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The value of the SPI in forecasting chronic stuttering

Dena Diane Stork
Portland State University

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APPROVED BY MEMBERS OF THE THESIS COMMITTEE:

[redacted]

Robert L. Casteel, Chair

[redacted]

Mary T. Withers

[redacted]

David Krug

Speech-language pathologists are in need of useful assessment instruments which differentiate early stuttering behaviors and will enable them to identify preschool children who need immediate intervention for stuttering. Furthermore, useful assessment tools are needed especially due to the variability across studies of normal disfluency and lack of reliability information on

more formal measures of differential evaluation of normal disfluency and incipient stuttering.

The Stuttering Prediction Instrument (Riley, 1981) is designed to differentiate the normally disfluent child from the incipient stutterer. However, before the SPI can be considered a valuable tool for differential evaluation, its predictive usefulness within a longitudinal study was questioned.

The present study involved two groups of subjects. One group contained seven children who scored nine or below on the SPI in preschool and therefore were identified as low-risk for stuttering. The second group consisted of seven children who received a score of ten or above on the SPI and therefore were identified as high-risk for stuttering. Conversational speech samples from each subject were videotaped and transcribed. In addition, a parent questionnaire was obtained.

The Fisher Exact Probability Test (Siegel, 1956) was used to analyze data obtained during this investigation. An association was revealed between pretest performance on the Reactions subtest, which evaluates parent/child concerns toward disfluencies, and post-test performance on the entire test which suggests that parent/child reactions to disfluencies are important to consider when forecasting a stuttering problem. Unlike other methods and instruments used for the purpose of differential

evaluation between normal disfluency and incipient stuttering (Riley, 1972; Adams and Webster, 1989; Adams, 1977; Curlee, 1980; and Pindzola and White, 1986), the SPI includes information about parent/child reactions which, according to the data obtained in this investigation, may be one of the most valuable aspects of this instrument.

Additionally, there was a significant association found between combined subtest scores received on the pre-test and combined subtest scores received on the post-test. Therefore, the data obtained in this investigation suggest that a score of ten or above on the SPI is a good indicator of chronic stuttering two years later when considering the low- and high-risk groups collectively. This finding is consistent with Adams' (1977) criteria which listed at least 10 disfluencies per 100 words as indicative of a stuttering problem. However, if parent/child reaction scores were not included in the critical SPI score of ten, only two subjects included in the study would have qualified as being high-risk for chronic stuttering (those subjects are currently in stuttering treatment). With that consideration in mind, the results found in the present investigation would be inconsistent with Adams' (1977) criteria because a score of 10 in this study would not have been a valuable criterion when forecasting a stuttering problem without including parent/child reactions. Thus, with this

particular sample, the SPI did not prove to be a good predictive instrument as its name implies.

THE VALUE OF THE SPI IN FORECASTING CHRONIC STUTTERING

by

DENA DIANE STORK

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TO THE OFFICE OF GRADUATE STUDIES:

The members of the Committee approve the thesis of Dena Diane Stork presented October 31, 1991.

[redacted]

Robert L. Casteel, Chair

[redacted]

Mary T. Withers

[redacted]

David Krug

APPROVED:

[redacted]

Theodore G. Grove, Chair, Department of Speech Communication

[redacted]

C. William Savery, Interim Vice Provost for Graduate Studies and Research

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INTRODUCTION AND STATEMENT OF PURPOSE

INTRODUCTION

Between 2 1/2 and 4 years of age, disfluencies are common in both normal children and those considered "at-risk" for stuttering (Culatta and Leeper, 1987). The ability to differentiate a normally disfluent child from one "at risk" for stuttering is important in determining stuttering caseloads for early intervention; however, speech-language pathologists find it difficult to determine if a young child's disfluencies are normal or if they reflect early signs of a beginning stutterer (incipient stuttering). Due to limited research on normal disfluencies and variability of disfluency in children described in the literature, speech-language pathologists feel uncomfortable making the decision between what is normal disfluency and what is incipient stuttering (Pindzola and White, 1986; Adams, 1977; and Curlee, 1980).

Accordingly, an assessment instrument which differentiates early stuttering behaviors would benefit the speech-language pathologist. The Stuttering Prediction Instrument (SPI) developed by Riley (1981) is a

a tool that purports to differentiate the normally disfluent child from the incipient stutterer. However, the author provides a very limited amount of reliability and validity data on the use of this instrument. Before the SPI can be considered a valid tool for differential evaluation, further analysis is needed concerning the predictive usefulness of this instrument within a longitudinal study of preschool children. Therefore, the following study was conducted.

STATEMENT OF PURPOSE

The purpose of this study was to determine the utility of the Stuttering Prediction Instrument (SPI) as a tool for differential evaluation of normal disfluency and incipient stuttering in preschool children.

The investigation will answer the following primary and secondary questions.

Primary Question

1. Is there an association between pretest performance on a particular subtest of the SPI and post-test performance on the entire test?

Secondary Questions

2. Does pretest performance on a particular subtest predict post-test performance on the same subtest?
3. Does post-test performance on a particular subtest predict overall performance on the entire test?

DEFINITION OF TERMS

Disfluency: Interruption in the normal flow of speech, which is characterized by involuntary, audible or silent, repetitions or prolongations (Van Riper, 1971; Wingate, 1964). All stutterers are disfluent but all disfluency is not stuttering. For example, disfluency could refer to the developmental hesitations of a child first learning to speak or occasional arrhythmic breaks in the speech of an adult.

Dysrhythmic phonations: A within-word event that may involve "a prolonged sound, an accent or timing which is notably unusual, an improper stress, a break, or any other speaking behavior not compatible with fluent speech and not included in another category" (Williams, Silverman, and Kools, 1968).

Grammatical pauses: A silent pause that occurs between grammatical junctures without signs of tension (DeJoy and Gregory, 1985).

Incipient stuttering: Considered to be the first stage of the development of stuttering characterized by mostly effortless repetitions or prolongations of syllables, sounds, or postures but lacking the chronicity of more advanced stuttering. An individual who demonstrates incipient stuttering will require intervention for the development of fluent speech and probably will not spontaneously recover from stuttering (Bloodstein, 1960).

Interjection: Extraneous sounds such as "uh," "er," and "mmm" and extraneous words such as "well" which are inserted within the flow of speech and are not part of the phrase or sentence (Johnson, 1961).

Intrusive schwa: The presence of a schwa vowel in place of the intended vowel (buh-buh-baby) (Van Riper, 1971).

Multisyllabic word repetition: Entire words consisting of two or more syllables are repeated within an utterance (today-today). Also referred to as poly-syllabic word repetition.

Normal disfluency: Disruptions in the flow of speech which are characteristic of most speakers to a

certain extent but do not warrant concern or intervention.

Part-word repetition: A type of disfluency which involves at least one reiteration of a sound or syllable within a word (p-p-paper or pa-pa-paper).

Phrase repetition: A repetition of at least two or more words immediately after they have been produced (it was it was a sunny day).

Single syllable word repetition: Repetition of an entire one-syllable word (he-he, it-it).

Unit repetition: Repetition of a sound, syllable, or word preceding the production of an utterance (Yairi, 1981).

Whole word repetition: A repetition that involves at least one reiteration of an entire word immediately after it has been produced. This includes both single-syllable and multisyllabic words (he he went to the store).

Revision-incomplete phrase: Refers to the modifications in the pronunciation of a word or in the grammatical form or content thought or content of a phrase which is not completed (Johnson, 1961).

Stuttering: Disruption in the fluency of verbal expression which is characterized by involuntary, audible, or silent, repetitions, or prolongation in

the utterance of short speech elements, namely: sounds, syllables, and words of one syllable. These disruptions usually occur frequently or are marked in character and are not readily controllable (Wingate, 1964).

