Subjects in the high-stress group were read the following instructions:

You have probably taken personality tests of the paper and pencil type and maybe some of the projective tests such as the inkblot test. Well, we have here a technique which gives an even deeper understanding of an individual and his personality. This is obtained from the way he answers some very significant questions. Previous studies with this technique have indicated that it is the best way we have of predicting a person's success in college and in his vocation. It is also quite revealing of the individual's self concept and of underlying motives in his relationships with other people. What you say will be recorded by this microphone. Okay?

After the appropriate introduction had been read, the following instructions were read to each S.

First, I'd like you to talk about yourself. For the next five minutes I'd like you to say aloud whatever thoughts about yourself come to mind. I don't care what you talk about, what sort of person you are, how you get along with other people, how other people might think or feel about you, just so long as you talk about yourself. Okay?

The E then started the tape recorder and left the room. After five minutes he returned and presented the subject with the AAACL. The subject was asked to read aloud the instructions on the AAACL and record, on an answer sheet, how he felt "right now."

IV. POST-EXPERIMENTAL DEBRIEFING

Debriefing was carried out by a letter mailed to each subject, thanking him for his help, briefly explaining the study, and assuring him that what he had said about
himself had not been used to explore his personality.

This delayed method of debriefing was used to in­
sure that all subjects would be naive, regarding the
experiment.

Immediately after each subject was administered the
appropriate treatment, he was thanked and asked not to
discuss the experiment with anyone.

V. SCORING

The first 100 words (plus the words necessary to
complete the final sentence) of each subject's verbal
sample were transcribed verbatim, but with non-fluencies
such as stuttering excluded. Mutilated copies of each
transcript were made with every fifth word deleted, for a
total of 20 deleted words per transcript. The passages
were "clozed" by 50 "receivers" drawn from the introductory
psychology class. Each receiver was assigned twelve tran­
scripts, three from each of the four MAS x treatment condi­
tions. The order of the transcripts was randomized for
each receiver. Thus, the transcript of any given subject
was presented to ten different receivers. The score for a
single receiver "clozing" a single transcript was computed
by summing the number of blanks which he correctly "filled
in." Since each transcript contained 20 blanks, the cloze
scores could range from 0 to 20.
CHAPTER III

RESULTS

I. RELIABILITY OF THE CLOZE PROCEDURE

In the present experiment, each receiver clozed 12 transcripts, 3 from each Stress x MAS condition. Ten receivers clozed each transcript. Thus, there were 5 different groups of receivers, each group clozing 12 transcripts. Separate analysis of variance was used for each group of receivers to estimate the reliability for that group (Winer, 1962). The estimated reliabilities for each of the 5 groups are: .32, .48, .64, .66, and .67. Each of these estimates is approximately equal to the average intercorrelation between the cloze scores of pairs of receivers, for a given group of 10 receivers.

Analysis of variance indicated that overall differences between the groups were not significant (F = 2.56, d.f. = 4,45, ns). However, the following interactions with groups of receivers were significant: Groups of receivers x Stress (F = 16.54, d.f. = 4,45, p < .01), Groups of receivers x MAS (F = 12.66, d.f. = 4,45, p < .01), and Groups of receivers x Stress x MAS (F = 14.4, d.f. 4,45, p < .01). These interactions were considered to
be part of the error in the analysis of variance described below.

II. EFFECTS OF TREATMENT CONDITIONS ON THE CLOZE MEASURE OF SPEECH PREDICTABILITY

For the purposes of analysis of the cloze scores a repeated-measures analysis of variance was performed with the receivers serving as subjects and the transcripts, drawn from each of the Stress and MAS conditions, serving as treatments. For the cloze scores, the main effect of stress was significant ($F = 7.14$, d.f. = 1,49, $p < .05$) indicating that the speech of subjects in the high-stress condition was significantly less predictable than the speech of $S$s in the low-stress condition. Neither the MAS main effect ($F < 1$, d.f. = 4,9) nor the MAS x Stress interaction ($F = 4.81$, d.f. = 1,49, $p < .20$) was significant.

III. EFFECTS OF TREATMENT CONDITIONS ON THE AACL SCORES

The mean AACL scores for different groups are presented in Table 1, in which it may be noted that the mean for the high MAS group is greater than the mean of the low-MAS group, and the mean of the high-stress group is greater than the mean of the low-stress group. These differences are in the predicted direction. An analysis of variance, however, indicated that both the differences
between stress groups \( (F = 1.99, \text{ d.f.} = 1,56, p < .25) \) and the differences between MAS groups \( (F = 3.17, \text{ d.f.} = 1,56, p < .10) \) failed to reach the .05 level of significance. The Stress x MAS interaction was also not significant \( (F < 1, \text{ d.f.} = 1,56, \text{ ns}) \).

