SPEECH DISFLUENCY UNDER CONDITIONS OF DELAYED AUDITORY FEEDBACK AND ANXIETY

By

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SPEECH DISFLUENCY UNDER CONDITIONS OF DELAYED AUDITORY FEEDBACK AND ANXIETY

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PREFACE

This thesis is concerned with the part anxiety plays in the phenomena of stuttering. Unfortunately I was unable to locate enough stutterers to work with. I am, therefore, indebted to Dr. Robert F. Stanners for his suggestions which pointed me toward a normal speech analog of stuttering - speech under conditions of delayed auditory feedback. His many suggestions on methodology and equipment are also greatly appreciated.

Further, I wish to express my thanks and gratitude to Drs. Kenneth Sandvold and Julia McHale who gave freely of their advice and time in helping to plan this experiment.

I also wish to thank my wife for both her wifely concern and her professional help in working with me on this study.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

THE PROBLEM

Stuttering is a problem which causes grave disruption to the stutterer's verbal ability and hence, in a verbal society, strains the stutterer's capacity to adjust to his own satisfaction, as well as that of his society.

Van Riper has defined stuttering as:

> . . . when the flow of speech is broken by hesitations, stoppages or repetitions, and prolongations of the speech sounds. Fluency is interrupted by contortions, tremors or abnormalities of phonation and respiration. (Adler, 1966, p. 6.)

Although a large body of research has been built up in this area much of the data is confusing. There is a wide array of behavior patterns

> . . . explained in many mutually exclusive ways and yet therapy methods based on these theories tend to yield similar results. No cure stands out. (Robinson, 1964, p. 3.)

> Few therapists, moreover, are satisfied with their own records of achievement in clinical work with stutterers, or would deny that there is need for better methods of treatment than have as yet been found. (Bloodstein, 1959, p. 65.)

If the cause, or causes, for stuttering were known quite possibly treatment for stuttering could be applied in a systematic manner, bringing about better results. Research in the area of delayed auditory feedback (DAF) has produced some evidence that DAF may be related to stuttering, possibly in a causal fashion. It has been shown (Lee,

1950) that artificially induced DAF causes speech disfluencies at least superficially resembling stuttering. The relationship implied is that the stutterer has some built-in delay factor involved in hearing his own speech, which in turn creates stuttering. One study by Neely (1961) has raised some doubt about the relationship between DAF and stuttering. Neely, however, did not control for the anxiety level of his subjects and there may be some question as to the generality of his results.

Many theorists in the area of stuttering have concluded that stuttering is based on anxiety to some extent. Some of these, such as Johnson (1959) and Wischner (1952), consider anxiety to be a very major factor in stuttering behavior. Others, such as Karlin (1965), feel that organic problems are the most important factors in stuttering but that anxiety reactions to these problems are also of considerable concern. Kasl and Mahl (1965) found that levels of anxiety were related to disturbances and hesitations in spontaneous speech. In terms of anxiety's general arousing effects Sechrest and Wallace (1967) mention several studies which show that ". . . under conditions of strong emotionality, human problem solving and adaptive behavior shows remarkable disorganization." (p. 103)

The implications are that levels of anxiety may have some effect on speech in terms of stuttering. Since there existed only a very small population of stutterers locally, a normal speech analog was needed in order to study the effects of anxiety. Research, other than the aforementioned study by Neely, indicates that a normal individual's speech under DAF might well be similar to the speech of stutterers (Yates, 1963). Hence, the speech of normals speaking under DAF was

observed. This study was designed to investigate the proposed relationship between anxiety and speech under conditions of DAF, with hopes that the results may be applicable to the stuttered speech of stutterers.

CHAPTER II

REVIEW OF THE LITERATURE

One manner of looking at speech is as a feedback or servosystem. Such a theory was proposed by Mysak (1959). Feedback information is constantly returning to the speaker by way of two circuits, closed and open. Closed circuits are those involving only components within the body, for example, kinesthetic feedback from muscles within the vocal area. Open circuits include outer stimuli such as visual perception of the listener's reaction to the speaker. This constant internal and external flow of feedback enables the speaker to oversee the speech process. When errors are made the circuits are able to bring this to our attention and we are able to correct our error by repetition or some other change so that the error is no longer repeated. In this manner speech becomes an automatic activity with its own monitoring service.

Mysak (1960) applied this servo-theory to the problems of stuttering. He felt that stuttering is a breakdown in verbal automaticity. Most experimental evidence for a servo-theory of stuttering comes from studies of DAF. These studies propose a breakdown in the mechanism of audition. DAF is a situation brought about by playing back the subject's (S) speech to him, through earphones, with a delay of some length from the time he originally spoke. Under DAF the S is speaking another sound by the time the previous sound is being heard. The S speaks into a microphone connected to a specially modified tape

recorder. As the tape passes across the recording head the S's voice is recorded. The tape then moves across a moveable playback head which sends the S's voice back to him through the earphones. The delay is controlled by changing the distance between the two tape deck heads. Delaying feedback tends to bring on disruption of speech noticeable in a changed rate of speech, and in the large number of misarticulations and syllable repetitions similar to stuttered speech (Lee, 1951).

The hearing of one's own speech is called sidetone. Sidetone comes to the speaker from three sources: (a) through the air from the mouth, (b) indirectly as sound travels out and is reflected back to the speaker, and (c) through bone and tissue of the head (Robinson, 1964). While there is a differing amount of time necessary for sound to reach the hearing mechanism via each of the above modes, the difference is usually too small to cause any disruptions. The delay of air conducted sidetone is normally .001 seconds (Yates, 1963). Conditions of DAF with delays of .1 to .2 seconds produce profound disruption. Stromsta (1956) has found that stutterers differ from normals in bone conduction patterns. He found a significant delay in air-conducted sidetone as related to bone-tissue sidetone.

If delayed speech sounds have some causal relation to stuttering, an improvement in the speech of stutterers should be noticeable if the feedback of speech can be eliminated. This has been found to be the case. Maraist and Hutton (1957) had stutterers read under five levels of masking noise from 0 to 90db. Five passages were read to control for adaptation. The mean number of errors decreased in approximately equal amounts as the masking level increased. At 90db, the S's mean rate of 144 wpm approximated normal reading. Trotter (1967), in a

personal report, says that a stutter aid - a portable noise generator, 35 to 770 cps, 97 to 119 db - which is worn like a hearing aid, cuts his stuttering down to one-quarter of his normal rate and shortens the length of his stuttering blocks. The device is used for short periods whenever the stutterer feels about to stutter or while he is actually in a block.

