THE RELATIONSHIP OF AUDITORY VIGILANCE TO ARTICULATORY DISORDERS

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ABSTRACT

THE RELATIONSHIP OF AUDITORY VIGILANCE
TO ARTICULATORY DISORDERS

by Doris A. Schuldt

The purpose of this study is to test the hypothesis that children with articulatory disorders will manifest greater deficiency in auditory vigilance than will children without such speech defects. Vigilance has been conceptualized as sustained attention. A significant decrement in the maintenance of attention is conceived by this writer to be a possible contributing factor in the development of articulatory disorders. A young child hears, he attends, he discriminates and reproduces sound. If a young child is able to hear but does not maintain attention, he may have difficulty in adequate discrimination and reproduction of sound. If such behavior persists during the critical stage of speech development, articulatory problems may result because of the dominance of such auditory attentional habits.

Two groups of subjects were selected -- children with known articulatory disorders and children without articulatory disorders. A total of thirty-eight subjects were used -- nineteen subjects in each group.

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A tape-recording was prepared that consisted of randomly selected digits presented at the rate of one every other second for a total of fifteen minutes. Signals, which required a response, were inserted and defined as any number presented twice in succession. A total of fifteen signals was inserted within the fifteen-minute testing period; one signal was randomly inserted within each one-minute segment. The task required by each subject was to detect the presentation of each signal and respond by drawing a line on his or her paper.

The level of vigilance was inferred from the performance by the number of signals to which the subject did not respond. Criterion measures were twofold: (1) errors of omission, lack of response when a signal was presented; and (2) errors of commission, a response when the signal was not presented.

The basic hypothesis was not given support by any of the statistical analyses in that no significant differences were noted. However, minimum support was noted in that errors of omission and commission for the two groups were in the predicted direction.

It was felt that the lack of available subjects and insufficient length of the experimental task may have contributed to the nonsignificant results.

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Decrements in vigilance can be attributed to the extinction of the listening response. Thus, it was suggested that the experimental task used in this research was not of sufficient length so as to allow extinction of the listening response to occur. Therefore, differential decrements in vigilance could not be elicited.

The present research appears to be unique in the area of auditory vigilance in that it utilizes children as subjects and attempts to assess the relationship of auditory vigilance to articulatory disorders. It was hoped that this study will serve to stimulate further research to delineate the role of auditory vigilance in the development of articulatory disorders.

Approved James W. Hillis, Thesis Advisor

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CHAPTER I

STATEMENT OF THE PROBLEM

Introduction

Functional articulatory disorders constitute a highly significant group in the basic field of speech pathology. A varied approach in research has been exemplified in the unfolding of functional determinants in articulatory disorders. Powers, in her review of the literature, has cited numerous studies in the area of articulation which have involved such variables as physical, psychophysical, intellectual, environmental, learning, emotional and personality. It appears that the area of auditory variables has been one of the foremost areas of investigation. The research in this area has centered primarily upon -- basic acuity for pure tones, acuity for the higher frequencies, pitch discrimination, speech sound discrimination, auditory memory span and perception for complex auditory patterns.[1]

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[1]Lee Edward Travis (ed.), Handbook of Speech Pathology (New York: Appleton-Century-Crofts, Inc., 1957), pp. 738-746.

It is felt that an area of research which has been neglected in articulatory disorders is that of auditory attentional habits. Van Riper stated, "We have found that most inadequate auditory discrimination or memory span is due to a lack of directed attention...."[1] Moreover, Powers has stressed that "It has long been this writer's clinical observation that many functional articulatory cases are inattentive to sound differences. If pushed, they can usually discriminate as well as normal speakers but they do not habitually do so. We have to evaluate, therefore, not only auditory capacities but also auditory habits or -- perhaps more accurately -- attentional habits as related to sound."[2]

Vigilance, which can be conceptualized as sustained attention, has been investigated recently in the field of psychology. It seems to this writer that such research may be of significance to the neglected area of auditory attentional habits in that the maintenance of attention seems vital in the development of adequate discrimination and production of sound.