Stuttering Prediction Instrument (SPI): A tool developed by Riley (1981) that purports to differentiate the normally disfluent child from the incipient stutter. The SPI assesses history of stuttering, parent/child reactions to stuttering, part-word repetitions, prolongations, and frequency of stuttering. Parent/child reactions, part-word repetitions, prolongations, and frequency are the only subtests calculated into the overall SPI score.

Tense pauses: An event that can occur before the first word in an utterance has been initiated or between words. There is presence of audible manifestations of heavy breathing and/or muscle tension (Williams, Silverman, and Kools, 1968).

Ungrammatical pauses: Silent pauses that occur at nongrammatical junctures (DeJoy and Gregory, 1985).

CHAPTER II

REVIEW OF THE LITERATURE

It is often difficult for the speech-language pathologist to differentiate between normal disfluency and incipient stuttering. This review of the literature will discuss characteristics of chronic stuttering, normal disfluency, and incipient stuttering, as well as methods of differential evaluation listed and discussed by several researchers.

CHARACTERISTICS OF STUTTERING

Stuttering is defined as a disruption in the fluency of verbal expression which is characterized by involuntary, audible, or silent repetitions, or prolongations in the utterance of short speech segments, namely, sounds, syllables, and words of one syllable. These disruptions usually occur frequently, have specific characteristics, and are not readily controllable (Wingate, 1964). Some common indicators of stuttering consist of the following: 10 or more disfluencies per 100 words of conversational speech, part-word repetitions and sound prolongations, presence of the schwa vowel, difficulty with initiation and maintaining airflow,

emotional reaction-avoidance behaviors with speaking, and tension (Adams, 1977; Curlee, 1980; Riley, 1981; Adams, 1984; Yairi and Lewis, 1984). Prevalence of stuttering is generally 1 percent of the population; however, incidence of stuttering is around 5 percent (Ham, 1990). A high percentage of stutterers may recover without intervention. According to Van Riper (1982), who summarized the results of eight recovery investigations, percentage of recovery averages 63.48 percent. Wingate (1976) cites a 42 percent recovery rate.

CHARACTERISTICS OF NORMAL DISFLUENCY

There is limited research available in the area of normal disfluency of preschool children. The data that is available shares some commonalties, as well as differences, in what constitutes normal disfluency.

Branscom, Hughes, and Oxtoby (1955) combined each of their studies and came to the following conclusions. Agreement was reached on repetitions of sounds, words, and phrases as being common in the speech of children aged two to five years. Word repetitions were reported by Branscom (1942) and Hughes(1943) to be the most common repetition while phrase repetitions were most frequent in Oxtoby's study. The difference in results may be attributed to the two different testing situations used to elicit speech

samples. Oxtoby elicited speech samples from each of his subjects in a free-play situation while Branscom and Hughes elicited speech from their subjects by means of a speech test. Agreement was reached on part-word repetitions being the least frequent type of repetition. Furthermore, repetitions tend to decrease with increasing chronological age in each of the studies.

DeJoy and Gregory (1985) studied nine categories of disfluency in two groups of nonstuttering males at 3.5 years and 5 years of age. The categories included revisions, ungrammatical pauses, interjections, word repetitions, phrase repetitions, dysrhythmic phonations, incomplete phrases, part-word repetitions, and grammatical pauses. Thirty males at 3.5 years of age exhibited more part-word repetitions, word repetitions, incomplete phrases, and dysrhythmic phonations than the 5-year-old males. In addition, these disfluencies tended to decrease significantly with age. Most preschool disfluency was attributed to demands on the immature symbolic/motor system of these children. As children gained better control of the symbolic motor system, their disfluencies decreased. Word repetitions were the most common type of repetition demonstrated by the 3.5-year-old males, followed by phrase repetitions. Part-word repetitions were the least common. In addition, the 3.5 year olds

exhibited significantly fewer grammatical pauses than the 5 year olds. The second group of 30 males at 5 years of age demonstrated more grammatical pauses which tend to characterize adult speech.

Yairi (1981) investigated 8 disfluency types in 15 normally disfluent 2-year-old males and 18 females. The disfluency types were interjections, single-syllable word repetitions, part-word repetitions, revisions, phrase repetitions, tense pauses, dysrhythmic phonations, and poly-syllabic word repetitions. Word repetitions were divided into two categories labeled single-syllable word repetitions and poly-syllabic word repetitions. He found that the most common disfluencies exhibited by these children in order were single-syllable-word repetitions, part-word repetitions and then revision-incomplete phrase. Unlike Branscom, Hughes, and Oxtoby (1955) and DeJoy and Gregory (1985), he noted part-word repetitions as one of the most common disfluency types. He found that dysrhythmic phonations and tense pauses were the least common. Variability in frequency of disfluency was evidenced within his groups of children.

Wexler and Mysak (1982) studied 36 normal boys, 12 at each age level of 2, 4, and 6 years. They examined seven categories of disfluency including revision-incomplete phrases, interjections, phrase repetitions, word

repetitions, dysrhythmic phonations, tense pauses, and part-word repetitions. It was found revision-incomplete phrases and interjections were most common among the three groups. Part-word repetitions and word repetitions were least frequent.

Summarizing the previous studies suggests part-word, whole word, and phrase repetitions seem to be the most common in normally disfluent children across several studies (Branscom, Hughes, and Oxtoby, 1955; Yairi, 1981; DeJoy and Gregory, 1985). However, Wexler and Mysak (1982) noted revision-incomplete phrases and interjections as most common in their sample across ages two, four, and six years. DeJoy and Gregory (1985) suggest that variability between studies may be due to different samples of children, sample sizes, and different ways of analyzing the data. (See Table I for data summary of past investigations.)

LONGITUDINAL STUDIES

Yairi, (1982) who has the only longitudinal study in the published literature, followed a group of 33 2-year-old children, 18 girls and 15 boys, over the course of 1 year. Disfluencies identified and classified in this study were part-word repetitions, single-syllable-word repetitions,

TABLE I

DATA SUMMARY OF PAST INVESTIGATIONS OF NORMAL DISFLUENCIES MEAN PER 100 WORDS

Investigator(s)	Sex of Subjects	Number of Subjects	Age					Totals
			2 Years	3 Years	4 Years	5 Years	6 Years	
								Repetitions
Branscom (1942)	M/F	49		WR 2.62 PHR 1.08 PW 0.45	WR 2.48 PHR 0.85 PW 0.42	WR 1.97 PHR 0.92 PW 0.29		3 Years 4.18 4 Years 3.73 5 Years 3.42
Hughes (1943)	M/F	39		WR 1.81 PHR 1.33 PW 0.91	WR 1.13 PHR 0.56 PW 0.97			2 Years 4.06 4 Years 2.66
Oxtoby (1943)	M/F	25		PHR 2.23 WR 1.48 PW 1.03				3 Years 4.76
								Frequency
Wexler & Mysak (1982)	M	36	RIP 3.50 INT 3.00 PHR 2.20 WR 2.10 DP 1.50 TP 1.50 PW 0.70		INT 2.60 RIP 2.60 TP 1.50 WR 0.90 DP 0.60 PW 0.60 PW 0.40		INT 3.40 RIP 2.30 TP 1.10 WR 0.90 PHR 0.70 PW 0.60 DP 0.20	2 Years 14.6 4 Years 9.1 6 Years 9.1
Yairi (1982)	M/F	33	INT 1.38 SWR 1.32 REV 1.07 PHR 0.57 TP 0.43 DP 0.43 PWR 0.07					2 Years 6.49
								Disfluency
				3.5 Years				
DeJoy & Gregory (1985)	M	60		REV 2.73 UGP 1.93 INT 1.78 WR 1.37 PHR 1.16 DP 0.90 IP 0.88 PW 0.79 GP 0.22		REV 2.40 UGP 1.82 INT 1.66 WR 0.78 PHR 0.66 IP 0.60 DP 0.50 PW 0.48 GP 0.41		3.5 Years 11.4 5 Years 9.3

