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I am submitting herewith a thesis written by Kathryn Rulon entitled "A Comparison of Disfluencies and Language Diversity Between Mongoloid and Normal Children." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Speech Pathology.

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We have read this thesis and recommend its acceptance:

Accepted for the Council:

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116

A COMPARISON OF DISFLUENCIES AND LANGUAGE DIVERSITY BETWEEN MONGOLOID AND NORMAL CHILDREN

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Kathryn Rulon

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ABSTRACT

The purpose of this study was to compare the language diversity scores and the disfluencies of a group of mentally retarded mongoloid children and a group of children with normal intelligence.

Ten children with normal intelligence and ten mid-mild to moderately mentally retarded mongoloid children were selected as subjects. Selection procedures insured that all subjects were Caucasian males who displayed no obvious hearing deficits and no gross deviations in the structure and function of the oral mechanisms. The Peabody Picture Vocabulary Test was administered to each subject from which the language ages were obtained. Normal subjects were then matched to mongoloid subjects on an individual basis according to language age.

Speech samples of 100 words in length were obtained from each subject. These samples were tape recorded and were later analyzed to determine the type-token ratio, the total number of disfluencies, and the number and types of disfluencies for each sample.

Results indicated that the type-token ratios of the normal group were significantly higher than those of the mongoloid group, thus, implying a greater amount of language

diversity among the normal population. However, no differences were found between the two groups in regard to their total numbers of disfluencies.

Analysis of the types of disfluencies revealed that both the normals and the mongoloids tended to use similar patterns of disfluencies; however, there was no relationship between type-token ratios and disfluencies for either the mongoloid group, the normal group, or the two groups combined.

TABLE OF CONTENTS

CHAPTER		PAGE
I.	INTRODUCTION AND REVIEW OF LITERATURE	1
	Stuttering and Mental Retardation	1
	Language and Disfluencies	8
	Summary	12
	Purpose	13
	Hypotheses	14
	Definition of Terms	14
II.	PROCEDURES	20
	Subjects	20
	Tests and Procedures	22
	Treatment of the Data	25
III.	RESULTS AND DISCUSSION	26
	Results	26
	Discussion	34
IV.	SUMMARY AND CONCLUSIONS	46
	Summary of the Study	46
	Conclusions	48
	Implications for Further Study	50
REFERENCES		51
APPENDIX		56
VITA		61

LIST OF TABLES

TABLE		PAGE
I.	Ranges, Means, Standard Deviations, Difference Between Means, and *t* Value of Type-Token Ratios	28
II.	Mean Number of Words, Differences Between Means, and *t* Values for Speech Samples Classified According to Fries' (1952) System	29
III.	Ranges, Means, Standard Deviations, Difference Between Means, and *t* Value for the Total Number of Disfluencies	31
IV.	Number of Disfluencies by Type, Ranks of Types of Disfluencies, and Rank-Order Correlation Coefficient for Relative Number of Disfluencies by Type Between Groups	33
V.	Rank-Order Correlation Coefficients Between Type-Token Ratios and Total Number of Disfluencies	35
VI.	Total Number of Responses, Number of One-Word Responses, and Mean Length of Response for all Subjects	40
VII.	Number of Words in Each Class and Type-Token Ratios According to Fries' (1952) Classification System for all Subjects	57

TABLE PAGE

VIII. Total Number of Disfluencies and Numbers of Disfluencies by Type According to Johnson's (1961) Classification for all Subjects 58

IX. Intelligence Quotients, Chronological Ages, and Receptive Vocabulary Ages of all Subjects . . 60

CHAPTER I

INTRODUCTION AND REVIEW OF LITERATURE

For several years investigators have shown interest in the speech and language problems of the mentally retarded, for it has long been recognized that these defects are a frequent accompaniment of mental retardation (Karlin and Strazzulla, 1952). One particular speech disorder, stuttering, has become a rather controversial topic of research in this area.

Stuttering and Mental Retardation

There have been many reports that the incidence of stuttering is greater in the mentally retarded population, and specifically in the mongoloid group, than in the population in general. In 1957, Schlanger and Gottsleben conducted a study of 516 mentally retarded subjects at a residential facility. Each subject was given a speech evaluation, and the number of subjects diagnosed as stutterers was obtained. Results indicated that 17 percent of those tested were stutterers, a figure which far exceeds the incidence of stuttering in the normal population (approximately 2 percent). Results also indicated that 45 percent of the mongoloids tested were found to stutter.

Schaeffer and Shearer (1968) studied case reports of 4,307 mentally retarded subjects in a residential facility. From these case reports they concluded that the incidence of stuttering was higher among the mentally retarded (7.6 percent) than among the general population.

In a study comparing mongoloid retardates to nonmongoloid retardates, Gottsleben (1955) found a significant difference between the mongoloid and nonmongoloid groups regarding the incidence of stuttering; a greater incidence of stuttering was found among the mongoloid group. Furthermore, a trend was indicated in both the mongoloid and nonmongoloid populations toward a greater incidence of stuttering than that found in the population in general.

In reviewing the literature, Van Riper (1971) concluded that the problem of stuttering seems to be much more prevalent in mental retardates than in the remainder of the population. Bloodstein (1969) states even more emphatically that stuttering seems to occur more frequently in the retarded population than in any other single identifiable group of people. Furthermore, when the mentally retarded population is divided into subgroups, mongoloid and other organically involved children seem to be prone to more disfluent speech (Lerman, Powers, and Rigrodsky, 1965). Keane (1972) states that there is more unanimity than disagreement that a higher than normal incidence of some form of disfluent speech

behavior is present in the specific syndrome known as Down's or mongolism. Bloodstein (1969) also agrees that among the various classifications of mental defectives, stuttering has been reported to be most common by far in mongols.

Two recent studies, however, have concluded that the incidence of stuttering is no greater among mental retardates and, specifically, among mongoloids. In a study conducted by Sheehan, Martyn, and Kilburn (1968) using institutionalized retardates, results indicated that the ratio of stutterers in the retarded population was approximately the same as that in the population generally. In 1969, Martyn, Sheehan, and Slutz examined the speech of 346 retardates from a different institution. Again, they found that the incidence of stuttering among the retarded subjects was no different from that in the normal population. They therefore concluded that stuttering was not related to intelligence at the lower end, any more than it has been shown to be related to the upper end of the intelligence scale. Furthermore, they stated that the "so-called stuttering" of the mongoloids did not appear to be associated with anticipations, avoidance devices, etc., so that what was involved, if anything, was not true stuttering but a kind of cluttering.