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[1]Charles Van Riper, Speech Correction: Principles and Methods (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1954), p. 215.

[2]Travis, op. cit., p. 745.

Statement of the Problem and Purpose of the Study

Audition has been long recognized as an essential factor in the development of acceptable speech patterns. Hearing deficiencies result in varying degrees of distorted speech patterns that are dependent upon the severity of the hearing deficiency.

If a young child does not attend sufficiently to sound stimulation during the critical stage for speech development, is it then possible that improper speech patterns will result? A young child hears, he attends, he discriminates and reproduces. If a young child is able to hear but does not maintain attention, he may have difficulty in adequate discrimination and reproduction of sound. If such behavior persists during the early developmental years of life, it appears to this writer that articulatory problems will result because of insufficient attention to sound stimuli. Therefore, the purpose of this research is to investigate whether or not there is a difference in auditory vigilance, or the maintenance of attention, between children with articulatory disorders and children without articulatory disorders.

Hypothesis

It is hypothesized that children with articulatory disorders will manifest greater deficiency in auditory vigilance than will children without such defects.

Importance of this Study

It is hoped that this study will reveal a possible contributing factor in the development of functional articulatory disorders. Is it possible that what is thought to be a discrimination problem, is, in reality, an attentional variable? As previously mentioned, Powers suggested that children with articulatory problems can discriminate, if encouraged to do so. However, they do not habitually do so because of improper attentional habits.

Inaddition to the etiological consideration, therapeutic techniques might be improved if such information concerning attentional habits was available. If children with articulatory problems are more deficient in auditory vigilance than children without such defects, then the clinician would need to design the therapy so as to maximize the maintenance of attention.

It is hoped that the present research might stimulate additional investigation in the area of

auditory vigilance and its relationship to functional articulatory disorders.

Definition of Terms

For purpose of this study the terms used are defined in the following manner:

Powers has defined a functional articulatory disorder as "...an inability to produce correctly all of the standard speech sounds of the language, an inability for which there is no appreciable structural, physiological, or neurological basis in the speech mechanism or its supporting structures, but which can be accounted for by normal variations in the organism or by environmental or psychological factors."[1]

Mackworth theoretically defined vigilance as "...a state of readiness to detect and respond to certain specified small changes occurring at random time intervals in the environment...."[2] Experimentally, the level of vigilance can be inferred from the performance by the number of signals to which the listener does not respond.[3]

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[1] Ibid., p. 708.

[2] N. H. Mackworth, "Some factors affecting vigilance," Advancement of Science, 53 (1957), pp. 389-390.

[3] N. H. Mackworth, Researches on the Measurement of Human Performance, London: H.M.S.O. Medical Res. Council Spec. Rep. Ser. No. 263.

Organization of Thesis

Chapter I has contained an introduction to the area of vigilance and its possible relationship to the development of functional articulatory disorders. Thereafter, a statement of the problem and purpose of the study was presented. Also, a hypothesis, a statement of the importance of the study, definitions of terms and an outline clarifying the organization of the thesis were presented.

Chapter II will consist of a review of the literature in the area of vigilance. Studies will be cited from the fields of speech and hearing, psychology and general communication.

Chapter III will consist of an elaboration of subjects, equipment and methods. Subareas within methods will be auditory stimulus material and testing procedures.

Chapter IV will include a section consisting of the results. Statistical analyses will be discussed. The Chapter will conclude with a discussion section conerning the results.

Chapter V will consist of a summary, conclusions and implications for future research.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

Vigilance may be considered as being subsumed under the broad area of attention. English and English defined attention as "...the active selection of, and emphasis on, one component of a complex range of objects to which the organism is respondent; the maintenance of a perceptual set for one object and the disregard for others...."[1] Early research has focused upon five problem areas of attention:

(1) Determiners of attention: Which stimuli will be selected through attention and what responses will be elicited?