Since masked sidetone attenuates stuttering the number of stutterers among the deaf should be lower than the number found in the normal population. Indeed, Albright and Malone (1942) found .29% of deaf children in their sample stuttered as compared to .7-1.0% found in the normal population (Adler, 1966).

All of the above evidence suggests the hypothesis of some relationship, possibly causative, between feedback and stuttering. Neely (1961) rated non-stutterers, speaking under DAF, and stutterers, speaking as they normally would, along several measures in order to compare the resulting speech errors. Two specific measures were adaptation and consistency. Adaptation refers to stutterers' ability to attain greater fluency after reading a passage several times over. Consistency refers to the perseverance of a stuttering response to a particular word across adaptation trials. While over-all stuttering goes down, some words are stuttered consistently across trials (Johnson and Inness, 1939). Neely (1961) hypothesized that if "stuttering" under DAF was the same as a stutterer's stuttering, the same degree of adaptation and consistency should be found between stutterers reading a passage as they normally would and non-stutterers reading the same passage under DAF. Neely found that the mean number of errors between the two groups was significantly different, with the implication being that the two

types of speech disorders, natural and induced, were not the same. Two of Neely's implicit assumptions are felt to be incorrect. First, Neely must assume that adaptation and consistency are constant factors needing no time for development. Bloodstein (1965) has shown this to be incorrect. The adaptation and consistency effects in the disfluencies of young children are much lower than that of adult stutterers, quite probably developing with experience with stuttering. Secondly, Neely must assume that except for the stuttering phenomenon stutterers and non-stutterers are similar groups. There is a considerable body of evidence which suggests that the two groups might differ on at least one measure, anxiety.

Much of the evidence for a connection between stuttering and anxiety has come from physiological studies of autonomic behavior at the time stuttering is taking place.

Goss (1952) noted that the following behavioral changes have been found:

> Respiratory [antagonism between upper and lower thoracic levels, prolongation of inspiration, clonic and tonic interruptions of expiration, etc. (Strother, 1937 and Hill, 1944)], cardiovascular [heart rate, sinus arrhythmia, blood pressure, etc. (Hill, 1944)], and psychogalvanic (Fletcher, 1914) changes are the most frequently observed physiological antecedents and/or concomitants of stuttering behavior. In an early study Fletcher (1914) observed differences between the breathing patterns accompanying normal speech and those accompanying overt stuttering. In addition, when compared with non-speaking situations he noted changes in plethysmographic, heart rate, and psychogalvanic responses during stuttering. The intensity of these responses appeared to be positively correlated with severity of stuttering. Robbins (1919) also reported a positive relationship between peripheral vasoconstriction and stuttering spasms or expressed fear to stuttering. Travis, Tuttle, and Cowan (1936) found premature ventricular contractions during stuttering and it was their suggestion that this form of cardiac arrhythmia might be related to anxiety. That cardiovascular changes are restricted to the speech situation and perhaps to the

> occurrence of overt spasms is suggested by Ritzman's (1943, 1942) failure to find significant differences between stutterers and normals with respect to heart rate, blood pressure, and sinus arrhythmia under rest conditions.
>
> L. E. Travis (1927), Fossler (1930), Henrikson (1936), V. Travis (1936), Morley (1937), and Strother (1937) have observed respiratory changes prior to and/or coincident with overt stuttering. Further the findings of L. E. Travis, V. Travis, Morley, and perhaps those of Henrikson and Strother suggest that for the most part these disturbances were not present when stutterers spoke words fluently. Morley, for example recorded 73% of the observed breathing abnormalities during the occurrence of overt spasms. Likewise, Van Riper (1936) has demonstrated that high inspiration-expiration ratios and other breathing irregularities were characteristic antecedents of actual or anticipated stuttering behavior (Goss, 1952, p. 39).

Goss goes on to say that these physiological states are those commonly associated with fear or anxiety.

> . . . the probability of the occurrence of overt stuttering is some direct function of the strength of an antecedent and/or concomitant anxiety state (Goss, 1952, p. 39).

The belief in a relationship between anxiety and stuttering is far from isolated. Hahn's (1943) compendium of theories of stuttering contains articles by Bluemel, Boome, Fletcher, Gifford, Greene, Johnson, Natoleczny, Solomon, and Van Riper, all of which make explicit some form of anxiety ("anxiety," "fear," or "preparatory set") as an important cause of stuttering. What does anxiety do?

Bluemel (1932) felt that some disfluencies were normal in early childhood speech. He termed this "primary stuttering." These disfluencies come naturally and are not pushed or forced as in a stuttering block. The child is not aware of them as speech errors. Bluemel went on to say that if the child is not made overly aware of these disfluencies they will eventually disappear. If, however, considerable attention is brought to these disfluencies secondary stuttering may develop as the child tries consciously to control his speech.

Johnson (1955) agreed with Bluemel in the position that primary stuttering was not really different from normal disfluencies that all children have in their early years of speech. He felt that the anticipatory struggle reaction, involving disrupting muscular tension, came not from hesitancies the child heard in his own speech but from abnormal parental reactions to the child's disfluencies.

Johnson states: (a) it is generally a layman (parent) who makes the initial diagnosis of stuttering; (b) what they diagnose as stuttering is actually normal speech with normal disfluencies; (c) stuttering develops not before the diagnosis but after it because of the attitude and reaction the diagnosis brings about.

> It is a "hesitation to hesitate" to which children generally normal in every other respect are especially prone in a society which places a very high premium on fluent speech (Bloodstein, 1959, p. 18).

Johnson's diagnosogenic theory contends that stutterers are not born different; they are made to be different. Some evidence for this has been found in anthropological studies. Bullen (1945) published reports from Fortune, Meade, Kluckohn and other anthropologists active among Pacific cultures, stating that essentially no stuttering existed in any of these cultures. Johnson (1944) found no stuttering among members of the Bannock, and the Shoshone, and, in fact, no word for that behavior. Snidecor (1947) attempted to find a stuttering Indian and after interviewing 800 and having obtained information on 1000 more, he found not "one pure-blooded Indian who stuttered." All of these cultures were similar in that there was an absence of heavy culture pressures, including speech pressures (Bloodstein, 1959). Children had a great deal of freedom and little was expected of them.

Speech was not hurried along but allowed to develop naturally. This is to be compared to the atmosphere of the young Kwakiutl, Nootka, and Salish - all Pacific Northwest Canadian Indian tribes. Lemert (1953) found stutterers among these tribes and characterized their cultures by their unique social competitiveness. Prestige of the family group was sought after and highly valued. Shortcomings in any individual member could jeopardize the total family. This group of Indians did have a word for stuttering, as well as stutterers.