LEGEND:

PW	= Part-word repetition	GP	= Grammatical pause
INT	= Interjection	PHR	= Phrase repetition
IP	= Incomplete phrase	REV	= Revision
UGP	= Ungrammatical pause	TP	= Tense pause
WR	= Word repetition	SWR	= Single-syllable word repetition
RIP	= Revision-incomplete phrase	PWR	= Poly-syllabic word repetition
DP	= Dysrhythmic phonation		

Sources: Branscom (1942), Hughes (1943), Oxtoby (1943); refer to Branscom, M.E., Hughes, J., and Oxtoby, E.T. (1955) in Bibliography.

multi-syllabic word repetitions, phrase repetitions, interjections, revisions, dysrhythmic phonations, and tense pauses. Yairi found that these children exhibited all types of disfluencies. However, 76 percent of the total disfluencies demonstrated by this group were part-word repetitions, single-syllable-word repetitions, interjections, and revisions. At three different times within this year, the frequency of the children's disfluencies was examined. The frequency of disfluencies was found to fluctuate each time. In addition, disfluency did not appear to follow a developmental course, at least when considering this brief period of one year.

CHARACTERISTICS OF INCIPIENT STUTTERS

According to Yairi (1981), an incipient stutterer is one who is starting to demonstrate disfluencies common in chronic stutterers such as, part-word repetitions, single-syllable whole-word repetitions, and dysrhythmic phonations.

Yairi and Lewis (1984) discussed speech characteristics present in children at the onset of their stuttering compared to children who were not considered stutterers. The subjects, two and three years of age, were selected on the basis of parent reports of stuttering behaviors, confirmed by a speech-language pathologist, and

matched with children said to have no stuttering behaviors. Yairi and Lewis analyzed three indicators in order to differentiate the two groups. The greatest indicator which differentiated the two groups was that the stuttering group was 3 1/2 times more disfluent than the non-stuttering group. With respect to the types of disfluencies, the stuttering group exhibited significantly more part-word repetitions, dysrhythmic phonations, and single-syllable whole-word repetitions. It became more difficult to differentiate the two groups as some overlap of disfluency types appeared in both groups. The largest overlap occurred with respect to interjection and revision-incomplete phrases. Overall, overlaps decreased for those disfluencies most commonly found in the speech of stutterers, such as single-syllable word and phrase repetitions. The smallest overlap occurred with respect to part-word repetitions and tense pauses. Finally, Yairi and Lewis found that stutters demonstrated more unit repetitions compared to non-stutters.

DIFFERENTIAL EVALUATION

Methods of differential evaluation have been proposed by several researchers (Adams and Webster, 1989; Adams, 1980; Curlee, 1980; and Pindzola and White, 1986). Characteristics of normal and incipient stuttering

TABLE II

CHARACTERISTICS OF INCIPIENT STUTTERING AND NORMAL DISFLUENCY

Incipient Stuttering	Normal Disfluency
10 or more disfluencies per 100 words (Adams, 1977)	9 or fewer disfluencies per 100 words (Adams, 1977)
Disfluencies are part-word repetitions and sound prolongations (Riley, 1981; Adams, 1977)	Disfluencies are mainly whole-word repetitions, interjections, and revisions (Adams, 1977)
At least 3-unit repetitions (Curlee, 1980; Adams, 1977; Yairi & Lewis, 1984)	No more than two-unit repetitions (Curlee, 1980; Yairi & Lewis, 1984; Adams, 1977)
Schwa vowel present (Adams, 1977)	No schwa vowel present (Adams, 1977)
Difficulty with initiation and maintaining airflow (Adams, 1977)	No difficulty with initiation or maintaining airflow (Adams, 1977)
Prolongations longer and 1 second and 2% or more of the words; blocking, and hesitations longer than 2 seconds (Curlee, 1980)	
Emotional reactions-avoidance behavior associated with speaking (Curlee, 1980)	
Audible and/or silent groping, body movements, eye blinks, lip and jaw tremors (Riley, 1981; Curlee, 1980)	
Variability in frequency of stuttering in different situations (Curlee, 1980)	

discussed in the literature have formed the basis for diagnostic criteria suggested by Adams (1977) (see Table II). The more criteria the child meets, the more likely he is an incipient stutterer. Criteria, listed by Adams (1977), for normally disfluent children are: 9 or fewer disfluencies/100 words, disfluencies are predominantly whole-word repetitions, interjections, revisions, no more than 2 unit repetitions, no schwa vowel, and no difficulty with initiation or maintaining airflow. Conversely, incipient stutterers would have at least 10 disfluencies/ 100 words, disfluencies are part-word repetitions, prolongations, possible audible and silent groping, at least 3 unit repetitions, the schwa vowel is present, difficulty with initiation, and trouble maintaining airflow. In addition, Curlee's (1980) diagnostic criteria lists prolongations, blocking or hesitations, body movements, emotional reactions-avoidance, complaints of speech, and variability in frequency of stuttering in different situations as characteristic of an incipient stutterer. Pindzola and White (1986) developed an identification procedure, The Protocol for Differentiating the Incipient Stutterer, to help distinguish between incipient stutterers and normally disfluent children. It is a tool that assists the speech-language pathologist in classifying types of disfluent behaviors, auditory, visual

and psychological, as being normal, questionable, or indicative of stuttering (see Appendix A). A number of questionable marks suggests incipient stuttering.

Adams and Webster (1989) discuss two different types of case selection strategies for stuttering. The first type, the Differential Diagnostic Approach (DDA), utilizes behavioral criteria such as those listed previously by Adams, Curlee, and Pindzola and White, to differentiate normal versus incipient stutters. According to Adams and Webster, the validity of DDAs is questioned by speech-language pathologists due to the limited research concerning the characteristics of normal disfluency and incipient stuttering. The second type of case selection strategy, the Individual Treatment for All Approach (ITA) discussed by Adams and Webster, was developed out of the partial dissatisfaction with certain aspects of the DDAs. The ITA involves providing some method of treatment to every child that is designed to fit individual behaviors and case histories; however, there is no published data on its use.

The Stuttering Severity Instrument (SSI) developed by Riley (1972) is an objective tool that can be used with children and adults. It evaluates severity of stuttering behavior and can serve as a reference point for measuring clinical changes. Frequency of repetition and audible and

inaudible prolongations of sounds and syllables, duration of blocks, and physical concomitants are tabulated into the final SSI score. A severity rating is assigned according to the overall score. A disadvantage of the SSI is the lack of normative data on the performance of preschool children. Thus, young children tend to be labeled stutterers according to their scores on the SSI for it has no normal range.

Another method available to the clinician for the purpose of differential evaluation is the Stuttering Prediction Instrument (SPI), also developed by Riley (1981). The SPI assesses history of stuttering, parents' reaction to the stuttering, part-word repetitions, prolongations, and frequency of stuttering. This instrument is unique in that it does provide norms for preschool disfluency. Parent reactions, part-word repetitions, prolongations and frequency of disfluency are the only subtests calculated into the overall SPI score. Riley's norming sample for the SPI consisted of 102 children between the ages of 3.8 and 8.9 years. Eighty-five of these children were accepted into stuttering treatment programs; 17 had disfluencies that had not become chronic. Of these 17 children, 11 were not given treatment but were monitored by the author for a period of one to three years. Abnormal disfluency did not develop

in these 11 children; therefore, this group formed a basis for predicting chronicity. In addition, six other children continued to be monitored for stuttering. According to Riley, a high correlation was found when comparing SPI and SSI scores, even though the SSI weights frequency much higher than the SPI, and the SPI has more information about specific disfluency types and parent/ child reactions to the disfluencies. (See Table III for comparison of differential diagnostic instruments.)