(2) Shifting and fluctuations of attention: Does the response fluctuate in strength or shift from one stimulus to another?

(3) Distraction: What irrelevant stimuli, and to what degree, will tend to distract individuals from the assigned task?

(4) Divided attention: How well can an individual do two things at one time?

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[1]Horace B. English and Ava C. English, A Comprehensive Dictionary of Psychological and Psychoanalytical Terms (New York: Longmans, Green and Co., 1959), p. 49.

(5) Span of attention: How well can an individual make a single comprehensive response to a collection of stimuli?[1]

Recently, much interest has been generated in a new area of attention research -- vigilance. As the reader will recall, vigilance may be conceptualized as sustained attention. Bakan defined vigilance "...as the ability to sustain attention quite irrespective of what the stimuli are...."[2]

Basically, two criteria have been utilized in the measurement of vigilance:

(1) Total of unreported signals;

(2) Size of signal before it is reported and detected.[3]

A recent comprehensive review of the literature has delineated nine major variables which are known to affect performance on a vigilance task. They are as follows:

(1) Rate of signal presentation: A greater percentage of signals is detected with an increase in rate of signal presentation;

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[1]Robert Woodworth and Harold Schlosberg, Experimental Psychology (New York: Henry Holt and Co., 1955), pp. 73-74.

[2]Donald Buckner (ed.), Vigilance: A Symposium (New York: McGraw-Hill Book Co., Inc., 1963), Chapter 2, p. 30.

[3]Mackworth, Advancement of Science, p. 390.

(2) Intersignal interval: Increased regularity of intersignal intervals leads to more signal detections;

(3) Signal magnitude: Signals of large magnitude (size, duration, intensity) escape detection less frequently than those of smaller magnitude;

(4) Knowledge of results: Information about performance during a vigilance task minimizes, prevents or postpones a decrement in performance on the task;

(5) Environmental factors: Distractions which compete for attention in vigilance task will lower apparent signal frequency and consequently result in deteriorated performance;

(6) Knowledge of signal location: When signals appear at locations which cannot be predicted, performance is generally poorer than when location is known;

(7) Periods of interpolated rest and activity: The level of performance on vigilance task returns after a period of rest or an interpolated activity, to that observed near to task beginning;

(8) Sudden intense extraneous stimuli: A blast of 115db of noise (truck horn) lasting 0.5 second when a signal was not detected maintained vigilance performance at a high level;

(9) Motivation: Motivation level determines the initial level of performance on a vigilance task and may

expedite or postpone the onset of a decrement in performance.[1]

According to Bakan most of the experimental work with vigilance tasks has involved environmental variables such as auditory noise, humidity, isolation and the like. Some of the research investigated task variables such as length of vigil, signal intensity and deviation, frequency of signal, interpolated rests and the like. The least research has been done in the area of subject variables which have included studies on the effect of drugs, sleep deprivation, rest periods, knowledge of results and individual differences.[2] Bakan has stressed the need for research in isolating individual-difference parameters in vigilance performance.[3]

Research results have shown consistently that a decline in signal detection is usually characteristic of average performance of a group. However, most investigators have reported wide individual differences in susceptibility to a decline. The fact that some individuals do not manifest a decline during a vigilance task suggests

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[1]Buckner, op. cit., Chapter 11, pp. 136-144.

[2]Paul Bakan, "Extraversion-introversion and improvement in an auditory vigilance task," British Journal of Psychology, 50, (1959), p. 325.

[3]Buckner, op. cit., Chapter 2, p. 22.

that subject variables as well as task and environmental variables play an important role in vigilance behavior. In this review the author would like to emphasize recent research involving subject variables.