Wischner (1947, 1950, and 1952) extended Johnson's theory by providing the mechanisms involved in stuttering through an application of learning principles. In studies on adaptation and expectancy in stuttering, Wischner was impressed with a similarity between adaptation and experimental extinction of a learned response. Wischner hypothesized that stuttering was a learned response which was reinforced through drive reduction; the stutterer's anxiety about speech errors was reduced. Expectancy of stuttering, and anxiety about speech errors, builds up as the stutterer speaks fluently. At some point in the build-up the block occurs and its immediate effect is to reduce the stutterer's anxiety. Of course stuttering has its negative aspects; however, the immediate positive reinforcement of drive reduction adds a greater potential for the stutter response than suppression of the response produced by the negative sanctions of society.

Wischner has likened stuttering to the "instrumental avoidance" act in Hilgard and Marquis (1940). Stuttering allows the stutterer to avoid the anxiety of speech. However, the more he stutters, the greater his anxiety about speech and the more stuttering he must engage in. Hilgard and Marquis point out that one feature distinguishing

instrumental avoidance response from the other instrumental acts is that instrumental avoidance responses are unusually difficult to extinguish - just as erradication of stuttering has been difficult.

Sheehan (1958) also uses the idea of drive reduction; however, he goes into the mechanisms involved in how the stutter begins by applying an interpretation of the conflict research of Miller (1944). Sheehan views stuttering as a double approach-avoidance conflict situation. The first approach-avoidance conflict is to speech, which allows communication; however, it opens the stutterer to a stuttering block. If the approach gradient of speech is initially higher than the avoidance gradient fluent speech may ensue. However, since the avoidance gradient is theoretically higher in slope, a point is reached at which the approach and avoidance gradients intersect. In Miller's runway experiments with rats, vacillation before reaching the end of the runway, and eventually fixation, was found. Sheehan compares this vacillation to stuttering. Fixation does not ensue because of the drive reduction brought about by the stutter. The anxiety level of the stuttering - produced avoidance gradient is lowered sufficiently for the stutterer to begin to speak fluently again. The position is complicated by the approach-avoidance conflict to silence, hence "double" approach-avoidance. Silence reduces the threat of stuttering. The negative factor is that there is then a lack of communication, with consequent frustration.

As in the other anticipatory struggle or anxiety theories of stuttering the initial fear of stuttering appears to come about in reaction to the over-concern of parents and/or significant others in relation to the normal disfluencies in childhood speech.

The impression of stutterers that one might get from the above is that they are a rather anxious group as a whole, either in terms of speech or in terms of the lives they lead in essentially competitive, striving societies. Quite possibly the differences Neely (1961) found between the stutterers' speech and the speech of normals under DAF may have been due to the sample of normals Neely used. Stutterers, it has previously been said, seem to be quite anxious as a group. The "normal" group was not screened for levels of anxiety and was probably a random sample composed of S's at no particular level of anxiety and with no particular anxiety in relation to speech. There was also nothing inherent in the reading task to boost anxiety other than the difficulty of reading under DAF (Lee, 1950). In such a situation, where there are no sanctions for speech errors, we have no reason to believe that the mixed anxiety non-stutterers will behave in the same manner as stutterers. The non-stutterer has no need to develop avoidance reactions and specific fear since the stress he is under is transient; he doesn't have to live with it. Reading under DAF is a stressful situation in itself (Pronko and Leith, 1956 and Forney and Hughes, 1961). This may even be perceived as a threatening situation. Sarason (1960) concludes that highly anxious people react to threat in a personalized manner, often detrimental to solution of the presenting problem. The low anxious person reacts to threat by attacking the problem.

Spilka (1954) hypothesized that Ss relying on exteroceptive cues could be shown to manifest greater speech disruption under DAF than Ss characterized as relying on interoceptive cues. Spilka related exteroceptive reliance to hypersensitivity to one's environment as

exemplified by paranoid and rigid persons. Interoceptive reliance was related to schizoid, withdrawn persons. Spilka found that exteroceptive and interoceptive Ss, rated on the basis of the interpretations of the California Test of Personality (Secondary Series), Guilfords STDCR, the total E scale, and the Paranoid and Schizophrenia subtests of the MMPI, behaved somewhat differently under DAF. The most consistent voice variable related to the personality traits measured was change in vocal intensity. Increases of the variable were associated with negative self-attitudes, poor adjustment, and paranoid tendencies. Decreases in vocal intensity were associated with schizoid modes of behavior, as measured by the above instruments. The relationships, while low, provide some support for the hypothesis.

In many ways the forementioned personality traits may be equated with the terms high anxious and low anxious. In the definition of anxiety involved in the development of the Taylor Manifest Anxiety Scale (TMAS) anxiety was assumed to be an index of a Ss reactivity or excitability. The high reactivity Spilka associated with exteroceptive reliance seems similar to the concept of high anxiety as measured by the TMAS. The lowered concern for environmental cues involved in Spilka's interoceptive group seems similar, in turn, to the low reactivity of the concept, low anxious.

Goldfarb and Braunstein (1958) provide further support for a relationship between personality variables and speech fluency in their study of DAF and schizophrenic children. Under normal conditions, schizophrenic children showed poorer speech in reading than did normal children. However, under conditions of DAF the schizophrenics experienced a wide range of disruption - no breakdown to severe disturbance -

while the normals all showed gross speech impairments.

The original conception of anxiety, as measured by the TMAS, was as a drive (D), in the Hullian system. D energizes all responses in the organism's response hierarchy in a multiplicative manner.

$$_{s}E_{r} = f(D \times {}_{s}H_{r})$$

(Where E = performance and H = Habit.)

From the above multiplicative relationship it has been hypothesized that under certain conditions anxiety will facilitate performance, while under other conditions anxiety will interfere with performance. Relatively simple learning situations, such as eyelid conditioning, have only one response elicited. It follows that $_{s}E_{r}$, defined by a measure of performance of that response, would be increased or enhanced by a high drive level. In the case of more complex learning situations, however, there are a range of responses which are elicited, only one of which may be correct. If this response is a highly dominant response anxiety should facilitate performance. If the response having the highest value of H happens not to be the correct response in this situation, anxiety should interfere with correct performance by facilitating the incorrect, dominant response.