In conclusion, further reliability studies are needed on methods of differential evaluation. Differentiating between the normally disfluent child and the incipient stutterer is difficult because of variable data in the research, large standard deviations reported in each of the studies, and limited information on normal and incipient stuttering. Before the SPI can be considered a reliable tool for differential evaluation, further analysis is needed concerning its predictive usefulness. In addition, longitudinal studies are sorely needed as there has only been one longitudinal study published (Yairi, 1982).

TABLE III

COMPARISON OF DIFFERENTIAL DIAGNOSTIC INSTRUMENTS FOR STUTTERING

Types of Disfluencies	Pindzola & White (1986)	Riley SSI (1972)	Riley SPI (1981)	Adams (1977)
Repetitions	PWR,WWR,PHR	PWR	PWR,WWR	PWR,WWR,PHR
Prolongations	X	X	X	X
Interjections	X			X
Revisions				X
Size of Speech Unit Affected	X	X	X	X
Frequency of Disfluencies	X	X	X	X
Number of Unit Repetitions	X		X	X
Visual Evidence/ Physical Concomitants	X	X	X	
Historical/ Psychological Indicators	X		X	
Rhythm/Tempo/ Speed of Disfluencies	X			

Legend: PWR = Part-Word Repetition
WWR = Whole-Word Repetition
PHR = Phrase Repetition

Source: Casteel, R.L. (1990)

CHAPTER III

METHODS AND PROCEDURES

METHODS

Introduction

In the months of December 1987 and January 1988, 94 subjects ranging in age from 3 to 5 years were administered the Stuttering Prediction Instrument (SPI) (Riley, 1981) by Dia Norris, speech-language pathologist from Albina Ministerial Alliance Head Start Program, and Pam Dahm, a former graduate student of speech pathology at Portland State University. This investigator chose 14 children from the original 94 subjects to be utilized in this present study.

SUBJECTS

Original Study

Ninety-four children from Albina Ministerial Alliance Head Start ranging in age from three to five years served as subjects for the original 1987-88 study. Each of the subjects met certain selection criteria for the original Norris study. These criteria included:

1. A permission form signed by a parent or primary caregiver.

2. No prior intervention or counseling for stuttering.
3. Enrollment as a student at Albina Ministerial Alliance Head Start, Portland, Oregon.

Present Study

Fourteen children, 9 males and 5 females, who were drawn from the original 94 tested in the Norris (1987-88) study, served as subjects for the present study. These same children ranged in age from 6.6 through 8.5 years (mean age: 7.5 years). Five children were enrolled in the first grade and nine children in the second grade. Eleven children were Black, two were Caucasian, and one was of Hispanic origin. Each child met certain selection criteria for the present study. These criteria included:

1. A permission form signed by the parent or primary caregiver.
2. Located in their present school by the investigator.
3. Seven subjects who scored nine or below on the original SPI to serve as the low-risk group.
4. Seven subjects who scored ten or above on the original SPI to serve as the high-risk group.

Seven subjects who scored nine or below on the Stuttering Prediction Instrument were chosen and placed in a low-risk category by the investigator and seven subjects

who scored ten or above were placed in a high-risk category for chronic stuttering. Subjects from the low-risk category were chosen from a pool of low-risk children and subjects from the high-risk category were chosen from a pool of high-risk children. This was accomplished for both groups through the use of a random order table. To obtain total scores on the SPI, the investigator added the subtotal scores for Sections II through V. There was, however, one subject in the high-risk category whose parents did not fill out Section II at the time of the pre-test in 1987-88. Therefore, Section II could not be calculated in the subject's total SPI score. The combined score for this subject on Sections III through V alone met the criteria for placement in a high-risk category.

In the high-risk category, five children had not received speech therapy for stuttering since being tested in 1987-88, while two children had received speech therapy for stuttering since being tested in 1987-88. All seven children in the low-risk category had not received speech therapy for stuttering since being tested in 1987-88.

PROCEDURES

Subject Eligibility Procedures

Following the identification and location of subjects, each parent or primary caregiver was sent a

recruitment letter (see Appendix B) regarding the purposes of this longitudinal study and to seek confirmation of their willingness to participate again. Each parent received a consent form (see Appendix C) concerning participation in this study, permission to videotape, and a question as to whether their child has ever spoken to a speech-language pathologist regarding their child's speech or if their child has received speech therapy for stuttering since being tested in 1987-88. Finally, each consenting parent was sent an SPI questionnaire (see Appendix D). High-risk subjects were found eligible for the study and chosen in the following order:

1. Child has not received speech therapy for stuttering since being tested in 1987-88.
2. Parents have received less than three sessions of counseling for stuttering.
3. Parents have received three or more sessions of counseling for stuttering.
4. Child has received direct treatment for stuttering by a public school clinician.

When needed, the investigator returned to the remaining pool of subjects and chose those subjects in the order listed above.

Instrumentation

Riley's (1981) Stuttering Prediction Instrument consists of five sections. Sections I and II involve a parent questionnaire. Section I is divided into two parts: background information regarding the child's disfluencies and family history of stuttering. Section II addresses both the parents' and child's reactions to the disfluencies.

Sections III, IV, and V of the SPI are based on a speech-language sample. For Section III, the most severe part-word repetition is examined with regard to the number and quality of the repeated sounds or syllables. In addition, the quality of repetitions with respect to degree of abnormality is addressed. For example, the child may distort the repetitions by changing the vowel so it does not match the target sound; the repeated syllables may be hurried; the repeated syllables may be abruptly separated in a staccato manner; or the repeated syllables may be accompanied by tension.

In Section IV, three types of prolongations are examined: vowel prolongations; phonatory arrest; and articulatory posturing.

The final section, Section V, pertains to a frequency count of the number of stuttering events (part-

word repetitions and prolongations described above) per 100 words of conversational speech.

Speech Sample Procedures

Following the design of the original Norris (1987-88) study, each subject was videotaped long enough to provide a minimum of a 150-word sample while interacting with the investigator in a non-distracting school environment. The video equipment, a Panasonic AG-100 Camcorder, was set up by the investigator (prior to interacting with the child) in a position which provided a close-up view of the child.

A standard set of toys, open-ended questions, parallel talk, and verbal prompts (see Appendix E) used in the original Norris (1987-88) study were utilized to elicit a spontaneous speech sample from each subject.

Scoring Procedures

A 125-word sample was transcribed verbatim from the video recordings for each subject by the investigator. The first 25 words were bracketed and scored in the same manner as the original Norris study. Each disfluency was coded as a specific type, such as part-word repetition, vowel prolongation, phonatory arrest, or articulatory posturing, and coding symbols (see Appendix F) were placed above each disfluency. Each 100-word sample was analyzed

for the number of repeated sounds or syllables in the most severe example of part-word repetitions. This number was placed above the part-word repetition. The duration of the most severe vowel prolongation, phonatory arrest, and/or articulatory posturing was determined using a stopwatch. The number of seconds or part of a second was placed above the prolongation. A frequency count of the number of stuttering events (part-word repetitions and prolongations) per 100 words of conversational speech was determined. The investigator made a dot for each fluent word (.) and a diagonal line (/) for each stuttering event. The number of stuttering events was divided by the number of words analyzed, and the total was multiplied by 100 to get percentage of words stuttered.

Assigning scores for the number of repeated sounds and syllables in the most severe part-word repetition, abnormality of repeated syllables, duration of prolongations, and percentage of stuttering was done according to procedures for scoring the Stuttering Prediction Instrument (see Appendix G).