Vigilance Studies: Subject Variables

In 1960, McGrath et al. investigated the problem of discovering or developing predictors of vigilance performance. Since large individual differences have resulted consistently in vigilance research, an attempt was made to find positive relationship between a large number of behavioral measures and criteria of performance on vigilance tasks. Thirty-five different test variables were studied. It was found that scores on none of them consistently correlated with measures of performance on the vigilance task used.[1]

Various studies have been designed to assess the relationship between general intelligence and vigilance performance. McGrath reviewed a number of these studies and there appears to be no significant relationship between measures of general intelligence and vigilance performance.[2]

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[1]J. McGrath, A. Harabedian and D. Buckner, "An exploratory study of the correlates of vigilance performance," Human Factor Problems in ASW Technical Report (Los Angeles: Human Factors Research, Inc., 1960), No. 4.

[2]Buckner, op. cit., Chapter 10, p. 118.

A study by Bakan systematically analyzed retrospective reports taken from subjects at the conclusion of a vigilance task. The author attempted to shed some light upon the wide variation found among subjects participating in the same vigilance task. "An analysis of these responses in terms of degree to which subjects agree with each item suggests the following:

(1) The task has a soporific effect for most subjects.

(2) Continuous concentration is not characteristic of the behavior of subjects in this task.

(3) The detection of a signal makes the subject feel good.

(4) The overall motivation of subjects is good."[1]

Therefore, it appears that a complex of subjective factors is related to signal-detection performance in a vigilance task.

Eysenck[2] and Broadbent[3] suggest that the personality dimension extraversion-introversion is a correlate of decremental performance in vigilance tasks. An early study by Bakan has shown that the hypothesis of greater

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[1] Ibid., Chapter 7, p. 99.

[2] H. Eysenck, The Maudsley Personality Inventory (London: University Press, 1959).

[3] D. Broadbent, Perception and Communication (London: Pergamon Press, 1959), p. 150.

decrement for extraverts was not supported.[1] However, a recent study with improved methodology and controls has supported such a relationship.[2]

Auditory Vigilance as related to Speech and Hearing:

This writer has noted that there is a lack of research using children as subjects in vigilance tasks. Moreover, to the writer's knowledge, there is a complete lack of research in determining the nature of the relationship between auditory vigilance and articulatory disorders. As was previously noted, Powers and Van Riper stressed the importance of attention in the etiology of articulatory disorders. However, researchers within the field of speech and hearing seem to have neglected vigilance. They appear to have assumed the factor of attention in their studies of auditory discrimination, auditory memory span and the like but have not empirically evaluated it in isolation.

Recently, the editors of dshAbstracts have recognized this area in that they have included studies in vigilance designed to evaluate the role of expectancy, cutaneous and

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[1]Paul Bakan, "Extraversion-introversion and improvement in an auditory vigilance task," British Journal of Psychology, 50, (1959), p. 325.

[2]Buckner, op. cit., Chapter 2, pp. 22-28.

auditory signals and the effect of aging.[1] None of these studies, however, seem significantly relevant to this review.

Auditory Vigilance as related to Listening:

Listening is generally viewed by authorities in the area as one of the components of the language arts -- reading, writing, speaking and listening. Anderson stressed that quantitatively viewed, it is the most important of the four language arts.[2] It can be conceived as an assimilative skill which serves as a vehicle in the interplay of ideas via the expressive form of oral language. As Barbe clarified, "Listening is a process of reacting to, interpreting and relating the spoken language...."[3]

Listening is commonly viewed within an auditory context. However, deaf and hard-of-hearing individuals can be trained to lipread as a means of reacting to, interpreting and relating the spoken language. Oyer and O'Neill applied the term "visual listening" to this communicative

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[1]American Speech and Hearing Association and Gallaudet College, Deafness, Speech, Hearing Abstracts (Danville, Illinois: Deafness, Speech and Hearing Publications, 1961), Vol. 2.

[2]Harold Anderson, "Needed Research in Listening," Elementary English, 24 (1952), p. 217.