In simple learning tasks the predicted facilitative effect of anxiety on performance has been found (Spence, and Taylor, 1951; Taylor, 1951; Spence, Farber, and Taylor, 1954). For example, high anxious Ss, as labeled by TMAS scores, learn a conditioned eyelid response faster than low anxious Ss.

The findings in more complex situations, while open to more question, still provide support for the basic hypothesis. Taylor and

Chapman (1955) reasoned that under conditions characterized by high intratask interference high anxious Ss would perform at a lower level than would low anxious Ss. This hypothesis was confirmed on a verbal paired associates learning task.

It would appear that reading under conditions of DAF is a complex task involving competing verbal responses to various arrays of letters and feedback from previous responses. It is therefore hypothesized that Ss high in anxiety, as measured by the TMAS, will make more errors on a reading task than low anxious Ss.

Spence, Farber, and Taylor (1954) found a relationship between electric shock and anxiety and the level of performance in eyelid conditioning. They found that high anxious Ss performed better under conditions of shock, or shock threat, than high anxious Ss under no threat of shock. Both of these groups performed better than low anxious Ss under similar conditions, although in the low anxious groups the shock or shock threat Ss performed at a higher level than the no shock group.

Considering the Spence, Farber, and Taylor (1954) result, it is further hypothesized that on a DAF reading task high anxious Ss who are threatened with shock for "too many" speech errors will commit more speech errors than those high anxious Ss not threatened with shock. In the same manner, low anxious Ss threatened with shock will commit more speech errors than those low anxious Ss under no shock threat.

Summary of the Review

1. The speech disruption caused in "normals" by DAF may be related to the stuttered speech of stutterers.

2. Stutterers may be a more anxious group, on the whole, than "normals."

3. If stutterers are characterized by anxiety, Neely's (1961) conclusion that ". . . an adequate account of stuttering behavior - or the more comprehensive stuttering problem - is not to be found in the auditory feedback mechanism." (p. 98) is subject to doubt.

4. Groups can be differentiated according to reaction to DAF on the basis of personality traits which seem to be related to the concepts of high anxiety and low anxiety as defined by the TMAS.

5. Anxiety does seem to affect performance. Whether anxiety facilitates or hinders performance depends on task variables. High anxiety tends to hinder performance on complex tasks. There seems adequate reason to consider reading under DAF a complex task.

6. It was hypothesized that levels of anxiety are related to speech errors under DAF such that high anxious Ss will commit more errors than low anxious Ss. It was further hypothesized that high anxious Ss who are threatened with shock would commit more speech errors than those high anxious Ss not threatened with shock and similarly that those low anxious Ss threatened with shock would make more speech errors than non-shock threatened low anxious Ss.

CHAPTER III

METHOD

Equipment

A Bell and Howell tape recorder, model 775A, modified for DAF by Lafayette Instrument Company was used to record each S's reading. A Scott Stereomaster amplifier, model 260-B, was added to the DAF channel. Speech was recorded through a Dynamic Unidyne III microphone, model 5455, series 2, mounted 6-8 inches in front of the Ss. Speech was fed back through a Koss SP5SM Stereo headset. The feedback volume was set at a level subjectively chosen by the experimenter (E) as slightly above the range of normal speech, 50-60 db. The delay time was .14 seconds.

Subjects

There were 48 Ss chosen from a group of 436 undergraduate males enrolled in Introduction to Psychology classes at Oklahoma State University.

Development of the Anxiety Variable

The above 436 undergraduates were administered a modified form of the TMAS. In addition to the 50 items of the TMAS 38 items from the K and L scales of the MMPI were on the inventory to mask the true nature

of the instrument. Only the 50 TMAS items were included in the scoring, however. The resulting distribution of scores had a mean of 15.82 and a standard deviation of 8.02. High and low anxious Ss were chosen from the top 60 and bottom 60 scores, respectively. From these 120 Ss 48 volunteers were used, 24 high and 24 low anxious Ss, all of whom were at least one standard deviation above or below the mean. The range of TMAS scores for the high anxious Ss was 25-40, while the range for low anxious Ss was 1-8.

Development of the Threat Variable

As Ss reported for the experiment they were placed in either the shock threat group (ST) or the non-shock threat group (NST) on a random basis. A panel with three lights, green, yellow, and red, was mounted on the table in front of the S. ST Ss were told that these were warning lights which would go on one at a time, from green to red, as "too many" errors in reading were committed. After the final light was turned on the Ss were told that if the errors continued they would be shocked through clip-on electrodes attached to two of their fingers. In actuality the lights were turned on after each quarter of the passage, the rationale being that, in this fashion, threat raised by the initial mentioning of shock could be maintained throughout the passage. Shock was not actually to be given to any S.

The NST group was simply asked to read the passage. No mention of counting speech errors was made, nor was mention of shock made.

Measurement of Speech Error Variable

All Ss were given the same passage to read. The passage was in a

controlled reading study guide at a level of the 11th and 12th grade reader. The guide was suggested by the Oklahoma State University Reading Center. The passage was composed of five pages, typewritten and covered with clear plastic. It was 1512 words long. As the Ss read, E, who sat opposite them and was somewhat screened from view by the recording equipment, marked speech errors on a separate scoring sheet, out of S's view. Speech errors consisted of the following:

A) Omissions - One for each word omitted.

B) Additions - One for each single word or group of words.

C) Misarticulations - One for each word unless that word was preceeded by a long pause, in which case the pause was counted.

D) Long pauses - One for each pause over two seconds or, between sentences, over four seconds - time subjectively noted.

E) Repetitions - One for each word repeated.

F) Prolongations - One for each word prolonged.

E rated each S's speech as they originally read the passage. Each reading was taped and as a reliability check a speech therapist rated tapes of the S's reading. E also rerated the Ss. Using Pearson's Product-Moment Correlation, intrarater reliability for E was .982; interrater reliability was .989. As a measure of overall rater reliability an average of inter- and intrarater reliability was computed yielding .986.

Procedure

Ss were seated in front of a desk which held the apparatus, and they were positioned so that they were approximately 6-8 inches from the microphone. Each S was asked if he had a hearing loss or a speech

problem, such as a lisp or stutter, that he knew of. Those Ss that had such problems, and there were three of them, were excused from the experiment.

The procedure followed thereafter depended upon whether S was in the NST or ST group.

NST Group

Each S in this group was told the following:

> I am studying reading behavior and I am going to give you an article to read aloud. You will, however, be reading under conditions of delayed auditory feedback. You will be wearing earphones and this tape recorder has been modified to play the sound of your voice back to you with a slight delay. This means that you will hear words you have just spoken a fraction of a second after you have said them. You may have some difficulty reading through the passages, however, don't be alarmed as this is quite often the case.