One may well wonder why there are such differing opinions as to the incidence of stuttering among mental

retardates. One possible reason is that there are many types of mental retardation, all with differing etiologies. Since the subjects for these incidence studies were drawn from a variety of institutions, the differences in findings may have resulted from differences in the types and/or etiologies of the retardates.

Another explanation for the conflicting findings stems from the fact that there are so many definitions of stuttering in existance. Van Riper (1971) believes that the definition of stuttering is of major importance since an erroneous definition may lead to unfortunate consequences, such as an improper diagnosis. Yet he further states that the variability among the stuttering definitions makes it clear that "this complex and variable disorder is hard to delimit." Bloodstein (1969) points out that there are many conflicting inferences about the underlying nature of stuttering that reveal themselves in our definitions.

In looking at the various definitions of stuttering, Wingate (1964) has found variabilities along several dimensions: "one kind attempts a fairly straightforward statement of speech characteristics; another implies denial that such a condition exists; others presumptively define in terms of an etiology; others offer a description of the full range of behavioral features observed in only some stutterers; and there are those which are some combination of the

foregoing." No one of these definitions has become universally accepted.

Furthermore, inherent in the stuttering disorder are those features which are not always confined in an easily identifiable manner to discrete moments (Bloodstein, 1969). These features are not only difficult to define, but they are also often difficult to observe. Variables such as anxiety and apprehension are not easily measured and therefore are subject to value judgments in their identification.

It becomes apparent, then, that a diagnosis of stuttering is dependent upon both the definition used and the value judgments of the examiner. It is possible that one or both of these variables may have differed in the studies of the incidence of stuttering among mental retardates, thus accounting for the conflicting findings.

Another possible explanation for the disagreement in findings stems from the confusion between "stutterings" and "clutterings." According to Van Riper (1971), with Wendell Johnson's definition of stuttering as something that exists only after the person begins to react with fear and struggle to his "normal" repetitions and prolongations, then few of the severely impaired mentally retarded could be said to stutter. In Van Riper's opinion, most retardates have short memories and little foresight. Their disfluencies are typically rather simple, and frustrations occur primarily

because of language deficits rather than because of their disfluencies. They generally show little anticipation of difficulty, and most of the time they seem to be unaware that they are stuttering or have stuttered. The disorder tends to be episodic, and although there are some mildly feared speaking situations, there are few word or phonemic fears.

Thus, it seems that many of the so-called stuttering symptoms manifested by the mentally retarded could also be classified as clutterings. However, many of the problems which are inherent in the definition of stuttering are also involved in the definition of cluttering. For example, cluttering has been defined as a speech disorder in which there is a disassociation between thinking and speaking. Other descriptions include the following statements: the speaker appears to be unable to plan ahead; he cannot form anticipatory schemata of what the sentence is going to say. There appears to be a kind of "idling in the speech motor," and organizational weakness in all areas is an outstanding feature. All channels of communication are affected. The disorder is said to be specifically characterized by a short attention span, impaired articulation, and excessive speed of delivery. In contrast to stutterers however, clutterers supposedly have little awareness of their difficulty; there

are no phobic signs and there is a striking absence of anxiety (DeHirsch, 1970; Zisk and Bialer, 1967). It appears, then, that definitions of cluttering, like stuttering, also involve many constructs which are difficult to observe and which depend largely on value judgments of the listener.

The aforementioned problems in defining stuttering and cluttering suggest that a more objective measure should be utilized to compare the relative presence of speech fluency problems in different populations. An obvious solution would be to employ counts of disfluencies, since disfluencies can be observed and can also be measured with a relatively high degree of interjudge reliability. And, although the terms stuttering and disfluency are not synonymous, several studies have indicated that there is a relationship between certain types of disfluencies (primarily, sound or syllable repetitions, sound prolongations, and broken words) and stuttering (Bloodstein, 1969).

Shearer and Baud (1970) state that, with the exception of surveys dealing with the incidence of stuttering, little research concerning the disfluencies of the mentally retarded has appeared in the literature. Keane (1972) goes on to state that future investigations might profitably be directed toward ascertaining the exact nature of the disfluent speech behavior which is present in retardates, and especially in mongoloids. Perhaps new information on factors relating to

the frequency and types of disfluencies found in retardates may help our understanding of why some of these people have become labeled as stutterers.

Language and Disfluencies

Much research has been conducted concerning disfluencies found in the normal population. Several of these studies have related disfluencies to various aspects of language usage. Since many of the results of these studies have been collected and discussed at length in various other reviews of the literature, only a brief summary of some of the more relevant findings will herein be provided.

In a series of pioneering studies occupying a period of approximately 10 years (circa 1935-1945), S. F. Brown investigated the relationship between stuttering and the loci of its occurrence within the speech sequence. He found four linguistic factors to be related to the frequency and occurrence of stuttering: grammatical class of the word, initial sound of the word, length of the word, and position of the word in the sentence. In two later studies, Taylor (1966 a, 1966 b) generally supported Brown's findings. Her results indicated that (1) more stuttering occurred on consonants than on vowels; (2) long words were stuttered more than short words; and (3) less stuttering occurred on final words

than on initial words in the sentences. However, she found all three of these factors to be effective independently of each other. She also pointed out that the influence of Brown's grammatical factor was not rigorously demonstrated.

Another factor which has been related to the occurrence of stuttering is that of information load. In a study by Schlesinger, Forte, Fried, and Melkman (1965) it was found that most stuttering occurred on words which were low in transitional probability (that is, high in information). Similarly, other researchers (Maclay and Osgood, 1959; Goldman-Eisler, 1968) have investigated the relationship between information load and hesitation phenomena and have found that more hesitations occur before content words and longer words (high in information) than before function words and short words.

In 1967, Silverman and Williams conducted a study concerning language skills of stuttering and nonstuttering children in which they used such measures as mean length of response, standard deviation of mean length of response, number of one-word responses, mean of five longest responses, and the structural complexity score. Their results indicated that the scores of the stutterers were below those of the nonstutterers on all measures except the one-word responses.

Three recent studies (Caldwell, 1971; Williams, 1971; Abney, 1971) investigated the relationship between linguistic competence, as measured by the Michigan Picture Language Inventory (MPLI) and disfluencies. Caldwell found a correlation between low performance on the MPLI and disfluencies, while Williams and Abney found no such relationship. One possible explanation for these differing findings may be that Caldwell used both "good" and "poor" articulators in her sample, whereas Williams and Abney used only "good articulation" subjects. Therefore, since correlations have been found between articulation skills and language competence, the fact that Caldwell included "poor" articulators in her sample may account for her different results.