[3]Walter Barbe and Robert Myers, "Developing Listening Ability in Children," Elementary English, 31, (1954), pp. 82-84.

process. It is to be noted that these authors do not propose to adopt this term but use it only to delineate the similarity between auditory and visual performance.[1]

Keller presented a comprehensive review of the literature in listening and cited significant findings during the past ten years. Listening was consistently defined in terms of comprehension and all the studies assumed this viewpoint.[2]

In common parlance, vigilance has been confused with listening. It is to be emphasized that these are two distinct processess -- vigilance involving the maintenance of attention irrespective of stimuli and listening involving the comprehension of oral language. It is felt that studies should be designed to assess independently these factors. Such a study has been done by Galambos in his assessment of the neurophysiological concomitants of attention in auditory experiences. His results indicated that an attentive animal displays more activity in a larger number of brain locations than does an inattentive animal.[3]

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[1]John J. O'Neill and Herbert J. Oyer, Visual Communication (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1961), pp. 5-6.

[2]Paul Keller, "Major findings in listening in the past ten years," Journal of Communication, 10 (1960), pp. 29-38.

[3]Ralph Galambos, "Some Recent Experiments on the Neurophysiology of Hearing," Annals of Otology, Rhinology and Laryngology, 60 (1956), pp. 1053-1059.

The present study is designed to evaluate auditory vigilance and its relationship to articulatory disorders with a minimal amount of contamination by comprehension.

CHAPTER III

SUBJECTS, EQUIPMENT AND METHODS

Subjects

Two groups of subjects were selected -- children with articulatory disorders and children without such speech disorders. Subjects were enrolled in one of two Catholic parochial schools -- St. Therese and Holy Cross -- both in the area of Lansing, Michigan. Subjects were limited to those children in the first and second grade. Ten subjects for each group were selected from St. Therese and nine subjects for each group were selected from Holy Cross. An auditory screening test -- sweep check -- had been administered by the Michigan Department of Health Hearing Conservation Section to twenty-eight subjects within the past two months and ten subjects within the past twelve months. Those children who did not pass the auditory screening test were eliminated as subjects.

The experimental group consisted of seven girls and twelve boys whose records indicated that they had been diagnosed recently by a speech clinician as exhibiting articulatory problems. Five subjects were in the second grade and fourteen subjects were in the first grade. The mean age for this group was 6.59.

The control group consisted of eleven girls and eight boys who did not manifest speech disorders. These subjects were selected utilizing a table of random numbers. Five subjects were in the second grade and fourteen subjects were in the first grade. The mean age for this group was 6.63.

Equipment

Equipment used in this research was as follows:

(1) A tape-recording consisting of auditory stimulus material and;

(2) A single track Wollensax tape recorder.

Methods

Auditory Stimulus Material

A tape-recording was constructed which consisted of two parts -- a pre-test and an actual test. The pre-test recording consisted of randomly selected digits presented at the rate of one every other second. A total of 60 digits was presented within a period of two minutes. Signals, which required a response, were inserted and defined as any number presented twice in succession. The frequency of such signals was one every minute. One signal was randomly inserted within each one-minute segment of the recorded material. A total of two signals was presented during the pre-test tape-recording. There

was a fifty-second rest period between the pre-test and actual test recordings.

The actual test recording also consisted of randomly selected digits presented at the rate of one every other second. A total of 450 digits was presented within a period of fifteen minutes. Signals, as mentioned above, were inserted in a semi-random manner -- one signal was randomly inserted within each one-minute segment.

During the recording session the volume setting was eight, the tape speed was three and three quarter inches per second and tone balanced. This tape-recording was constructed to be presented with a volume setting of three, tape speed of three and three quarter inches per second and tone balanced.

Testing Procedure

Two subjects were tested during a single session. They were seated at tables which were placed equidistant from the tape recorder and in a manner that would insure independence of performance. The experimenter was seated between each pair of subjects in order to facilitate observation and recording of errors.

All subjects were given the following instructions:

> "You will hear many numbers. I want you to listen for any number with the same number right after it like two, two or five, five. When you hear any two numbers in a row, I want you to draw a stick on your paper. First, we'll listen for a short time, like a practice time, and then we'll listen for a long time. Do you have any questions?"