ST Group

Each S in this group was told the same as the NST group except for the following words, which were deleted: ". . .however, don't be alarmed as. . ." The following was added to the instructions for the ST group.

> Errors in your reading will be recorded and if too many are made you will receive an electric shock. You will be warned prior to this. The green light will go on first. If you continue to make errors the yellow light will go on. If the errors continue the red light will go on. If the errors continue beyond this point you will receive a shock.

All Ss were then given the headphones and told to put them on in a comfortable manner. The NST Ss began reading as soon as E said "you may begin." The ST Ss were fitted with clip-on electrodes attached to their index and little fingers on their non-dominant hand. They began

reading after the same final instruction.

CHAPTER IV

RESULTS

The major statistical analysis was a 2x2x4 factorial analysis of variance. The first factor was anxiety, with the two levels, high and low anxious. The second factor was shock, with the two levels, shock threat and no shock threat. The passage was divided into quarters which constituted the 3rd factor.

The performance of all four groups across quarters of the passage is presented in Figure 1. The high anxious groups (HST and HNST) are consistently higher than the low anxious groups (LST and LNST) in the number of speech errors per quarter. The same effect may be seen in a simpler presentation, Figure 2. In Figure 2 the data are collapsed over levels of practice.

Table 1 presents the results of an analysis of variance for the data found in Figure 1. The values of $\underline{F}$ for anxiety and for experience were significant beyond the .01 level. The $\underline{F}$ for threat conditions did not reach significance, nor did any of the interactions.

The Newman-Keuls multiple range test was used to test the difference between all possible pairs of means of errors made per quarter. The mean performance on the first quarter was significantly different from that of the second quarter, the third quarter, and the fourth quarter. All of the other possible differences were not significantly different. All of the significant differences found were significant

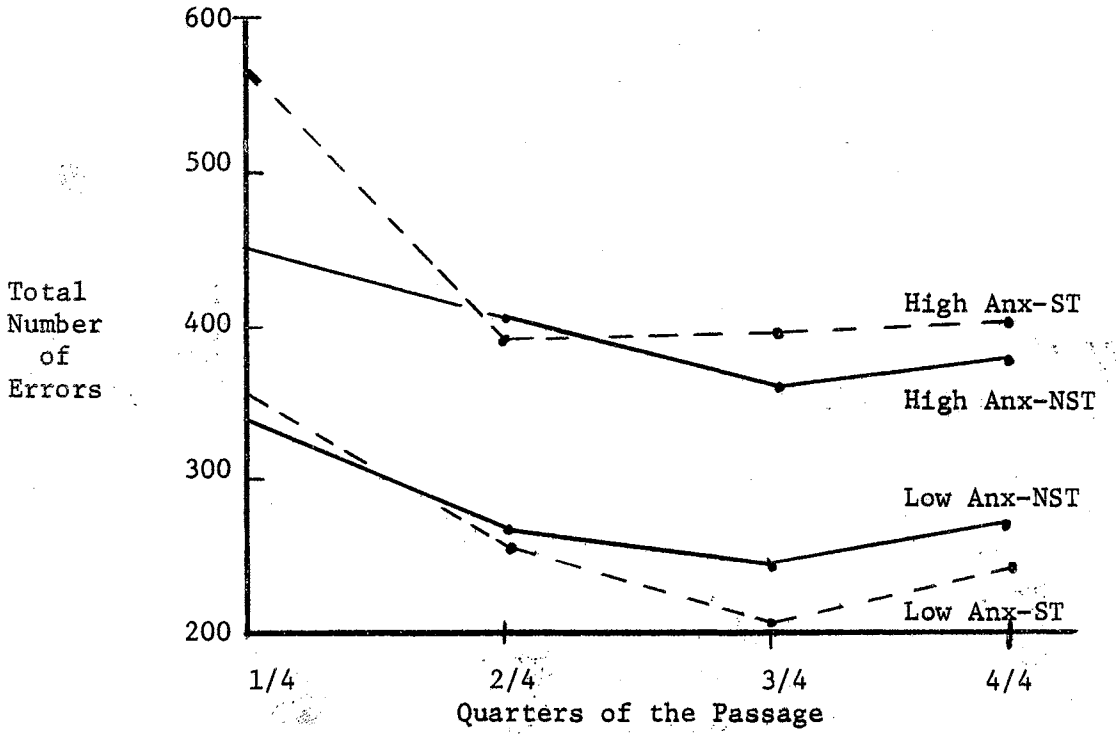

Figure 1. The Total Number of Speech Errors for Each of Four Groups Across Quarters of the Passage

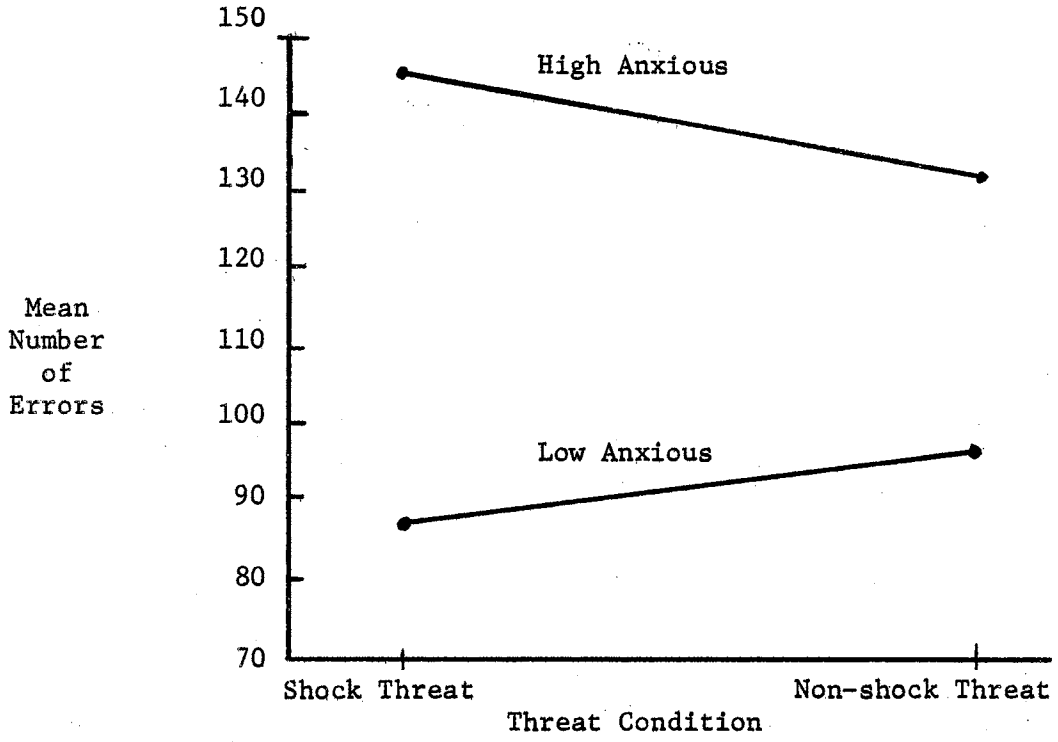

Figure 2. The Mean Number of Speech Errors for High and Low Anxious Subjects Under Two Conditions of Threat