**TABLE 1**

Means of AACL Scores

<table>
<thead>
<tr>
<th>Stress Condition</th>
<th>MAS Level</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>High stress</td>
<td>HA</td>
<td>10.13</td>
</tr>
<tr>
<td></td>
<td>LA</td>
<td>8.47</td>
</tr>
<tr>
<td>Low stress</td>
<td>HA</td>
<td>9.00</td>
</tr>
<tr>
<td></td>
<td>LA</td>
<td>6.13</td>
</tr>
</tbody>
</table>
CHAPTER IV
DISCUSSION

The data of the present study support the hypothesis that stress reduces the predictability of speech. This result is consistent with the disruption theories, such as Sarason's (1959), which hold that anxiety disrupts behavior by producing task-irrelevant responses.

The present results are in disagreement with the Osgood and Walker (1959) report that letters written under high drive (suicide letters) showed greater stereotypy (as measured by, e.g., type-token ratios, and cloze procedure) than non-suicide letters. The present finding regarding stress is, however, in agreement with the better controlled study of Platz and Honigfeld (1965), which indicated that transcribed spoken passages containing numerous words judged indicative of tension were less predictable than passages containing few tension-indicating words. Some­what similar results were also obtained by Gynther (1957) in a study in which she found lowered "communicative efficiency" to be associated with stress.

The MAS factor, contrary to predictions, had no significant effect on speech predictability. A plausible
explanation for the fact that the stress factor was significant, although the MAS factor was not, may be that the anxiety measured by the Taylor Manifest Anxiety Scale was chronic anxiety unrelated to the experimental situation and unrelated to the content of the speech and therefore not so likely to interfere with the speech, whereas the anxiety resulting from the high-stress condition may have been acute and related to the speaking situation, and perhaps to the speaking process and content of what was being spoken and therefore more likely to interfere with the speech. That is, in the high-stress condition a subject was instructed to talk about himself, with the understanding that what he said about himself would expose him to a penetrating personality analysis. Thus the very act of talking about himself may have been threatening and may, therefore, have resulted in the continued production of acute, situationally related anxiety which, in turn, disrupted the speech.

While the present study was in no sense designed as a general or a critical test of Hullian theory, it may be worthwhile to note that the effect of stress on speech predictability in the present study appears to be inconsistent with Hullian theory, as interpreted by Osgood and Walker (1959), and by Platz and Honigfeld (1965). According to these authors, the Hullian view would be that stress should result in greater stereotypy of language or more predictable
None of the hypotheses in the present study concerning AACL scores was supported. While the Stress and MAS main effects were in the predicted direction, they failed to reach an acceptable level of significance. Inspection of the data revealed a large within-group variation, suggesting that perhaps examination of ordinal differences would be appropriate. Therefore Mann-Whitney U tests of analysis of ranks (Winer, 1962) were computed on the main effects of both factors. Neither Stress ($U = 346.5, p < .07$) nor MAS ($U = 348.50, p < .07$) was significant.

The failure to find significant AACL differences between stress conditions may be of some importance, since psychological stress is usually defined in terms of a perceived threat which in turn produces anxiety, and indeed, this conceptualization of stress was utilized in formulating some of the primary hypotheses of the study, viz. those concerning the effects of stress on speech predictability. However, while the logic of the conceptualization of the process by which stress affects speech may require that stress produces state anxiety, it was felt that the measurement of state anxiety was not crucial to the experiment, since it was well recognized that anxiety measures tend to correlate only slightly, if at all, both between and within individuals (Krause, 1961). It is possible that subjects in the high-stress condition may have felt that to admit
that they were anxious about having their personalities analyzed would indicate that they had something to hide and were afraid of exposure. That is, the subjects may have believed that being anxious was, in itself, "diagnostically significant," and, as a result, may have been reluctant to admit feeling anxious.