The pre-test was then presented. Those subjects who did not respond to one of the two signals were eliminated and replaced by other randomly selected subjects. This pre-test was included in the present research to familiarize all subjects with the task and to be reasonably certain that the instructions were understood.

Qualified subjects then were administered the actual test. The experimenter recorded the correct responses. Errors of omission, responses that were omitted when the signal was presented, and errors of commission, responses made when the signal was not presented, also were recorded by the experimenter. The results obtained from the analysis of this data are contained in the following Chapter.

CHAPTER IV

RESULTS AND DISCUSSION

Results

As previously stated the level of vigilance is inferred from the performance by the number of signals to which the listener does not respond. Thus, the criterion measure of vigilance, for purposes of this research, is twofold: (1) errors of omission, lack of response when a signal is presented; and (2) errors of commission, a response when a signal was not presented.

The means and standard deviations for errors of omission for the two groups are presented in Table I. The following statistical analysis was employed in the assessment of the statistical significance of the difference between children with articulatory disorders and children without articulatory disorders on errors of omission. First, an F_{max} test was utilized to test for the inequality of variance in the two samples.[1]

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[1]Helen M. Walker and Joseph Lev, Statistical Inference (New York: Henry Holt and Co., 1953), p. 192.

TABLE I

Means and Standard Deviations
for Articulatory Defective Children
and Nonarticulatory Defective Children

	Mean	Standard Deviation	
Articulatory Defective Children	3.95	2.25	
			$t = 1.00$*
Nonarticulatory Defective Children	3.22	2.16	

*not significant at the .05 level

TABLE II

A Comparison of Errors and Nonerrors
Between Articulatory Defective Children
and Nonarticulatory Defective Children

	Errors	Nonerrors	
Articulatory Defective Children	6	13	
			$\chi^2 = 2.53$*
Nonarticulatory Defective Children	2	17	

*not significant at the .05 level

The obtained F_{max} (F_{max} = 1.07) was not significant at the .05 level of confidence. Thus, a *t* test, which assumes equal variances within samples, was utilized to evaluate the difference between means of the two sample groups. The resulting *t* (*t* = 1.00, df 36) was found not to be significant at the .05 level. Thus, the null hypothesis, that the two means are equal, could not be rejected at the .05 level of confidence.

The errors and nonerrors between children with articulatory disorders and children without articulatory disorders are classified and summarized in Table II. A Chi-Square statistical analysis was employed in the assessment of significant difference between the two groups on errors of commission. The obtained Chi-Square (χ^2 = 2.53, df 1) was not significant at the .05 level of confidence. Thus, one cannot assume that the two sample groups differed significantly.

Discussion

The basic hypothesis was not given support by any of the statistical analyses in that no significant differences were noted. Minimum support was noted, however, in that the errors of omission and commission for the two groups were in the predicted direction. The statistical results, however, do not support the hypothesis that auditory vigilance is of significance in articulatory disorders.

Andreas stated, "Decrements over long periods of performance may occur for tasks which involve very little motor effort but which demand sustained perceptual effort. In common parlance we might speak of fatigue or boredom in accounting for a person's decreasing effectiveness in a prolonged task demanding his attention."[1] More scientifically, the previous statement could be referred to as vigilance. Bakan attributed a decrement in vigilance to an extinction of the listening response.[2] Thus, it is suggested that a lack of sufficient length of the experimental task would not allow the process of extinction of the listening response to occur.

It has been noted that there is a complete lack of previous experimental studies in auditory vigilance utilizing children as subjects. Thus, norms of auditory vigilance at various ages have not been established. Also, the optimal length of an auditory vigilance task for children is not known.

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[1]Burton G. Andreas, Experimental Psychology (New York: John Wiley and Sons, Inc., 1960), p. 433.

[2]Bakan, op. cit., p. 330.