TABLE I

ANALYSIS OF VARIANCE OF SPEECH ERRORS PER QUARTER

Source of Variation	SS	df	MS	F	P
Between Subjects	41,563.75	47			
A(TMAS)	6,972.13	1	6,972.13	8.95	< .01
B(Induced Threat)	23.39	1	23.39	.03	> .01
AB	287.62	1	287.62	.37	> .01
Subjects within groups [Error(Between)]	34,280.61	44	779.10		
Within Subjects	9,278.50	144			
C(Trials)	2,954.43	3	984.81	22.12	< .01
AC	59.48	3	19.83	.45	> .01
BC	283.55	3	94.52	2.12	> .01
ABC	104.40	3	34.80	.78	> .01
CxSubjects within groups [Error(within)]	5,876.64	132	44.52		

TABLE II

MEAN NUMBER OF SPEECH ERRORS PER QUARTER

		1st	2nd	3rd	4th	Overall Means
High Anx-ST	Mean	46.5	32.6	33.3	33.3	145.9
	SD	26.9	15.7	18.2	18.8	
High Anx-NST	Mean	37.6	33.6	30.6	31.5	133.4
	SD	11.6	12.8	11.4	16.0	
Low Anx-ST	Mean	29.5	21.2	16.8	20.5	88.9
	SD	16.4	10.7	10.1	13.3	
Low Anx-NST	Mean	28.6	22.6	20.6	23.1	95.0
	SD	13.9	12.4	11.8	12.2	
Overall Means		35.5	27.5	25.4	27.1	

at the .01 level or better. Table 3 has been inserted to summarize the results of the Newman-Keuls Test.

TABLE III

TESTS ON MEANS USING NEWMAN-KEULS PROCEDURE

Quarters		C_3	C_4	C_2	C_1
Ordered Means		25.3	27.2	27.6	35.5
		C_3	C_4	C_2	C_1
Differences	C_3		1.9	2.3	10.2
Between	C_4			.4	8.3
Pairs	C_2				7.9

$S_B = .963$ Df = 132

r =	2	3	4
$S_B q_{.99}$ (r,132)	3.56	4.04	4.33

	C_3	C_4	C_2	C_1
C_3	-	-	-	*
C_4	-	-	-	*
C_2	-	-	-	*

*Means significantly different from each other at the .01 level.

CHAPTER V

DISCUSSION

Anxiety did prove to be a significant factor. Also, in the direction of the hypothesis, the HST group had committed numerically more errors than the HNST group, although the difference did not reach significance. The opposite results, however, occurred with the LST and LSNT groups, although, again, the differences between the two groups did not reach significance. Although the interaction between anxiety and conditions of threat was not significant the disparity between results and hypothesis may possibly be found in the problem of what constituted threat. Spence, Farber, and Taylor (1954) found that under no shock or threat of shock differences between high and low anxious Ss were small and not significant. They proposed that differences between high and low anxious Ss would be a function of the degree of noxiousness or threat in the experimental situation. Possible the threat without any experience with shock is not particularly effective in arousing true emotionality, particularly for low anxious Ss. If Ss were allowed to set a level of shock at their individual thresholds for pain quite possible the initial experience could make the threat of shock become a clear and present danger. Spence, et al, (1954) found that when shock was introduced, or when threat of shock, which had been preceded by experience with shock, was used, the difference between low and high anxious Ss was significant.

Another significant effect was experience. For all groups other than the HST group errors declined from the first quarter through the third quarter. There was an increase in errors in the fourth quarter for all groups although this increase began during the third quarter for the HST group. The initial decline might well be an adaptation effect which has been found in the past (Winchester, Gibbons, and Krebs, 1959). The increase of errors over the final quarter has not been previously reported. The reading task in this study is longer than most tasks reported on in the literature. There is a possibility that fatigue was a factor involved, particularly in that it seemed to affect all groups across levels of anxiety and conditions of threat. Lee (1950) has observed that reading under DAF can be a fatigueing experience as shown by marked emotional tension, frustration, and reddening of the face resulting from only short periods of contact with DAF.

It may be seen then, that speech under DAF is at least a function of level of anxiety and possibly the more acute condition of threat at the time of speech. A replication of Neely's (1961) study would seem to be in order. In such a replication the anxiety levels of the "normals" would be controlled. It might well be found that high anxious, threatened normals behave in a manner more similar to stutterers than low anxious normals. It is doubtful that a 1:1 correspondence between the stuttering pattern of stutterers and that of normals under DAF could be reached due to the transient nature of DAF experiments.

The literature seems to lead to a conclusion that some physiological defect, quite possibly in the feedback mechanism, is to be found among stutterers. The data found in this study indicates, however, that high and low anxious Ss react differentially to an artificially

induced feedback "defect." These findings would lead to a possible reproachment between the more physiological theories of etiology, the "breakdown" hypotheses, and the psychogenic etiology, and "anticipatory struggle" hypotheses (Bloodstein, 1959). The physiological defect may cause an initial problem with speech. However, the reaction to the initial stress may be a key factor. If ridicule and/or punishment is frequently meted out for poor speech, anxiety may develop at a high level. In a society as verbal as our own a high level of anxiety about speech would be maintained almost constantly. Mednick (1958) has shown that not only do high anxious Ss condition more rapidly but they also show significantly greater generalization. In such a manner anxiety developed originally in specific situations involving speech could generalize to the many situations involving verbal behavior. In such a manner this high level of anxiety would contribute to the maintenance of a higher than average number of speech errors. If the anxiety reaction to speech were kept at a low level, the generalization effect created by states of high anxiety might be kept at a low level, and through adaptation to everyday speech, one might "outgrow" stuttering.