With regard to the problem of anxiety and stress, more useful studies could be done investigating the nature of anxiety, and the relationship of different anxiety measures to different stress situations. With respect to speech predictability, more studies need to be done investigating the effects of different stress situations on the communication process. In addition, very little is known about the mechanism by which anxiety disrupts speech. Further research is needed to illuminate the linguistic changes which occur under high stress and which mediate the lowered predictability found in this study.
CHAPTER V

SUMMARY

To test the effects of experimental stress and of degree of trait anxiety on speech predictability, two groups of 30 Ss each were chosen from introductory psychology students obtaining extreme scores on the Taylor Manifest Anxiety Scale (MAS). Half of the Ss in each of these groups received an introductory statement designed to produce ego involvement and to make the experimental situation seem threatening to the S. The other half received an introductory statement which de-emphasized the importance of the situation. The Ss were then asked to talk about themselves for 5 minutes and their speech was tape recorded. Transcriptions of the first 100 words of the speech passages were subjected to the Cloze Procedure and cloze scores of speech predictability were obtained. An analysis of variance indicated no significant MAS effect and no significant MAS x Stress interaction. The speech of subjects in the high-stress situation was found to be significantly less predictable than the speech of Ss in the low-stress situation. These results were interpreted as being consistent with disruption theories of anxiety which state that anxiety disrupts behavior.
APPENDIX A

THE TAYLOR MANIFEST ANXIETY SCALE (MAS)

I. CONSTRUCTION OF THE TEST

Five judges were asked to select items indicative of manifest anxiety from a set of about 200 MMPI terms previously screened by Taylor. The 65 items on which there was 80 per cent or better agreement were then reduced to 50 items which showed high correlation with total scores. These 50 items plus 175 buffer items make up a form of the MAS which was used by Taylor in much early research conducted about 1948-1951. During this period the MAS was administered to nearly 2,000 college students at the State University of Iowa. In these studies, Taylor (1953) found that the test-retest reliability was .89 for a three-week intertest interval, and .81 for five- to seventeen-month intervals. Also, no significant sex differences were found.

A further revision of the scale was carried out (Taylor, 1953) in which a number of the items were re-written to make them simpler and clearer. This revised version is the form presently being used in research at Iowa. The new form correlates .85 with the old form, which is
about as high as the old form correlates with itself. Test-retest reliability of the new form is .88 for a four-week interval.

II. VALIDITY OF THE MAS

In a study reported by Gleser and Ulett (1952), a psychiatrist rated 151 normal individuals and 40 psychiatric patients with overt anxiety as a prominent symptom. Ratings, which were made on an eight-point scale of anxiety proneness, defined as a tendency for overt anxiety symptoms to appear in a stressful situation. For the total group, the correlation between the ratings and MAS scores was .61. Other similar studies by the same group of experimenters indicated lower coefficients, from .29 to .40.

Hoyt and Magoon (1954) asked counselors to classify their own clients (N = 289) into groups of high, medium, or low manifest anxiety. The mean MAS scores of each group were significantly different.

In a study by Kendall (1954), 96 tuberculosis patients were rated for manifest anxiety by nurses. From this group, a sub-set of patients who had extremely high or extremely low MAS scores was selected. When ratings were compared on the upper and lower thirteen percentile groups, a significant difference at the .01 level of confidence was found.
In a study by Buss, Wiener, Durkee, and Baer (1955), each of 64 psychiatric patients was interviewed and then rated by four psychologists on directly observed and reported anxiety. The overall rating of anxiety correlated .60 with the patients' MAS scores.

Lauterbach (1958) correlated MAS scores with a composite rating of anxiety from forty-four male psychiatric patients. The ratings were made by three psychologists, a psychiatrist, and a social worker. The psychologists' combined ratings correlated .44 (p < .01) with the MAS scores. The ratings by the psychiatrist and the social worker were neither internally consistent nor reliably related to the MAS scores.

Siegman (1956a) found higher MAS scores for patients who were diagnosed anxiety reaction as contrasted to a group of neurotics with different diagnoses. However, Rubin and Townsend (1958) reported no significant differentiation of anxiety neurotics from neurotics with other diagnoses.

Matarazzo, Guze, and Matarazzo (1955) reported a correlation of .95 between the 225-item revised form of the MAS and the 50 critical anxiety items of that form when the 50 critical anxiety items were given as a short form of the MAS.
APPENDIX B

THE AFFECT ADJECTIVE CHECK LIST (AACL)

The AACL was developed by Zuckerman (1960) as a quick and simple measure of transitory or "state" anxiety. It was felt that such a test was needed since most anxiety questionnaires are designed to measure anxiety as a relatively stable trait. Such questionnaires ask Ss to respond in terms of how they "generally," "often," "usually," and "seldom" behave.