Munson (1972) used the transformational model to relate linguistic structures to disfluencies. Her results showed a greater number of hesitations in more complex transformations than in simpler transformations. Pitzl (1972) also used the transformational model, but also added a measure of language diversity, the type-token ratio. She concluded that there was a consistent inverse relationship between type-token ratios and total number of disfluencies for every level of structural complexity with the exception of automatic responses. Similarly, Bilsky (1973) found that increased structural complexity resulted in a greater number

of disfluencies, and that as sentence length increased, the number of disfluencies also increased.

As can be seen from the above cited research, a number of relationships between language usage and disfluencies have been suggested in regard to the normal population. Therefore, it seems quite probable that the disfluencies found in the mentally retarded population may likewise be related to their language usage.

Although our knowledge of the language usage of the mentally retarded is far from complete, several characteristics of their language have been reported. In 1952, Karlin and Strazzulla conducted a study using 50 mentally retarded children from a nonresidential facility. Several defects in the language function of these children were noted: (1) the almost exclusive use of concrete language, indicating a lack of abstract thinking; (2) echolalia; (3) irrelevancy of ideas to the specific topic at hand; and (4) perseveration of words and ideas. In another study, Beier, Starkweather, and Lambert (1969) utilized the type-token ratio with regard to mentally retarded subjects. In comparing children with normal intelligence to the mentally retarded children, they found that the type-token ratios of the mentally retarded were below those of the normals, thus indicating that the retardates were less diverse in their language usage.

In reference to the language of mongoloids, Goertzen (1957) states that one may characterize their vocabulary as limited and slow to develop as speech is often delayed several years. Usually, pronunciation and articulation are clumsy and difficult to understand, and other defects, including voice disorders and disfluencies, are generally present.

Summary

There have been a number of reports which suggest that there is a greater incidence of stuttering among mental retardates, and specifically among mongoloids, than among the population in general. However, two recent studies have reported results which do not support this contention. One possible reason for these conflicting opinions may be differences in the definitions of stuttering which were used. It is suggested that disfluencies may provide a better measure of disturbances in speech fluency than does an actual diagnosis of "stuttering."

It has been demonstrated in the normal population that disfluencies are affected by linguistic factors. Since mental retardates are reported to have language problems, the need exists to relate language to disfluencies in the mentally retarded population and to compare these findings with regard to the normal population.

There are a number of characteristics of the language of the mentally retarded population in general, and more specifically, in the mongoloid population, which may have an effect upon disfluency. If, as the literature has suggested, there is an increased incidence of stuttering among the mentally retarded, then there must be some factor in the speech of retardates which makes listeners more likely to label their speech as stuttered. This factor may well be the occurrence of a greater number of disfluencies. In turn, this greater number of disfluencies may be related to the language usage of the retardates. It may be hypothesized, therefore, that if language age were to be held constant, there should be no difference in the total number of disfluencies between retardates (specifically mongoloids) and normals.

Purpose

It was the purpose of this study to compare the language diversity scores and the disfluencies of a group of mentally retarded mongoloid children and a group of children with normal intelligence. A type-token ratio was used to assess language diversity, and disfluencies were counted and classified according to Johnson's (1961) eight categories.

Hypotheses

The following null hypotheses were tested:

1. There is no difference in type-token ratios between a group of mid-mild to moderately mentally retarded mongoloid children and a group of children with normal intelligence matched on the basis of language age.

2. There is no difference in the total number of disfluencies between a group of mid-mild to moderately mentally retarded mongoloid children and a group of children with normal intelligence matched on the basis of language age.

3. There is no relationship in the relative number of disfluencies by type between a group of mid-mild to moderately mentally retarded mongoloid children and a group of children with normal intelligence matched on the basis of language age.

4. There is no relationship between type-token ratios and number of disfluencies: (a) for the mongoloid group; (b) for the normal group; and (c) for the two groups combined.

Definition of Terms

Categories of disfluencies. The following eight categories of disfluencies were suggested by Johnson (1961):

1. Interjections of sounds, syllables, words, or phrases. This category includes extraneous sounds such as "uh," "er," and "hmmm" and extraneous words such as "well" which are distinct from sounds and words associated with the fluent text or with phenomena included in other categories.

2. Part-word repetitions. Repetitions of parts of words (i.e., syllables and sounds) are placed in this category.

3. Word repetitions. Repetitions of whole words, including words of one syllable, are counted in this category.

4. Phrase repetitions. Repetitions of two or more words are included in this category.

5. Revisions. Instances in which the content of a phrase is modified or in which there is grammatical modification are classified as revisions. Change in the pronunciation of a word is also counted as a revision.

6. Incomplete phrases. An incomplete phrase is one in which the thought or content is not completed and which is not an instance of phrase repetition or of revision.

7. Broken words. This category is typified by words which are not completely pronounced and which are not classifiable in any other category, or in which the normal rhythm of the word is broken in a way that definitely interferes with the smooth flow of speech.

8. Prolonged sounds. Sounds or parts of words that are judged to be unduly prolonged are included in this category.

Language age. In this study, the mental ages derived from the Peabody Picture Vocabulary Test were interpreted as the language (receptive vocabulary) ages.

Mental retardation. Mental retardation refers to significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior, and manifested during the developmental period (American Association on Mental Deficiency, 1973).

Mild mental retardation. According to the American Association on Mental Deficiency, the Stanford-Binet intelligence quotient range for individuals in this category is 52 to 68.

Moderate mental retardation. According to the American Association on Mental Deficiency, the Stanford-Binet intelligence quotient range for individuals in this category is 36 to 51.

Mongolism (Down's Syndrome). Mongolism is the chromosomal anomaly of the trisomy-21, mosaic, or translocation type.

Type-token ratio. The type-token ratio (TTR) is the number of different words (types) over the total number of words (tokens). The Overall TTR (Johnson, 1944), which is

simply the TTR for the entire language sample was used for the purposes of this study.

In order to compute the TTR, words were categorized according to Fries' (1952) classification system. Words in Fries' system are first divided into two major classes: content words and function words.

Content words. These words correspond to, but are not identical with, nouns, verbs, adjectives, and adverbs. In classifying content words the following test frames were used:

The concert is/was good (always)/ Concerts are/were good (always).

The clerk remembered the tax (suddenly).

The team went there.

Class 1 words are ones which can be substituted for "concert," "clerk," "tax," and "team" in these test frames. (A word can be substituted for another if it does not change the grammatical structure of the sentence.)

Class 2 words can substitute for "is," "was," "remembered," and "went" in the above frames.

Class 3 words behave as does "good" in the test frame and can serve as substitutes.

Class 4 words are those which can serve as substitutes for "always," "suddenly," and "there" in the test frames.