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APPENDIX A

EXPERIMENTAL READING PASSAGE

Before a hushed audience of perspiring farmers and their wives, a gaunt, sallow man with lank hair falling to his shoulders motioned for quiet. Behind him, on a stage lit with candles backed by tin reflectors, a boy of twelve lay with his feet on one chair, his shoulders on another. On his mid-section reposed a king-sized rock.

The hypnotist announced in his melodious voice, "And now, ladies and gentlemen, a demonstration of the uncanny powers of mind over matter. You see here a young man in a perfect cataleptic trance in which his body assumes the rigidity of an iron bar. I shall take this sledge hammer and apply sufficient force to this paving stone to smash it, without waking the lad or causing him the slightest injury."

He swung the sledge. The rock split and fell to the floor with resounding thumps. The boy remained stretched between chairs, as immobile as a statue.

The stone-breaking routine is as old as the hills, but it is still in use. The rigidity of catalepsy is imitated by taking a very short person, such as a wiry girl or young boy, and placing his shoulders on one chair, his feet on another. This position can be held for some time. The "paving stone" is a hunk of soft sandstone. The blow which breaks it is distributed through the bulk of the stone and is not felt by the subject underneath.

Let there be no doubt that there is such a thing as hypnotism. It had been known for thousands of years to the learned men of the Far East when, nearly 200 years ago, it began to be studied by Western medical men. The first of them to recognize its possibilities was Anton Mesmer, who, in Paris in the 1780's, was acclaimed a miraculous healer. His power, he said, came from "magnetism" applied to physical ills through magnets, magnetized water, and bottles of iron filings. He did "cure" a lot of people, although they may have felt a little rusty afterward. What had effected the cures was hypnotic suggestion, helped by his prestige and the elaborate magnetic contraptions.

Just what is hypnotism? So far as we know, it is a state of mind resembling sleep, artificially induced by outside suggestions: those of a hypnotist. It is not true sleep. A hypnotized subject can be left standing rigid in the center of a stage. No one could do this in normal sleep.

There are many methods of inducing a hypnotic trance, but all have one thing in common. The subject's attention is caught and held on some object: the tip of a pencil held above the level of the eyes, a finger or even a glaring glass eye held in the fist of the operator. Whatever it is, the subject is told to gaze at it steadily. Soon his eye muscles tire and his eyes begin to droop or flicker. At this point the hypnotist tells him that his eyelids are growing heavy, a feeling of drowsiness is overcoming him, he is sinking deeper and deeper into a dreamless sleep.

About one out of five persons actually goes right to "sleep" at this point. But while the subject seems to be asleep he is attentive to commands by the hypnotist. State hypnotists, however, do not always

rely on real hypnotism. Many times they use stooges for dramatic effects.

A friend I call Professor, a retired hypnotist, is a gold mine of data on pseudo hypnosis. "It's very seldom you see an operator who does a full shoe of nothing but fake stuff," he explains. "The reason is that it's easier to use real hypnosis, after you get the hang of it, than to train stooges to act hypnotized. A good hypnotist's subject will give a better performance than any stooge. And you don't have to pay him; he's already paid you for a ticket."

"When you get enough experience you can pick out your 'one-in-fives' easy enough. Only one person in five, on an average, will go into deep hypnosis the first crack out of the box. So you get a good-sized crowd on stage and tell 'em to clasp their hands. Then you give them a lot of suggestions that their hands are stuck fast, they can't open them no matter how hard they try, and so on. If you watch you'll be able to pick out those who really can't open their hands until you tell them they can. They're your prospects. A couple of other tests will screen out the very best ones. You can usually get at least three from a crown of twenty-five. Then you go to town."

"Right from the first you start conditioning the audience in a belief in your powers. There's nothing like a couple of set-up demonstrations to get them to believing that you really do what you say you will."

The professor would seat his volunteers in a large semicircle on stage and give a brief orientation talk on the powers of suggestion. Then he would take a silver sugar bowl from a side table.

"I shall hold this lump of sugar in the air above your heads, and

one at a time I shall command you to taste the sugar without touching it. Please raise your hand when the sweet taste registers on your tongue."

Under one armpit he had hidden a bulb filled with saccharin powder. A rubber tube as thin as a knitting needle was taped to his arm, leading from the bulb to the edge of his shirt cuff. At the opportune moment a squeeze of the arm sent a little puff of saccharin into the air about the subject's face. Licking his lips, the gullible fellow naturally tasted the saccharin and was convinced of the suggestive powers of the hypnotist.

"In working the sticks, barnstorming," the professor told me in a reminiscent mood, "you'd invariably come up against some tough customers. Every now and then one would force his way on stage and roar out a challenge to hypnotize him."

"For such hard cases I had a beautiful system. After asking if his heart were sound, I would lead the loudmouth to a sort of throne, an armchair on a little platform. On each side is an incense burner, going full blast. You seat the skeptic in the chair and have him loosen his collar and tie. With mystic passes you set out telling him that he is getting drowsy, his eyelids feel heavier and heavier."

"Now this is a combination of hypnosis and devious trickery. For in one hip pocket you have a flat flask of chloroform. In your side pocket is a rubber bulb connected with the flask by a tube. Another tube leads from the flask up your sleeve and down to the cuff. As one hand makes the passes, the other goes to the side pocket and starts squeezing the bulb, which sends a spray of anesthetic into his face. The incense hides the acrid odor of the chloroform."

"You don't put a man all the way out with the chloroform, of course. It just knocks the cutting edge off his conscious mind so that the suggestion can begin to work, and he's under."

Although hypnotism was rediscovered by the West only a century ago, there is little about it that is really new. Even its most recent development, the use of sedatives to assist in creating a hypnotic trance, goes all the way back to earliest times. Modern investigators have found that the administration of a drug derived from Cannabis indica, sometimes called "Indian Princess" or more commonly, marijuana, a plant found all over the world, enables them to hypnotize the insane and other subjects not accessible to suggestion alone.

Yet witch doctors since the dawn ages have known the Indian Princess. The witch doctor places his patient on a mat, kindles a fire and, throwing herbs on it, fans the smoke into the patient's face. If the herbs contain a few leaves of Canabis indica, the suggestions given during the treatment take effect with sledge-hammer power.

And finally, science has given hypnotism a gimmick which is today one of the most closely guarded secrets of the art. To the electronics expert it's a simple device: an oscillator tube hooked up to an amplifier. Set up in the wings of the stage, it is tuned up until its squeal is just out of range of the human ear. Then the volume is turned on full force. There is something about this silent screech, according to hypnotists, that makes ordinary people unusually susceptible to hypnosis and makes good hypnotic subjects fall over like tenpins.