RELIABILITY

Speech samples for each of the 14 subjects were assigned an identification number. From these 14 samples, 5 were selected through the use of a random order table.

A graduate student from the Portland State University Speech and Hearing Sciences Program selected ten consecutive utterances from each of the five samples and formed content transcripts for each of the samples (see Appendix H). A content transcript provides words contained in the child's utterance but no information concerning the repetition of words or syllables, prolongations, or any other types of disfluencies.

The investigator discussed procedures for coding and scoring the utterances with another graduate student in speech pathology and one practicing speech-language pathologist (see Appendix I). Each judge was trained to transcribe the ten utterances from the five content transcripts. Results were compared with the investigator's scoring results.

Interjudge reliability between the experimenter and the graduate student in speech pathology was 82 percent. Interjudge reliability between the graduate student and the practicing speech-language pathologist was 88 percent. In addition, interjudge reliability between the experimenter and the practicing speech-language pathologist was 86 percent. Intrajudge reliability for all three judges was 100 percent.

Data Analysis

Data were analyzed using the Fisher Exact Probability Test (Siegal, 1956). This test determines whether two groups differ in proportion with which they fall into two categories. In practical terms, this test was used to determine the extent to which belonging to the "low-risk" or "high-risk" group was associated with subsequent performance on the SPI post-test. The Fisher Exact Probability Test was selected for use in the present investigation because two independent groups of a small sample size were involved. To determine if any associations exist between pretest performance on each particular subtest of the SPI and post-test performance on the entire test, pre- and post-test scores from both the low- and high-risk groups were analyzed according to each individual subtest and combined subtests as well (subjects' scores are listed in Table IV).

For statistical purposes, critical values for each subtest were generated. Critical values are scores achieved on particular subtests or combined subtests that

TABLE IV

COMPARISON OF THE 1987-88 AND 1991 STUTTERING PREDICTION INSTRUMENT SCORES

SUBTEST	II Parent/ Child Reac- tions	III Part- Word Repeti- tions	IV Pro- longa- tions	V Fre- quency	Total	Eligi- bility Code
HIGH RISK						
Subject 1						
Pretest	N/A	3	12	3	18	1
Post-test	0	2	4	3	9	
Subject 2						
Pretest	2	4	0	5	11	1
Post-test	0	0	0	0	0	
Subject 3*						
Pretest	5	3	0	7	15	4
Post-test	4	2	4	3	13	
Subject 4*						
Pretest	12	5	6	6	29	4
Post-test	8	3	4	7	22	
Subject 5						
Pretest	0	5	0	5	10	1
Post-test	0	1	0	2	3	
Subject 6						
Pretest	2	5	0	5	10	1
Post-test	0	2	0	2	4	
Subject 7						
Pretest	1	2	4	3	10	1
Post-test	0	1	0	3	4	

* = Stuttering Treatment

Eligibility Code: 1 = No stuttering treatment
2 = Less than three sessions of parent counseling for stuttering
3 = Three or more sessions of parent counseling for stuttering
4 = Direct stuttering treatment by a public school clinician

TABLE IV

COMPARISON OF THE 1987-88 AND 1991 STUTTERING PREDICTION INSTRUMENT SCORES
(continued)

SUBTEST	II Parent/ Child Reac- tions	III Part- Word Repeti- tions	IV Pro- longa- tions	V Fre- quency	Total
LOW RISK					
Subject 1					
Pretest	0	0	4	1	5
Post-test	3	2	0	4	9
Subject 2					
Pretest	0	1	0	3	4
Post-test	0	1	0	3	4
Subject 3					
Pretest	0	2	0	2	4
Post-test	0	1	0	2	3
Subject 4					
Pretest	0	1	0	2	3
Post-test	0	1	0	2	3
Subject 5					
Pretest	1	2	0	3	6
Post-test	0	1	0	2	3
Subject 6					
Pretest	0	3	0	4	7
Post-test	0	2	0	3	5
Subject 7					
Pretest	1	0	0	0	1
Post-test	0	1	4	3	8

suggest a child is "at-risk" for stuttering (see Table V). The following were procedures utilized for generating critical values:

1. A cutting score was adopted based upon the SPI administrative manual.
2. An "at-risk" score was determined for each subtest. This was accomplished by taking the ratio of each subtest to the total score and applying it to the cutting score. For example, in the case of the Reactions subtest there were 12 points possible against 58 points possible on the total test. In this case, the same ratio was applied to the cutting score to yield the critical contribution of this subtest.

TABLE V

GENERATED CRITICAL VALUES FOR EACH INDIVIDUAL SPI SUBTEST

Subtest	Score
Reactions	2.08
Part-Word Repetitions	1.21
Prolongations	5.17
Frequency	1.55
Total	10.00

The data were analyzed for the low- and high-risk groups collectively; therefore, predictions will not be perfect for every individual within each group. The sample size in this investigation was too large for analyzing data on each individual subject.

CHAPTER IV

RESULTS AND DISCUSSION

RESULTS

The purpose of the present study was to determine the value of the Stuttering Prediction Instrument (SPI) as a predictive tool. Specifically, the ability of the SPI to predict incipient stuttering in preschool children over a two-year span was examined.

Analysis

Based on initial SPI performances, the subjects were placed into two categories corresponding to "low-risk" and "high-risk." Subsequently, the post-test scores of subjects in each of the two groups collectively were compared. Comparisons included not only individual subtests but total scores of all subtests combined.

Scores achieved by each individual subject on an SPI pretest and SPI post-test were presented in Table IV. This table included scores received on each of the subjects and on the subtests combined. Specific subtests of the SPI analyzed were the following: (1) Reactions, (2) Part-Word Repetitions, (3) Prolongations, (4) Frequency, and (5) Combined Subtests. Results of this

investigation will be discussed in order to answer the following questions.

Primary Question

1. Is there an association between pretest performance on a particular subtest of the SPI and post-test performance on the entire test?

Analysis of the Reactions subtest revealed a p-value of .0209 which reflects a statistically significant difference at the .05 level of confidence. Thus, there appears to be a substantial association between pretest performance on the Reactions subtest of the SPI and post-test performance on the entire test. Subjects in the low-risk group who did not exceed the cutting score of 2.08 on the Reactions pretest also did not exceed the cutting score of 10 on the entire SPI post-test. Subjects in the high-risk group who exceeded the cutting score of 2.08 on the Reactions pretest also achieved a score exceeding the cutting score of 10 on the entire SPI post-test.

Scores achieved by both groups on the Part-Word Repetitions subtest were analyzed and a p-value of .2308 was revealed. Thus, no significant difference at the .05 level of confidence was obtained for this subtest. Subjects in the low-risk group and subjects in the high-risk group tended to exceed the cutting score of 1.21 when

pretested. However, both groups did not exceed the cutting score of ten on the entire SPI post-test.

On the Prolongations subtest, a p-value of .2308 was obtained. Therefore, no significant difference was found at the .05 level of confidence. Subjects in the low-risk group and the high-risk group did not exceed the cutting score of 5.17 on the Prolongations pretest and likewise did not exceed the cutting score of 10 on the entire SPI post-test.

A p-value of .2308 for the Frequency subtest revealed no significant difference at the .05 level of confidence. Most subjects in both the low- and high-risk groups tended to exceed the cutting score of 1.55 on the Frequency pretest. However, the majority of subjects in both groups did not exceed cutting scores of ten on the entire SPI post-test.

Finally, a statistically significant difference at the .05 level of confidence was found with a p-value of .0003 when combined subtest scores achieved by the two groups were examined. Thus, there appears to be a substantial association between pretest performance on combined subtests and post-test performance on combined subtests. Those subjects in the low-risk group who did not exceed cutting scores of ten when pretested on combined subtests also did not exceed the cutting score of

ten when post-tested on combined subtests. Subjects in the high-risk group who tended to exceed the cutting score of ten when pretested on combined subtests performed similarly when post-tested on combined subtests (p-values are listed in Table VI).