Function words. These words include all those not belonging to the four categories already considered. There are fifteen groups of function words.

Group A includes all the words which can be substituted for "the" in the sentence "The concert was good."

Group B includes the words which can be substituted for "may" in the sentence "The concert may be good."

Group C includes only the word "not" as in the sentence "The concert may not be good."

Group D includes all the words which can be substituted for "very" in the sentence "The concert may be very good."

Group E includes all words which can substitute for "and" in the sentence "The concerts and the lectures are and were interesting and profitable now and earlier."

Group F includes all words which can be substituted for "at" in the sentence "The concerts at the school are at the top."

Group G includes only the word "do" and its variant forms "does" and "did" used as an auxiliary. They may substitute for the first "do" in the sentence "Do the boys do their work promptly?"

Group H includes only the word "there" as in the sentence "There is a man at the door."

Group I includes all the words which can be substituted for "when" in the sentence "When was the concert good?"

Group J includes all the words which can be substituted for "after" in the sentence "The concert was good after the new director came."

Group K includes only the four words "well," "oh," "now," and "why" when used at the beginnings of sentences.

Group L includes only the two words "yes" and "no."

Group M includes the attention-getting utterances "look," "say," and "listen."

Group N includes only the word "please" which most frequently appears at the beginning of requests.

Group O includes only the form "lets" which in a request sentence includes the speaker and is not the same as "let us" which does not include the speaker.

CHAPTER II

PROCEDURES

The present study was designed to determine the relationship between the diversity of language and the types of disfluencies found in mentally retarded mongoloid children as opposed to those found in children with normal intelligence matched on the basis of language age.

Subjects

Two groups of ten children each were selected for this study. Group I consisted of mentally retarded mongoloid children who were enrolled at the Daniel Arthur Rehabilitation Center, Oak Ridge, Tennessee, and at Cansler Elementary and McCallie Schools, both located in Knoxville, Tennessee. All were nonresidential facilities. Group II consisted of children exhibiting no apparent physical or intellectual problems who were enrolled at Tate's School of Discovery in Knoxville.

Subjects for Group I were selected on the basis of the following criteria: (1) a diagnosis of Down's Syndrome obtained from either a formal chromosomal analysis or from a report sent from a medical doctor; (2) member of the Caucasian race; (3) male sex; (4) normal hearing function based

on results of a formal audiological evaluation, if available, or on observations by the examiner, teacher, and/or parent if formal testing had not been performed; (5) mid-mild to moderate mental retardation determined from a psychological evaluation administered by a qualified examiner licensed by the state of Tennessee (Stanford-Binet intelligence quotient range for moderate to mid-mild classification: 36-60); and (6) no gross structural or functional oral anomalies which might interfere with speech production. The chronological age range of subjects selected for this group was 10-0 to 18-6; the Stanford-Binet I.Q. range was 38 to 58.

Selection for membership in Group II was based on the following criteria: (1) member of the Caucasian race; (2) male sex; (3) normal hearing function as based on observations by the examiner, teacher, and/or parent; (4) normal intelligence based on the I.Q. score obtained on the Peabody Picture Vocabulary Test (acceptable I.Q.: 70 and above) and on teacher appraisal of the child; (5) no gross structural or functional oral anomalies which might interfere with speech production; and (6) no apparent physical defect. Each subject from Group II was selected on an individual basis to match a subject from Group I according to receptive vocabulary age obtained on the Peabody Picture Vocabulary Test (the means of the language ages were matched to within two months).

The chronological age range of subjects in Group II was 3-1 to 5-7.

Tests and Procedures

Each subject in Group I was tested in one session on an individual basis. The Peabody Picture Vocabulary Test (PPVT) was administered in order to obtain a receptive vocabulary age. An intraoral examination was also performed to rule out subjects with gross deviations in oral structure and function. This examination consisted of evaluations of the lips, tongue, teeth, and palatal structures, and of lateral, vertical, and circular tongue movements, lip protrusion and extension, and tongue-tip/alveolar ("tuh") and back-tongue/palatal ("kuh") movements. The rate of these movements was not assessed.

Following these initial screening tests each subject was shown a series of pictures and was asked to talk about them. These pictures were situational in content, and were obtained from various preschool reading-readiness books. Subjects were questioned and prompted by the examiner when necessary in order to obtain a speech sample of 100 words in length from each subject. The following are examples of questions asked by the examiner:

What do you see in this picture?

Tell me about this (picture).

Can you tell me any more?

What do you think about this picture?

All speech samples were tape recorded.

Group II subjects were tested individually, but two sessions were required for each subject. The first session was conducted for screening purposes, during which the intra-oral examination and the PPVT were administered. Both intelligence quotients and receptive vocabulary ages were derived from the PPVT. From those children displaying normal oral mechanisms and normal I.Q.'s, the subjects for Group II were selected by a matched-pair procedure in which a Group II child was matched to a Group I child by receptive vocabulary age. Thus, receptive vocabulary ages were matched, irrespective of chronological ages between the two groups.

During the second individual testing session for those selected for Group II, a 100 word speech sample was obtained following the same procedures as those described for Group I subjects. The samples obtained from Group II subjects were also tape recorded.

Speech samples from children in both groups were transcribed from the tape recordings by the examiner. Repeated playings of the tapes were utilized to facilitate accurate transcriptions; unintelligible utterances and automatic responses were omitted. Thus, all speech samples

consisted of the first intelligible 100 words, excluding automatic responses.

The transcriptions were analyzed in the following manner: (1) each word was placed into one of the nineteen possible categories of the Fries' (1952) classification system. The total number of categories used by each subject was then divided by the total length of the sample (100 words) in order to obtain the type-token ratio for each subject. (2) The total number of disfluencies was calculated for each speech sample. (3) Finally, the disfluencies were counted and classified according to Johnson's (1961) eight categories. Intra and interexaminer reliability of the disfluency measurements was established by randomly selecting three speech samples from each group. Tapes of these samples were played, and the total number of disfluencies and the number and types of disfluencies were calculated both by the examiner and by another listener who was selected from among the graduate students in Speech Pathology at The University of Tennessee. These two sets of evaluations were then compared to those from the original analysis using a percent agreement index (agreements/agreements + disagreements).

In judging the total number of disfluencies, the intrarater agreement was 98.8 percent (593 agreements; 7 disagreements); interrater agreement for the total number of

disfluencies was 98.5 percent (591 agreements; 9 disagreements). In judging the number of specific types of disfluencies, the intrarater agreements was 98 percent (588 agreements; 12 disagreements) while the interrater agreement was 97.3 percent (584 agreements; 16 disagreements).