But as one operator recently told me, "You want to watch out with that oscillator that you don't get yourself groggy with it. I nearly

flu-fed a show until I regained my composure enough to tell my assistant backstage to turn the darned thing off; it was knocking me out."

APPENDIX B

REVISED VERSION OF TAYLOR MANIFEST ANXIETY SCALE

Do not write or mark on this booklet in any way. Your answers to the statements in this inventory are to be recorded only on the separate Answer Sheet.

The Statements in this booklet represent experiences, ways of doing things, or beliefs or preferences that are true of some people but are not true of others. Read each statement and decide whether or not it is true with respect to yourself. If it is true or mostly true, blacken the answer space in column T on the Answer Sheet in the row numbered the same as the statement you are answering. If the statement is not usually true or is not true at all, blacken the space in column F in the numbered row. Answer the statements as carefully and honestly as you can. There are no correct or wrong answers. We are interested in the way you work and in the things you believe. Sometimes it may be difficult to make a decision, but please answer every item either true or false without skipping any.

REMEMBER: Mark the answer space in column T if the statement is true or mostly true; mark the answer space in column F if the statement is false or mostly false. Be sure the space you blacken is in the row numbered the same as the item you are answering. Mark each item as you come to it; be sure to mark one and only one answer space for each item. Here is an example:

	T	F
I would like to be an artist.	II	II

If you would like to be an artist, that is, if the statement is true as far as you are concerned, you would mark the answer space under T. If the statement is false, you would mark the space under F.

If you have any questions, please ask them now.

DO NOT MARK ON THIS BOOKLET

1. Once in a while I think of things too bad to talk about.
2. I find it hard to keep my mind on a task or job.
3. I blush as often as others.
4. I do not always tell the truth.

5. People often disappoint me.

6. I get angry sometimes.

7. I am easily embarrassed.

8. It makes me nervous to have to wait.

9. I sweat very easily even on cool days.

10. I frequently notice my hand shakes when I try to do something.

11. I have often felt that I faced so many difficulties I could not overcome them.

12. Sometimes when I am not feeling well I am cross.

13. I cannot keep my mind on one thing.

14. When in a group of people I have trouble thinking of the right things to talk about.

15. If I could get into a movie without paying and be sure I was not seen I would probably do it.

16. Often my bowels don't move for several days at a time.

17. I often find myself worrying about something.

18. I do not have as many fears as my friends.

19. At times I think I am no good at all.

20. I like to know some important people because it makes me feel important.

21. I do not tire quickly.

22. At times I have been worried beyond reason about something that really did not matter.

23. I do not like everyone I know.

24. I am more self-conscious than most people.

25. I am a very nervous person.

26. I am not afraid to handle money.

27. My family does not like the work I have chosen (or the work I intend to choose for my life work).

28. I gossip a little at times.

29. Sometimes at elections I vote for men about whom I know very little.

30. I am the kind of person who takes things hard.

31. My feelings are hurt easier than most people.

32. I worry over money and business.

33. My parents and family find more fault with me than they should.

34. I often dream about things I con't like to tell other people.

35. I am liked by most people who know me.

36. I have reason for feeling jealous of one or more members of my family.

37. Once in a while I laugh at a dirty joke.

38. At times I lose sleep over worry.

39. At times I feel like swearing.

40. Sometimes I become so excited that I find it hard to get to sleep.

41. No one cares much what happens to you.

42. I do not read every editorial in the newspaper every day.

43. I feel anxious about something or someone almost all of the time.

44. Once in a while I put off until tomorrow what I ought to do today.

45. Most anytime I would rather sit and daydream than to do anything else.

46. Life is often a strain for me.

47. I have diarrhea ("the runs") once a month or more.

48. At times I am so restless that I cannot sit in a chair for very long.

49. My table manners are not quite as good at home as when I am out in company.

50. Criticism or scolding hurts me terribly.

51. I am often sick to my stomach.

52. I usually expect to succeed in things I do.

53. I am very confident of myself.

54. I cry easily.

55. I am often afraid that I am going to blush.

56. I have nightmares every few nights.

57. I don't like to face a difficulty or make an important decision.

58. I certainly feel useless at times.

59. It does not bother me particularly to see animals suffer.

60. I have a great deal of stomach trouble.

61. When embarrassed I often break out in a sweat which is very annoying.

62. It makes me uncomfortable to put on a stunt at a party even when others are doing the same sort of things.

63. I have very few headaches.

64. I am happy most of the time.

65. My hands and feet are usually warm enough.

66. I would rather win than lose a game.

67. I am not at all confident of myself.

68. I feel hungry almost all the time.

69. I have very few quarrels with members of my family.

70. I do not often notice my heart pounding and I am seldom short of breath.

71. At times my thoughts have raced ahead faster than I could speak them.

72. I am usually calm and not easily upset.

73. I am about as nervous as other people.

74. I work under a great deal of strain.

75. Often I can't understand why I have been so cross and grouchy.

76. At times I feel that I am going to crack up.

77. At times I am all full of energy.

78. I wish I could be as happy as others.

79. I often think "I wish I were a child again."

80. It makes me impatient to have people ask my advice or otherwise interrupt me when I am working on something important.

81. I have been afraid of things or people that I knew could not hurt me.

82. I worry quite a bit over possible troubles.

83. I have had periods in which I carried on activities without knowing later what I had been doing.

84. I find it hard to set aside a task that I have undertaken, even for a short time.

85. My sleep is restless and disturbed.

86. I can easily make other people afraid of me, and sometimes do for the fun of it.

87. I practically never blush.

88. I am never happier than when alone.

VITA

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Education: Graduated from Milby High School, Houston, Texas in May, 1961; attended Texas A&M University from 1961 to 1966; received the Bachelor of Science Degree from Texas A&M University in 1966. Interned at Diagnostic Center, Texas Department of Corrections, through the Contemporary Institute of Corrections at Sam Houston State College. Member Psi Chi, National Honor Society in Psychology and Alpha Kappa Delta, National Honor Society is Sociology; completed requirements for the Master of Science Degree at Oklahoma State University in May, 1969.

Professional Experience: Research Assistant, Psychology Department, Oklahoma State University, 1966-1967; Staff Psychologist Southeast Kansas Mental Health Center, Summer 1967, Teaching Assistant, Psychology Department, Oklahoma State University, 1967-1968; Psychologist, Larned State Hospital, Summer 1968.