Two groups that are equal in level of vigilance at the beginning of the task might thereafter demonstrate differential rates of extinction. One might then expect that significant differences would occur between the two groups if the task was of sufficient length. However, the optimal length for sufficient extinction to occur is not known with regard to children. Thus, it appears to this writer that the length of the auditory vigilance task utilized in this research was inadequate so as to permit sufficient extinction to occur. If this is true, one could not expect articulatory defective children to differ from nonarticulatory children unless the task was lengthened. Moreover, an addition of more subjects would tend to reduce the error term and thereby increase the liklihood of statistically significant differences.

The present research appears to be unique in the area of auditory vigilance in that it utilizes children as subjects and attempts to assess the relationship of vigilance to articulatory disorders. It, therefore, may contain various deficiencies due to the lack of a methodological and conceptual body of knowledge within this area. However, it is hoped that this study will serve to stimulate future research so as to delineate

the possible deficiencies in the present research and unfold the nature of auditory vigilance and its relationship to articulatory disorders.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

Vigilance has been conceptualized as sustained attention. A significant decrement in the maintenance of attention is conceived by this writer to be a possible contributing factor in the development of articulatory disorders. It appears to this writer that insufficient attention to sound stimulation during the critical stage of speech development would result in improper speech production. Thus, it is thought that an individual is handicapped in discrimination and reproduction of speech unless he attends sufficiently to sound stimuli. It was hypothesized, therefore, that children with articulatory disorders would manifest greater deficiency in auditory vigilance than would children without such speech defects.

Two groups of subjects were selected -- children with known articulatory disorders and children without articulatory disorders. A total of thirty-eight subjects was used -- nineteen subjects in each group.

A tape-recording was constructed which consisted of randomly selected digits presented at the rate of one

every other second for a total of fifteen minutes. Signals, which required a response, were inserted and defined as any number presented twice in succession. A total of fifteen signals was inserted within the fifteen-minute testing period; one signal was randomly inserted within each one-minute segment. The task required by each subject was to detect the presentation of each signal and respond by drawing a line on his or her paper.

The level of vigilance is inferred from the performance by the number of signals to which the listener does not respond. Criterion measures, for purposes of this research, were twofold: (1) errors of omission, a lack of response when a signal was presented; and (2) errors of commission, a response when the signal was not presented.

Conclusions

The basic hypothesis that children with articulatory disorders would manifest greater deficiency in auditory vigilance than would children without such speech defects was not given support by any of the statistical analyses in that no significant differences were noted. However, minimum support was noted in that children with articulatory disorders manifested greater errors of omission and commission than children without such speech defects.

It was felt that the lack of available subjects and insufficient length of the experimental task may have contributed to the nonsignificant results. Decrements in vigilance can be attributed to the extinction of the listening response. Thus, it was suggested that the insufficient length of the experimental task would not allow extinction of the listening response to occur.

Implications for Future Research

The present research appears to be unique in the area of auditory vigilance in that it utilizes children as subjects and attempts to assess the relationship of auditory vigilance to articulatory disorders. It is felt that implications for future research primarily have developed because of the uniqueness of this study. The following suggestions are proposed:

(1) Research is needed to determine the optimal length of an auditory vigilance task for children at various ages.

(2) Replication of the present study with increased length of the task is suggested so as to allow extinction of the listening process to occur.

(3) Research is further suggested to obtain reliability coefficients on this extended auditory vigilance task.

(4) Normative studies in the assessment of auditory vigilance performance at various ages are needed.

(5) Research is proposed to operationally differentiate between the concepts of hearing, listening and attending and to determine the functional relationships between these variables.

(6) Assessment of the role of auditory vigilance in normal speech development and speech pathologies seems advisable.

(7) Assessment of the role of auditory vigilance within a therapeutic situation would be valuable in terms of application.

It was hoped that this study will serve to stimulate further research to delineate the role of auditory vigilance in the development of articulatory disorders.

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