TABLE VI

RESULTS OF A FISHER EXACT PROBABILITY TEST COMPARING PRETEST PERFORMANCE OF LOW- AND HIGH-RISK GROUPS WITH POST-TEST PERFORMANCE ON COMBINED SUBTESTS

Subtest	P-Value	
Reactions	.0209*	
Part-Word Repetitions	.2308	NS
Prolongations	.2308	NS
Frequency	.2308	NS
Combined Subtests	.0003*	

*Alpha level was significant at $P < .05$; NS = not significant

Secondary Questions

2. Does pretest performance on a particular subtest predict post-test performance on the same subtest?

Overall, statistically significant differences at the .05 level of confidence were not found between pretest performance on any of the subtests or combined subtests and post-test performance on the same subtests or combined subtests.

Pretest scores from both groups on the Reactions subtest were examined and a p-value of .1648 was obtained.

Subjects in a low-risk group who did not exceed the cutting score of 2.08 on the Reactions pretest also did not exceed the cutting score of 2.08 on the Reactions post-test. High-risk subjects who exceeded the cutting score of 2.08 on the Reactions pretest tended equally either to exceed or not exceed the cutting score of 2.08 on the Reactions post-test.

A p-value of .8571 reflected no significant difference at the .05 level of confidence when pretest scores from both groups on the Part-Word Repetitions subtest were analyzed. Most low-risk subjects were above the cutting score of 1.21 on the Part-Word Repetitions pretest and were below the cutting score of 1.21 on the post-test. Subjects in the high-risk group, with the exception of one subject who exceeded the cutting score of 1.21 on the Part-Word Repetitions pretest, tended to also exceed the cutting score of 1.21 on the Part-Word Repetitions post-test.

Pretest scores from both groups on the Prolongations subtest were examined and a p-value of one was obtained. This p-value revealed no significant difference at the .05 level of confidence. Low-risk subjects who did not exceed the cutting score of 5.17 on the Prolongations pretest also did not exceed the cutting score of 5.17 on the Prolongations post-test. In addition, subjects in the

high-risk group who exceeded the cutting score of 5.17 on the Prolongations subtest did not exceed the cutting score of 5.17 on the Prolongations post-test.

A p-value of .8571 was revealed when pretest scores from both groups on the Frequency subtest were examined. Thus, no significant difference at the .05 level was obtained for this subtest. Those low-risk subjects who did not exceed the cutting score on the Frequency pretest tended not to exceed the cutting score on the Frequency post-test. Most high-risk subjects who exceeded the cutting score of 1.55 on the Frequency pretest tended not to exceed the cutting score of 1.55 on the Frequency post-test.

Finally, a p-value of .2308 for combined subtests was obtained. Therefore, no significant difference at the .05 level of confidence was revealed when pretest scores from both groups on combined subtests were examined. Subjects in the low-risk group who did not exceed the cutting score of ten when pretested on combined subtests also did not exceed the cutting score of ten when post-tested on combined subtests. Furthermore, most high-risk subjects who exceeded the cutting score of ten when pre-tested on combined subtests then did not exceed the cutting score of ten when post-tested on combined subtests (p-values are listed in Table VII).

TABLE VII

RESULTS OF A FISHER EXACT PROBABILITY TEST WHEN COMPARING PRETEST PERFORMANCE OF LOW- AND HIGH-RISK GROUPS ON A SUBTEST WITH POST-TEST PERFORMANCE ON A SUBTEST

Subtest	P-Value
Reactions	.1648 NS
Part-Word Repetitions	.8571 NS
Prolongations	1.0000 NS
Frequency	.8571 NS
Combined Subtest Scores	.2308 NS

*Alpha level was significant at P < .05; NS = not significant

3. Does post-test performance on a particular subtest of the SPI predict overall performance on the entire test?

Overall, statistically significant differences were not found between post-test performance on any of the subtests of the SPI or on combined subtests and performance on the entire test.

A p-value of .0962 for the Reactions subtest was obtained when post-test scores from both groups were examined. Therefore, no statistically significant difference at the .05 level of confidence was revealed. Subjects in the low-risk group who had scores on the Reactions post-test that did not exceed the cutting score of 2.08 also did not have scores exceeding the cutting score on the entire post-test. The majority of the high-risk subjects did not have scores exceeding the cutting

score of 2.08 on the Reactions post-test and did not have scores exceeding the cutting score of 2.08 on the entire post-test.

Scores on the Part-Word Repetitions post-test were analyzed, and a p-value of .4038 was obtained. Thus, no significant difference at the .05 level of confidence was revealed. Even though subjects in both the low-risk and high-risk groups somewhat tended to have scores on the Part-Word Repetitions post-test that exceed the cutting score of 1.21, both groups did not exceed the cutting score of 10 on the entire test.

A p-value of one was obtained on the Prolongations post-test. Therefore, no significant difference at the .05 level of confidence was revealed. Subjects in both the low-risk and high-risk groups had scores that did not exceed the cutting score of 5.17 on the Prolongations post-test and their scores did not exceed the cutting score of 10 on the entire post-test.

On the Frequency subtest, a p-value of .2308 was obtained. Thus, no significant difference was revealed. The majority of subjects in both the low-risk and high-risk groups had scores that exceeded the cutting score of 1.55 for the Frequency post-test. However, subjects in

both groups tended not to exceed the cutting score of ten on the entire post-test (p-values are listed in Table VIII).

TABLE VIII

RESULTS OF A FISHER EXACT PROBABILITY TEST COMPARING POST-TEST PERFORMANCE OF LOW- AND HIGH-RISK GROUPS ON EACH SUBTEST WITH PERFORMANCE ON COMBINED SUBTESTS

Subtest	P-Value	
Reactions	.0962	NS
Part-Word Repetitions	.4038	NS
Prolongations	1.0000	NS
Frequency	.2308	NS

*Alpha level was significant at P < .05;
NS = not significant

DISCUSSION

Data from this study was analyzed in order to determine whether the Stuttering Prediction Instrument is a useful tool for differentiating between incipient stutterers and nonstutterers between the ages of 2 1/2 and 5. To answer the question of whether the SPI is capable of forecasting chronic stuttering in young children, analysis of data indicated that overall the SPI does not appear to reliably predict chronic stuttering. However, there are some specific subtests included in the SPI that appear to be useful for making a better prediction.

The overall data obtained during this investigation revealed that there were indeed associations between

pretest performance on the Reactions subtest, which evaluates parent/child concerns toward disfluencies, and post-test performance on the entire test when examining scores received by the two groups. These data suggest that parent/child reactions toward disfluencies and total scores received on the SPI pretest are important aspects to consider when forecasting a stuttering problem. Unlike other methods and instruments used for the purpose of differential evaluation between normal disfluency and incipient stuttering (Riley, 1972; Adams and Webster, 1989; Adams, 1977, Curlee, 1980; and Pindzola and White, 1986), the SPI includes information about parent/child reactions, which according to the data obtained in this investigation, may be one of the most valuable aspects of this instrument. In addition, there was a significant association between combined subtest scores received on the pretest and combined subtest scores received on the post-test which would suggest a score of ten on the SPI or above is a good indicator of chronic stuttering two years later. However, in this investigation, a critical score of ten on the SPI would not have been a valuable indicator of a stuttering problem without including parent/child reaction scores. Furthermore, if parent/child reaction scores were not included in the critical SPI score of ten, only two subjects included in the study would have

qualified as being high risk for chronic stuttering. Those subjects are currently in stuttering treatment. In addition, the data obtained in this investigation revealed pretest performance on a particular subtest or combined subtests does not predict post-test performance on the same subtest or combined subtests. These results may be due to the small sample size in this investigation or due to the fact that a high percentage of stutterers outgrow stuttering (63.48 percent) (Van Riper, 1982).