Treatment of the Data

In order to compare type-token ratios and total numbers of disfluencies between groups (Hypotheses I and II), *t*-Tests for related measures were used. The Spearman Rank-Order Correlation (*rho*) was used to compare the relative number of disfluencies by type between groups and also to relate type-token ratios to disfluencies (Hypotheses III and IV).

CHAPTER III

RESULTS AND DISCUSSION

Speech samples of 100 words in length were obtained from each subject in a group of ten mentally retarded mongoloids and a group of ten children with normal intelligence. The speech samples were tape recorded and were later transcribed and analyzed. The data obtained from the analyses included a type-token ratio (used as a measure of language diversity) for each subject, the total number of disfluencies found in each speech sample, and the number of types of disfluencies present in each sample.

Results

Hypothesis One

There is no difference in type-token ratios between a group of mid-mild to moderately mentally retarded mongoloid children and a group of children with normal intelligence matched on the basis of language age. The 100 words from each subject were classified into Fries' (1952) categories. A type-token ratio was obtained for each subject by dividing the number of categories used by the total length of the sample (100 words). The range of the type-token ratios for the mongoloid group was 0.06 to 0.08 with a mean of 0.074.

The range of the type-token ratios for the normal group was 0.07 to 0.10 with a mean of 0.086. The raw data are displayed in Table I.

A t-Test for related measures was used to test the hypothesis. The computed t value for the difference in type-token ratios between groups was 3.34 ($t_{.05} = 2.26$; df = 9) indicating that the normal group had significantly higher type-token ratios than did the mongoloid group. Therefore, the null hypothesis was rejected.

Although not included in the original hypothesis, it was thought desirable to analyze the data further by comparing the number of items in each individual category in the Fries' (1952) classification between groups. Again, t-Tests for related measures were used to measure the differences. The raw data are displayed in Table II. For Class 1 words (similar, but not identical to nouns), the computed t value was 4.19 ($t_{.05} = 2.26$; df = 9), which indicated that the mongoloid group used significantly more noun-type words than did the normal group. For Class 2 words (similar to verbs), the computed t value was 2.26 ($t_{.05} = 2.26$; df = 9), indicating that the normals utilized significantly more verb-like words than did the mongoloids.

The computed t value for Class 3 words (comparable with adjectives) of 0.81 ($t_{.05} = 2.26$; df = 9) was not significant. For Class 4 words (similar to adverbs), the computed

TABLE I

RANGES, MEANS, STANDARD DEVIATIONS, DIFFERENCE BETWEEN MEANS, AND t VALUE OF TYPE-TOKEN RATIOS

Group	Range	Mean	SD	Difference Between Means	t
Mongoloid	.06-.08	.074	.007	.012	3.34*
Normal	.07-.10	.086	.008		

*P .05 ($t_{.05}$ = 2.26; df = 9).

TABLE II

MEAN NUMBER OF WORDS, DIFFERENCES BETWEEN MEANS, AND *t* VALUES FOR SPEECH SAMPLES CLASSIFIED ACCORDING TO FRIES' (1952) SYSTEM

Word Class	Mean for Mongoloids	Mean for Normals	Difference Between Means	*t**
I	49.2	37.0	12.2	4.19
II	20.0	23.8	3.8	2.26
III	8.6	6.7	1.9	0.81
IV	2.8	6.7	3.9	3.45
V	19.4	25.8	6.4	2.38

*P .05 ($t_{.05}$ = 2.26; df = 9).

t value was 3.45 ($t_{.05}$ = 2.26; df = 9) which indicated that the normal group used significantly more adverb-like words than did the mongoloid group.

For computational purposes, Groups A through O ("function" words) in the Fries' (1952) classification system were combined into a single category, "Class 5", for both mongoloid and normal groups. This collapsing of the data into a singular category ("Class 5") was done since there were so few responses in each of the fourteen groups (A through O) when taken individually. The computed t value for "Class 5" words was 2.38 ($t_{.05}$ = 2.26; df = 9) which indicated that the normals used significantly more function words than did the mongoloids.

Hypothesis Two

There is no difference in the total number of disfluencies between a group of mid-mild to moderately mentally retarded mongoloid children and a group of children with normal intelligence matched on the basis of language age. A t-Test for related measures was again used to test this hypothesis. For the 100 word speech samples, the range of the total number of disfluencies for the mongoloid group was 1 to 35 with a mean of 11.9. The range of the total number of disfluencies for the normal group was 2 to 15 with a mean of 7.1. The raw data are displayed in Table III.

TABLE III

RANGES, MEANS, STANDARD DEVIATIONS, DIFFERENCE BETWEEN MEANS, AND t VALUE FOR THE TOTAL NUMBER OF DISFLUENCIES

Group	Range	Mean	SD	Difference Between Means	t
Mongoloid	1-35	11.9	10.43	4.8	1.26*
Normal	2-15	7.1	3.90		

*P .05 ($t_{.05}$ = 2.26; df = 9).

The computed t value for the difference in the total number of disfluencies between groups was 1.26 ($t_{.05}$ = 2.26; df = 9) which indicated no significant difference between groups. Therefore, the null hypothesis was not rejected.

Hypothesis Three

There is no relationship in the relative number of disfluencies by type between a group of mid-mild to moderately mentally retarded mongoloid children and a group of children with normal intelligence matched on the basis of language age. To test this hypothesis, a Spearman Rank-Order Correlation (rho) was used. Disfluencies were counted and ranked in order according to types; the types were then compared between groups. A summary of the data is provided in Table IV. The resulting correlation coefficient was +0.827 which converted to a t ratio of 3.61 ($t_{.05}$ = 2.45; df = 6). It was thus concluded that there was a strong positive correlation in the relative number of disfluencies by type between the mongoloid and the normal groups. Therefore, the null hypothesis was rejected.

Hypothesis Four

There is no relationship between type-token ratios and number of disfluencies: (a) for the mongoloid group; (b) for the normal group; and (c) for the two groups combined.

TABLE IV

NUMBER OF DISFLUENCIES BY TYPE, RANKS OF TYPES OF DISFLUENCIES, AND RANK-ORDER CORRELATION COEFFICIENT FOR RELATIVE NUMBER OF DISFLUENCIES BY TYPE BETWEEN GROUPS

	Group			
	Mongoloid		Normal	
Disfluency Type	Number of Disfluencies	Rank	Number of Disfluencies	Rank
Interjections	62	1	30	1
Part-word Repetitions	12	4	13	2
Word Repetitions	18	2	11	3
Phrase Repetitions	15	3	7	5
Revisions	8	5	8	4
Incomplete Phrases	1	7.5	0	7.5
Broken Words	1	7.5	2	6
Prolonged Sounds	2	6	0	7.5
	rho = +0.83*			

*P .05 (t_{ob} = 3.61; $t_{.05}$ = 2.45; df = 6).