The AACL consists simply of a list of adjectives, eleven of which are scored "anxiety-plus" and ten of which are scored "anxiety-minus." The subject is asked to check those words which describe how he feels (or felt) at a given time. A subject's anxiety score is the number of anxiety-plus words which he checks plus the number of anxiety-minus words he doesn't check. The possible range of scores is 0 to 21.

I. CONSTRUCTION OF THE AACL

A list of affectively toned adjectives was used in the development of an anxiety scoring key. Adjectives that differentiated high and low anxiety groups (selected by psychiatric interview) and showed significant changes
in checking frequency during a hypnotically suggested anxiety state were used in the key.

II. RELIABILITY

Two versions of the AACL were given to 50 college students, consisting of 43 males and 7 females. The items on the two versions of the AACL were the same, but one test asked the Ss to check words which described how they "generally feel" while the other test asked them to check items describing how they felt "today." One week later the Ss took the two AACLs again. Internal reliability was calculated by the Kuder-Richardson Formula 20. Results showed that the general test is reliable internally (.72, p < .001) and in retest (.68, p < .001), while the today test is internally reliable on a single testing (.85, p < .001) but low in reliability on a retest (.31, p < .05). The actual correlation between the two versions was .43, indicating a significant, but only moderate, relationship between the two tests.

III. VALIDITY OF THE AACL

Thirty-five college students (12 females, 23 males) were given the Today AACL class meeting except those following test day meetings. There were a total of ten non-exam days and three exam days. The AACL scores increased very significantly on exam days.
The total college group in the two studies described above consisted of 65 males and 19 females. Sex differences were found to be insignificant (Zuckerman, 1960).

In an attempt to replicate the findings of the above experiment, Zuckerman (1962) administered the AACL to a new group of students on six consecutive class days, the last day being the first class exam day. The mean AACL for the first five days was significantly lower than the AACL for exam day. It was also found that the difference between the mean pre-exam day AACL scores and the exam day AACL scores was related to student ratings of how "worried" they were about the imminent exam; i.e., those who rated themselves most worried had the largest increase on their AACL scores. The above studies were reported by Zuckerman (1960, 1962). Other studies have also examined the validity of the AACL as a measure of state anxiety.

Winter, Fereira, and Ransom (1963) subjected 19 undergraduates to two conditions of low anxiety (a class project during which the E was jovial and friendly, and a humorous movie), two of experimentally induced high anxiety (Ss were told they were taking a test which measured how nervous they were, and a lobotomy film), and two conditions of examination anxiety. The AACL scores were significantly higher on the high-anxiety days than on the low-anxiety days.

Johnson (1968) took AACL and MAS measures before and after either a stressful or a non-stressful interview. The
AACL scores were significantly increased by the stress interview but not by the control interview. The MAS scores were not affected by either type of interview.
APPENDIX C

THE MARLOWE-CROWNE SOCIAL DESIRABILITY SCALE (SD SCALE)

The SC scale is intended to be a measure of an individual's need for approval. The measurement of this trait has relevance to experiments using paper and pencil personality tests since many such tests contain a large number of items, the endorsement of which is socially undesirable.

I. CONSTRUCTION OF THE SD SCALE

The SD scale was constructed by Crowne and Marlowe (1964). A number of personality inventories were consulted in order to devise a new set of items for the SD scale. In order to be included, an item had to meet the criterion of cultural approval and yet be untrue of virtually all people, and have minimal pathological or abnormal implications. A set of 50 items meeting these criteria was submitted to 10 judges for social desirability ratings. Ninety per cent or better agreement was found on 47 of the items. The 47 items were then submitted to 10 additional judges for rating degrees of maladjustment implied by socially undesirable responses to the items. The rating was done on a five-point scale. The mean rating for all items was 2.8, indicating neither good nor poor adjustment. The items were then
administered to 76 introductory psychology students, and an item analysis was performed. There were 33 items discriminating at the .05 level or better between high and low total scores, 18 of which are keyed true, and 15 false. These 33 items constitute the final form of the SD scale.

II. RELIABILITY

The Kuder-Richardson formula 20 gave an internal consistency coefficient of .88. One-month internal test-retest correlation was also .88.

III. VALIDITY

Crowne and Marlowe (1964), interpreting high SD scores as indicating "need for social approval," found that subjects who scored above the median compared to those who scored below the median expressed significantly more favorable attitudes in response to questions presented by the experimenter concerning a very tedious spool-packing task he had just had them perform.

Crowne and Marlowe (1964) also report studies which showed that high SD subjects respond significantly more than low SD subjects to both positive and negative verbal conditioning and that high SD subjects conform more in the Ash test than low SD subjects.
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