To answer the question of whether or not the post-test scores on any of SPI subtests would predict overall performance on the SPI, the data obtained in this investigation suggest that we cannot use the post-test scores on any of the SPI subtests to predict overall performance on the SPI. Therefore, the SPI does not appear to be a useful instrument for this purpose.

In the present study, improvement is defined as a decrease in a subject's SPI score at post-testing. Most low-risk subjects did not show post-test improvement on the entire test. On the other hand, with the exception of two, most high-risk subjects showed post-test improvement.

These findings suggest that although there were some associations between scores received on the pretest and scores received on the post-test, overall the SPI did not consistently forecast chronic stuttering in this given

sample. However, the results also suggest that the speech-language pathologist may find parent/child reactions to stuttering, and combined subtest scores on the SPI pretest useful indicators in the prediction of chronic stuttering. It should be noted that subject #3 and subject #4 in the high-risk group (see Table IV) received post-test scores that still placed them in the high-risk category for stuttering. In addition, these two children were receiving treatment for stuttering at the time of post-testing. When just these two isolated cases are considered, it appears the SPI is useful for forecasting chronic stuttering.

CHAPTER V

SUMMARY AND IMPLICATIONS

SUMMARY

Young children between the ages of 2 1/2 and 4 years of age often exhibit disfluencies in their speech. Disfluencies are found in the speech of normal children as well as those considered "at risk" for stuttering. Speech-language pathologists are in need of useful assessment instruments which differentiate early stuttering behaviors and will enable them to identify preschool children who need immediate intervention for stuttering. Furthermore, useful assessment tools are needed especially due to the variability across studies of normal disfluency and lack of reliability information on more informal measures of differential evaluation of normal disfluency and incipient stuttering.

The Stuttering Prediction Instrument (Riley, 1981) is designed to differentiate the normally disfluent child from the incipient stutterer. The SPI assesses familial history of stuttering, parent/child reactions to the stuttering, part-word repetitions, prolongations, and frequency of stuttering. In addition, the SPI provides

norms for preschool disfluency. However, before the SPI can be considered a valuable tool for differential evaluation, its predictive usefulness within a longitudinal study was questioned.

The present study involved two groups of subjects. One group contained seven children who scored nine or below on the SPI in preschool and therefore were identified as low-risk for stuttering. The second group consisted of seven children who received a score of ten or above on the SPI and therefore were identified as high risk for stuttering. All children attended preschool at the Albina Ministerial Alliance Head Start Program in Portland, Oregon, and currently attend elementary schools in the Portland Public School District. All met selection criteria for the original and present study. With the exception of two subjects in the high-risk group, all had not received speech therapy for stuttering since the SPI pretesting in 1987-88. Conversational speech samples from each subject were videotaped and transcribed. In addition, a parent questionnaire was obtained. The investigator scored each speech sample and parent questionnaire according to SPI scoring procedures.

The Fisher Exact Probability Test was used to analyze data obtained during this investigation. An association was revealed between pretest performance on

the Reactions subtest, which evaluates parent/child concerns toward disfluencies and post-test performance on the entire test, which suggests that parent/child reactions to disfluencies are important to consider when forecasting a stuttering problem. Unlike other methods and instruments used for the purpose of differential evaluation between normal disfluency and incipient stuttering (Riley, 1972; Adams and Webster, 1989; Adams, 1977; Curlee, 1980; and Pindzola and White, 1986), the SPI includes information about parent/child reactions which, according to the data obtained in this investigation, may be one of the most valuable aspects of this instrument.

Additionally, there was a significant association found between combined subtest scores received on the pre-test and combined subtest scores received on the post-test. Therefore, the data obtained in this investigation suggest that a score of ten or above on the SPI is a good indicator of chronic stuttering two years later when considering the low- and high-risk groups collectively. This finding is consistent with Adams' (1977) criteria which listed at least 10 disfluencies per 100 words as indicative of a stuttering problem. However, if parent/child reaction scores were not included in the critical SPI score of ten, only two subjects included in the study would have qualified as being high risk for

chronic stuttering (those subjects are currently in stuttering treatment). With that consideration in mind, the results found in the present investigation would be inconsistent with Adams' (1977) criteria because a score of ten in this study would not have been a valuable criterion when forecasting a stuttering problem without including parent/child reactions. Thus, with this particular sample, the SPI did not prove to be a good predictive instrument as its name implies.

IMPLICATIONS

Research Implications

The results of this study indicate the need for further research on differential diagnostic methods for identifying incipient stuttering. The speech-language pathologist might continue to consider different types of disfluencies a child is exhibiting, such as revisions, phrase repetitions, dysrhythmic phonations, and tense pauses, that are not addressed in the SPI to aid in a more reliable diagnosis of incipient stuttering. The SPI may need to be revised, specifically in regard to the critical value which suggests a child was "at-risk" for stuttering or within the types of disfluencies examined. Perhaps parent/child reactions should continue to be a valuable subtest of the SPI but should not be scored and included

as part of the SPI "at-risk" score of ten. In addition, a bigger sample size is needed with a longitudinal study so more confidence can be placed in the predictive usefulness of the SPI. Further research could involve a comparison of differential diagnostic methods within the same longitudinal study.

Clinical Implications

The results of this study provide valuable information for the speech-language pathologist who is searching for a useful assessment tool that purports to differentiate between the normally disfluent child and the incipient stutterer. Conclusions drawn from this investigation indicate that, overall, SPI is not a valuable instrument for predicting chronic stuttering. However, particular subtests of the SPI, such as Reactions, and total scores may assist the speech-language pathologist in making a better prediction. It should be cautioned that the interpretation of the data may only apply to the sample population in this study. Results of this study suggest that the SPI should be used cautiously or used with other methods of differential evaluation of early stuttering.

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APPENDIX A

PROTOCOL FOR DIFFERENTIATING THE INCIPIENT STUTTERER (PINDZOLA, 1986)

PROTOCOL FOR DIFFERENTIATING THE INCIPIENT STUTTERER (PINDZOLA, 1986)

I. AUDITORY BEHAVIORS

TYPE OF DISFLUENCY (mark the most typical)

Interjections	Hesitations/Gaps-Repetitions	Prolongations Coexisting Struggle
Probably Normal	Questionable	Probably Abnormal

SIZE OF SPEECH UNIT AFFECTED (mark the typical level at which disfluencies occur)

Sentence/Phrase	Word	Syllable-sound
Probably Normal	Questionable	Probably Abnormal

FREQUENCY OF DISFLUENCIES (compute from speech sample and mark values on continua)

Frequency of Repetitions

2%	5%	
Probably Normal	Questionable	Probably Abnormal

Frequency of Prolongations

1%	
Probably Normal	Probably Abnormal

Frequency of Disfluencies, in General

2%	5%	10%	
Normal	Probably Normal	Questionable	Probably Abnormal

DURATION OF DISFLUENCIES

Typical Number of Reiterations of the Repetition = _____

Less Than 2	2 to 5	More Than 5
Probably Normal	Questionable	Probably Abnormal

Average Duration of Prolongations = _____

Less Than 1 Sec.	One or More Seconds
Probably Normal	Probably Abnormal

AUDIBLE EFFORT (mark those that apply)

Lack of the Following_____ Presence of the Following_____
Probably Normal Probably Abnormal

_____Hard glottal attacks
_____Disrupted airflow
_____Vocal tension
_____Pitch rise
_____Others

RHYTHM/TEMPO/SPEED OF DISFLUENCIES

Slow/Normal; Evenly Paced_____ Fast, Perhaps Irregular_____
Probably Normal Probably Abnormal