Subjects were rank-ordered according to both type-token ratios and number of disfluencies for each group respectively, then for both groups combined. The data are displayed in Table V. Spearman Rank-Order Correlations were then used to test the hypothesis.

(a) For the mongoloid group, the correlation coefficient (rho = +0.139) was not significant at the .05 level of confidence (t_{ob} = 0.398; $t_{.05}$ = 2.31; df = 8).

(b) For the normal group, the correlation coefficient (rho = -0.161) was not significant at the .05 level of confidence (t_{ob} = 0.460; $t_{.05}$ = 2.31; df = 8).

(c) For the mongoloid and normal groups combined, the correlation coefficient (rho = -0.208) was not significant at the .05 level of confidence (t_{ob} = 0.90; $t_{.05}$ = 2.10; df = 18).

Since there was no significant correlation between type-token ratios and number of disfluencies for either of the groups individually or for both groups combined, the null hypothesis was not rejected.

Discussion

The purpose of this study was to assess the language diversity and the disfluencies of a group of mentally retarded mongoloid children and a group of children with normal intelligence and to compare the results between groups.

TABLE V

RANK-ORDER CORRELATION COEFFICIENTS BETWEEN TYPE-TOKEN RATIOS AND TOTAL NUMBER OF DISFLUENCIES

Group	rho	t Value
Mongoloid	+0.14	0.39*
Normal	-0.16	0.46*
Mongoloid and Normal	-0.21	0.89**

*P .05 ($t_{.05}$ = 2.31; df = 8).

**P .05 ($t_{.05}$ = 2.10; df = 18).

Mongoloid and normal children were matched on an individual basis according to language (receptive vocabulary) age. Type-token ratios were used to assess language diversity, and disfluencies were counted and classified according to Johnson's (1961) eight categories.

Type-Token Ratios

Results of this study indicated that a significant difference existed in type-token ratios between a group of mentally retarded mongoloid children and a group of children with normal intelligence. The children in the normal group were found to have significantly higher type-token ratios than the mongoloid children.

This finding is in agreement with results of a previous study by Beier, Starkweather, and Lambert (1969) which also indicated that the type-token ratios of their normal subjects were significantly higher than those of their mentally retarded subjects. They concluded that the number of different words used by the mentally retarded subjects differed very little from the number of words used by the normal subjects; rather, the mentally retarded deficit was found in conceptualization, organization, language structure, grammar, and syntax instead of in vocabulary. However, their study differed from the present study in a number of respects. In their study no controls were placed over such factors as

type or degree of mental retardation, nor did they seek to match normal and retarded subjects on any basis. In the present study, the type of retardation was specified (Down's Syndrome) as was the degree of retardation (mid-mild to moderate). Also, normal subjects were matched to mongoloid subjects on the basis of language (receptive vocabulary) age.

As has previously been mentioned, the type-token ratio in the present study was used as a measure of language diversity and was dependent upon the number of different types of words contained in each speech sample. Taken literally, the type-token ratio is actually the number of different words over the total number of words. For example, in the sentence, "The boy hit the dog" there are four different words and five total words; the resultant type-token ratio is 0.80. Therefore, in this case, the larger the vocabulary used, the higher will be the type-token ratio (DeVito, 1970). In the present study, however, a variation of this method was used. Before obtaining the type-token ratio, words were first "typed" by classifying each according to the Fries' (1952) system. Had the words not been categorized by such a system, a child responding with 100 different nouns (by naming 100 different pictures) might well have received a higher type-token ratio than a child responding with complete sentences but in response to only a few pictures (thus using the same words several times). Therefore, the type-token

ratios in this study depended upon the relative number of different word classes used rather than upon the extent of the vocabulary, per se.

In looking at the individual categories in the Fries' classification it is interesting to note that the mongoloids used significantly more Class 1 words (which are comparable with, but not identical to, nouns) than did the normals, while the normals used significantly more Class 2 (comparable with verbs) and Class 4 (similar to adverbs) words than did the mongoloids. However, there was no significant difference in Class 3 (comparable with adjectives) word usage between groups. The tendency for the mongoloids to use more "adjectives" than "adverbs" is most probably due to the fact that they used more "nouns" than "verbs."

These data suggest that the mongoloids tended to name the objects in the pictures more than to describe them, whereas the normals tended to use more descriptions. This difference implies a higher level of language development for the normals than for the mongoloids, since as language develops, responses begin to differentiate from the basic utterances which are primarily nouns (Hopper and Naremore, 1973).

Also included in the Fries' classification system are the "function" words, which are categorized in Groups A through O. These are words which do not make reference to

the real world; they do not have synonyms which can easily be found, and they do not have both connotative and denotative meanings (DeVito, 1970). In this study, the normal children used significantly more function words ("Class 5") than did the mongoloid children. This finding lends support to that of the Karlin and Strazzulla (1952) study, for they noted the tendency in their mentally retarded subjects to deal very little with abstract language.

It may also be mentioned that, although not formally tested, the mongoloid children were noted by the examiner to make shorter, less complex responses. The factor of length was checked by making a count of the number of one-word responses and determining the mean length of response. The raw data are displayed in Table VI. The range of the number of one-word responses given by the mongoloid group was found to be from 0 to 50 with a mean of 16, while the range of the number of one-word responses given by the normal group was 0 to 7 with a mean of 2. In regard to mean length of response, the range for the mongoloid subjects was from 1.45 to 5.55 with a mean of 3.03, while the range for the normal subjects was 2.86 to 6.67 with a mean of 5.06. Therefore, it is apparent that the mongoloid group used shorter responses than did the normal group.

In summary, it may be concluded that within the framework of this study, the mongoloid group, even though

TABLE VI

TOTAL NUMBER OF RESPONSES, NUMBER OF ONE-WORD RESPONSES, AND MEAN LENGTH OF RESPONSE FOR ALL SUBJECTS

Subject	Total Number of Responses	Number of One-Word Responses	Mean Length of Response
Mongoloid Group			
1	33	13	3.03
2	52	29	1.92
3	18	0	5.55
4	69	50	1.45
5	20	2	5.00
6	33	6	3.03
7	57	31	1.76
8	49	19	2.04
9	25	3	4.00
10	40	7	2.50
$\bar{X}$	39.6	16	3.03
Normal Group			
1	20	0	5.00
2	35	7	2.86
3	15	1	6.67
4	15	0	6.67
5	20	1	5.00
6	19	1	5.26
7	23	2	4.35
8	16	3	6.25
9	19	2	5.25
10	31	3	3.23
$\bar{X}$	21.3	2	5.06

considerably older, tended to use more concrete, less complex, and less diverse language than did the younger, normal group which had been matched for language age. These findings support the contention of Goertzen (1957) who believes that delayed language is one primary characteristic of mongolism.

Disfluencies

Results of the present study indicated that there was no significant difference in the total number of disfluencies between the mongoloid and normal groups. This finding is in accord with the findings of two other studies (Sheehan et al., 1968; Martyn et al., 1969) which have concluded that the incidence of stuttering (and thereby implying disfluency) is no greater in the mentally defective population than in the population in general.

The findings of the present study appear to be in contradiction, however, to the majority of the research in the area (Schlanger and Gottsleben, 1957; Gottsleben, 1955; Schaeffer and Shearer, 1968) which tends to indicate that the problem of stuttering (thus, again implying disfluency) seems to be much more prevalent among the mentally retarded, and specifically among the mongoloids, than in the general population (Van Riper, 1971; Bloodstein, 1969). In the present study, there are a number of factors which may serve to explain the difference in findings.

First of all, results of the present study were based on objective observations of disfluencies rather than on a subjective diagnosis of "stuttering." As has previously been mentioned, there are a great many differing definitions of stuttering in existence. A diagnosis of stuttering, then, depends upon the definition of stuttering which is used and upon value judgments of the listener. These variables were bypassed in the present study through the use of measurements of disfluencies, since disfluencies can be observed and can generally be measured with a relatively high degree of inter-judge reliability.

Secondly, the present study utilized only noninstitutionalized retardates. In the studies referred to above, only institutionalized retardates were used. In a review of the literature, Bloodstein (1969) points out that the occurrence of stuttering is thought to be much greater in institutionalized retardates (approximately 10 to 20 percent) than in noninstitutionalized retardates (approximately 3 percent).

Finally, in the present study, mongoloid subjects were individually matched to normal subjects according to receptive vocabulary ages. In the incidence studies cited above, the mentally retarded subjects were not matched to normal subjects; rather, their findings regarding their mentally

defective subjects were compared to incidence figures, etc., which had been obtained from other research studies.

Thus, there are a number of possible reasons why the results of the present study did not lend support to those of the stuttering incidence studies. However, the question still remains as to why there was no greater number of disfluencies in the mongoloid group than in the normal group. One explanation may relate to the language usage of the mongoloid children.

As has been mentioned, the mongoloid children were observed by the examiner to use less complex responses than did the normal children. Since it has been demonstrated (Munson, 1972) that as structural complexity increases the number of disfluencies also increases, it appears that the less complex responses of the mongoloids may have resulted in fewer disfluencies.

It was also noted both by the examiner and by the student who listened to the tapes for the purpose of assessing reliability that several of the longer responses of the mongoloid subjects were unintelligible. Since unintelligible responses were excluded from the analyses, it is quite possible that the shorter mean length of response of the mongoloid subjects (cited under the type-token ratios section) was due, in part, to the unintelligibility of the longer responses. Since it has been reported (Bilsky, 1973) that

length is a significant factor affecting the frequency of disfluencies in an utterance, it is conceivable that the longer, unintelligible responses of the mongoloids contained more disfluencies than the shorter responses used in the analysis. It is also possible that disfluencies might have been one factor which contributed to the unintelligibility of some of the responses.

Types of Disfluencies

Results of the present study indicated that there was a significant positive correlation in the relative number of disfluencies by type (classified according to Johnson's, 1961, eight categories of disfluencies) between the mongoloid and normal groups. Both groups tended to use interjections of sounds, syllables, words, or phrases more frequently than any other type of disfluency; incomplete phrases occurred least often of the disfluency types in both groups of subjects. Therefore, it may be concluded that in this study, mongoloids and normals had similar patterns of disfluencies.

As has been mentioned, the greatest number of disfluencies in both groups were of the interjection type. It is interesting to note that interjections are not one of the types of disfluencies which are likely to be considered stuttering (Bloodstein, 1969). Very little difference was

seen in the categories most often judged as stuttering (i.e., repetitions and prolongations).

Disfluencies and Type-Token Ratios

Results of this study indicated that there was not a significant relationship between type-token ratios and number of disfluencies for either the mongoloid group, the normal group, or the two groups combined. This finding contradicts that of the Pitzl (1972) study in which she found a consistent inverse relationship between type-token ratios and total number of disfluencies in normal children for every level of structural complexity with the exception of automatic responses. A possible explanation for this contradiction lies in the fact that, in the present study, sentences were not analyzed according to structural complexity.

CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary of the Study

The purpose of this study was to compare type-token ratios and disfluencies between a group of mentally retarded mongoloid children and a group of children with normal intelligence.

Ten children with no apparent intellectual deficits and ten mid-mild to moderately mentally retarded mongoloid children were selected as subjects. Selection procedures insured that all subjects were Caucasian males who displayed no obvious hearing deficits and no gross deviations in the structure and function of the oral mechanisms. The Peabody Picture Vocabulary Test was administered to each subject from which the language (receptive vocabulary) ages were obtained. Normal subjects were then matched to mongoloid subjects on an individual basis according to language age. Since no controls were placed on the chronological ages of the subjects, the mongoloid subjects were considerably older than the normal subjects.

Speech samples of 100 words in length were obtained from each subject. These samples were tape recorded and were

later analyzed to determine the type-token ratio, the total number of disfluencies, and the number and types of disfluencies for each sample.

In order to determine if there were significant differences in type-token ratios and in total numbers of disfluencies between the mongoloid and normal groups, t-Tests for related measures were used. Results indicated that the normal group had significantly higher type-token ratios than the mongoloid group; however, no difference was found between the two groups with regard to the total number of disfluencies. To compare the number of words in each of the five categories in the Fries' classification between groups, t-Tests for related measures were again used. Significant differences were obtained for all but one of the five categories; the mongoloids tended to use more noun-like words while the normals tended to use more verbs, adverbs, and function words.

Spearman Rank-Order Correlations (rho) were used to compare the relative number of disfluencies by type between groups and to compare the type-token ratios to the total number of disfluencies. The relative number of types of disfluencies was found to be positively correlated between groups. However, no significant correlation was found between type-token ratios and total number of disfluencies.

Conclusions

The following conclusions may be drawn from the analysis of the data obtained in this study:

1. Based on the statistically significant differences found in the type-token ratios between the children with normal intelligence and the mongoloid children, it appears that the normal subjects exhibited more diverse language than did the mongoloid subjects.

2. The fact that the mongoloid children used significantly more nouns, but significantly fewer verbs, adverbs, and function words than did the normal children lends support to the hypothesis that mongoloid children tend to use more concrete and less grammatically complex language.

3. There was no significant difference in the total number of disfluencies contained in the speech samples between the mongoloid and the normal subjects.

4. There was a positive correlation in the relative number of disfluencies by types between the two groups, thereby suggesting that the mongoloids and normals used similar patterns of disfluencies.

5. No significant correlation between type-token ratios and total number of disfluencies was found for either the mongoloid group, the normal group, or the two groups combined.

These findings should not be accepted or rejected without consideration of the following limitations:

1. Subjects who displayed gross deviations in oral structure and/or function, or who displayed obvious hearing deficits were excluded from this study.

2. Socioeconomic status was not controlled in either the mongoloid or the normal group.

3. No effort was made to control for articulatory defects in either of the two groups.

4. Only children in the mid-mild to moderate range of mental retardation were included in the mongoloid group.

5. No effort was made to control for the specific genotype (e.g., trisomy-21, translocation, mosaic) or for possible metabolic problems of the mongoloid subjects.

6. A chromosomal analysis was not required for all mongoloid subjects. Subjects were accepted on the basis of a report from a medical doctor in the event that no chromosomal report was available. Although a medical report can give an indication of mongolism, a definite diagnosis can be obtained only from a chromosomal analysis.

7. Mongoloid and normal subjects were matched according to language ages obtained from the Peabody Picture Vocabulary Test. This test has been shown to be only a gross indicator of language age; therefore, a finer measure of language may be indicated.

8. Due to the differences in the language abilities between the mongoloid and normal groups, the matching between groups on the basis of language age made it impossible to control for chronological age differences.

Implications for Further Study

The following topics are suggested for further research:

1. A study of mongoloid subjects comparing the structural complexity of responses and disfluencies.

2. An investigation of the relationship between the level of mental retardation and disfluencies in mongoloid subjects.

3. A comparison of other measures of language performance (e.g., mean length of response or mean length of utterances in morphemes) to disfluencies, again using mongoloid subjects.

4. An investigation of the number and types of disfluencies of mongoloid subjects in different speaking situations.

5. A comparison of the number of disfluencies between institutionalized and noninstitutionalized mongoloids.

6. An investigation of factors relating to the labeling of stuttering in mongoloids (e.g., the numbers and types of disfluencies compared to an actual diagnosis of stuttering).

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APPENDIX

TABLE VII

NUMBER OF WORDS IN EACH CLASS AND TYPE-TOKEN RATIOS ACCORDING TO FRIES' (1952) CLASSIFICATION SYSTEM FOR ALL SUBJECTS

Subjects	Class 1	Class 2	Class 3	Class 4	"Class 5" Groups A Through O	Type-Token Ratio
Mongoloid						
1	43	19	12	7	19	.07
2	55	17	7	2	19	.07
3	42	21	11	3	23	.08
4	67	19	3	1	10	.08
5	40	16	4	5	35	.07
6	44	22	16	0	18	.06
7	61	17	6	1	15	.07
8	45	19	12	6	18	.08
9	42	29	9	1	19	.08
10	53	21	6	2	18	.08
$\bar{X}$	49.2	20.0	8.6	2.8	19.4	.074
Normal						
1	36	28	3	7	26	.08
2	40	18	7	7	28	.09
3	34	25	1	8	32	.08
4	35	17	8	4	36	.07
5	38	26	2	4	30	.08
6	37	29	5	9	20	.09
7	39	29	1	7	24	.09
8	41	18	10	5	26	.10
9	33	28	11	9	19	.09
10	37	20	19	7	17	.09
$\bar{X}$	37.0	23.8	6.7	6.7	25.8	.086

TABLE VIII

TOTAL NUMBER OF DISFLUENCIES AND NUMBERS OF DISFLUENCIES BY TYPE ACCORDING TO JOHNSON'S (1961) CLASSIFICATION FOR ALL SUBJECTS

Subjects	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Total Number of Disfluencies
Mongoloid									
1	5	2	2	5	2	0	0	1	17
2	1	0	0	0	0	0	0	0	1
3	3	0	0	1	0	1	0	0	5
4	0	0	0	1	0	0	0	0	1
5	8	1	6	4	1	0	1	0	21
6	2	2	0	1	1	0	0	0	6
7	9	0	0	0	0	0	0	0	9
8	21	4	4	2	3	0	0	1	35
9	7	0	2	1	0	0	0	0	10
10	6	3	4	0	1	0	0	0	14
$\bar{X}$	6.2	1.2	1.8	1.5	0.8	.10	.10	.20	11.9
Normal									
1	1	0	0	3	0	0	0	0	4
2	1	2	1	0	0	0	0	0	4
3	10	0	2	3	0	0	0	0	15
4	8	1	0	1	1	0	0	0	11
5	1	0	2	0	2	0	0	0	5
6	3	1	1	0	1	0	2	0	8
7	1	1	0	0	3	0	0	0	5

TABLE VIII (continued)

Subjects	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7	Type 8	Total Number of Disfluencies
8	3	2	2	0	1	0	0	0	8
9	2	5	2	0	0	0	0	0	9
10	0	1	1	0	0	0	0	0	2
$\overline{X}$	3.0	1.3	1.1	0.7	0.8	0	0.2	0	7.1

TABLE IX

INTELLIGENCE QUOTIENTS, CHRONOLOGICAL AGES, AND RECEPTIVE VOCABULARY AGES OF ALL SUBJECTS

Subjects	Intelligence Quotient*	Chronological Age	Receptive Vocabulary Age**
Mongoloid Group			$\bar{X}$ = 5-9
1	38	16-11	8-1
2	40	16-10	7-8
3	54	10-9	6-1
4	46	15-1	6-1
5	43	17-1	5-11
6	49	18-6	5-7
7	43	14-5	5-5
8	40	15-2	5-2
9	58	10-7	5-2
10	56	10-0	4-0
Normal Group			$\bar{X}$ = 5-7
1	129	5-4	8-1
2	125	4-6	6-10
3	114	5-7	6-6
4	111	5-2	6-1
5	119	4-1	5-11
6	103	4-10	5-5
7	103	4-10	5-5
8	113	4-0	5-2
9	108	4-8	5-1
10	109	3-1	3-5

*For the mongoloid group, intelligence quotients were based on Stanford-Binet scores. For the normal group, intelligence quotients were obtained from the Peabody Picture Vocabulary Test (PPVT).

**All receptive vocabulary ages were derived from the PPVT. In this study, the mental age derived from the PPVT was interpreted as the receptive vocabulary age.

VITA

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