INTRUSION OF SCHWA VOWEL DURING REPETITIONS

Schwa Not Heard_____ Presence of Schwa_____
Probably Normal Probably Abnormal

AUDIBLE LEARNED BEHAVIORS (mark those that apply)

Lack of the Following_____ Presence of the Following_____
Probably Normal Probably Abnormal

_____Word/phrase substitutions
_____Circumlocutions
_____Avoidance tactics (starters, postponers, and the like)

II. VISUAL EVIDENCE (list behaviors observed)

Facial Grimaces/Articulatory Posturing:
Head Movements:
Body Involvement:

III. HISTORICAL/PSYCHOLOGICAL INDICATORS

Awareness and Concern (of child; of parents):
Length of Time Fluency Problem Has Existed:
Consistent Versus Episodic Nature of Problem:
Reaction to Stress:
Phoneme/Word/Situation Fears and Avoidances:
Familial History:
Other Covert Factors:

IV. SUMMARY OF CLINICAL EVIDENCE AND IMPRESSIONS

APPENDIX B

RECRUITMENT LETTER

RECRUITMENT LETTER

Dear Parent:

I am a graduate student at Portland State University in the Speech and Hearing Sciences Program. I am completing a study to learn more about a test that determines if young children will stutter when they are older (e.g., repeat or hold sounds). As you recall, Dia Norris, Speech-Language Pathologist for AMA Head Start, and Pam Dahm, a former graduate student at Portland State University tested _____ (fill in name of child) for stuttering characteristics in his/her speech on _____ (fill in date of testing) when he/she was in the Albina Ministerial Alliance (AMA) Head Start program. I would like to continue the study to see how your child's and other children's speech has changed to determine if the test does predict stuttering in young children. The participation of your child does not mean that we consider your child to be a stutterer.

The way in which ____'s (fill in name of child) speech is tested will be similar to the way in which he/she was previously tested while in pre-school at AMA Head Start. This would involve videotaping _____ (name of child) during 15 minutes of play and conversation with me at his/her school, during school hours. He/she will be tested within two weeks of receiving your consent form and questionnaire. You will be notified of this date prior to testing.

Your child's name will not be used in reporting the results of this study and the videotape will be used only for research purposes by authorized University personnel. You may refuse participation or withdraw permission at any time during this study without penalty.

Although your child may not stutter, his/her participation in this study will help speech-language pathologists determine whether this particular test is reliable in predicting which children stutter when they get older and which children don't. In addition, if your child does have some stuttering behaviors, he/she will benefit from receiving an evaluation for stuttering as well as a possible referral to a speech-language pathologist for stuttering treatment. The only possible risks as a result of your child's participation in the study are that he/she will be taken out of class for a short period of time.

Please return the enclosed permission form and Stuttering Prediction Instrument questionnaire to me with a few days. _____ (Name of child) will be tested at a day and time in cooperation with his/her classroom teacher.

I have enclosed a self-addressed, stamped envelop for your convenience. If you have any questions, please call me at 725-3603. I greatly appreciate your cooperation.

If you have any problems as a result of your child's participation in this study, please contact the Chairman of the Human Subjects Research and Review Committee, Office of Grants and Contracts, 303 Cramer Hall, Portland State University, 725-3417.

Sincerely,

Dena D. Stork
Graduate Student
Speech and Hearing Sciences Program

enc

APPENDIX C

CONSENT FORM

CONSENT FORM

CHILD'S NAME_____ NICKNAME_____

BIRTHDATE_____ AGE_____

I hereby give my permission for my child, _____, to participate in this study. My child may attend a videotaping session at his/her school

I understand I may withdraw my permission at any time during this study without penalty.

_____ _____ _____

SIGNATURE OF PARENT OR GUARDIAN RELATIONSHIP DATE

APPENDIX D

STUTTERING PREDICTION INSTRUMENT (RILEY, 1981) SECTIONS I AND II (PARENT QUESTIONNAIRE)

STUTTERING PREDICTION INSTRUMENT (RILEY, 1981)
SECTIONS I AND II (PARENT QUESTIONNAIRE)

1. Since the time your child was tested on _____ at Albina Ministerial Alliance Head Start, have you ever spoken to a speech-language pathologist regarding your child's speech?

   Yes_____ No_____

   If your answer was "yes," how many times did you speak with a speech-language pathologist? _____

   For what reason?_____

   _____

2. Since being tested in 1987-88 at Albina Ministerial Alliance Head Start, has your child received speech therapy for stuttering?

   Yes_____ No_____

   If your answer was "yes," for how long has your child received speech therapy for stuttering?

   _____

SECTION I: HISTORY

BACKGROUND

1. When did your child first exhibit disfluencies?

   What were the related circumstances?

2. Is the severity of the stuttering increasing?

   Is the severity of the stuttering decreasing?

3. Does the stuttering come and go?

   Is today's speech more or less disfluent than usual or is it about average?

FAMILY HISTORY OF STUTTERING

4. Have any family members ever stuttered?

   a. The biological father? Yes__ No__
      From age ___ to age ___

   b. The biological mother? Yes__ No__
      From age ___ to age ___

   c. Any biological siblings? Yes__ No__
      From age ___ to age ___

   d. Any other relatives?
      Grandfather Yes__ No__
      Grandmother Yes__ No__
      Aunt Yes__ No__
      Uncle Yes__ No__
      Cousin Yes__ No__
      Other_____ Yes__ No__

SECTION II: REACTIONS

5. Does your child's disfluency make you feel:

a.	unconcerned	(score 0)	
b.	concerned	(score 1)	Score____
c.	very concerned	(score 2)	

6. Has your child been teased about his stuttering?

a.	never observed	(score 0)	
b.	observed to mild degree	(score 1)	Score____
c.	observed to moderate or severe degree	(score 2)	

7. Does your child get frustrated when he cannot get the word out (e.g., cries, stamps foot, hits himself, or asks, "why can't I talk right")?

a.	never observed	(score 0)	
b.	observed to mild degree	(score 1)	Score____
c.	observed to moderate or severe degree	(score 2)	

8. Does your child sometimes change a word because of a fear of stuttering?

a.	never observed	(score 0)	
b.	observed to mild degree	(score 1)	Score____
c.	observed to moderate or severe degree	(score 2)	

9. Does your child avoid some situations because of a fear of stuttering?

a.	never observed	(score 0)	
b.	observed to mild degree	(score 1)	Score____
c.	observed to moderate or severe degree	(score 2)	

10. Are there any observable and/or distracting extraneous facial or bodily movements during stuttering?

a.	never observed	(score 0)	
b.	observed to mild degree	(score 1)	Score____
c.	observed to moderate or severe degree	(score 2)	

APPENDIX E

LIST OF STIMULI

LIST OF STIMULI

Toys

Fisher Price Play Village
Picture Books

Questions

1. How old are you?

2. What is your teacher's name? Tell me about her.

3. Do you have any brothers or sisters? Tell me about them.

4. Did Santa Claus come to your house? What did he bring you?

5. Tell me the story of the Three Little Bears (or Three Little Pigs).

6. Tell me what is happening in the town (as child plays with the Play Village).

Prompts

Tell me more.
What else?
Why?
Oh.
Tell me about it.

Source: Questions and materials used by Pam Dahm and Dia Norris to elicit speech samples for the SPI.

APPENDIX F

CODING SYMBOLS

CODING SYMBOLS

Part-Word Repetition	PWR
Vowel Prolongation	VP
Phonatory Arrest	PA
Articulatory Posturing	AP

APPENDIX G

SCORING THE STUTTERING PREDICTION INSTRUMENT

SCORING THE STUTTERING PREDICTION INSTRUMENT

Section I. History: The items in this section of the SPI are not assigned scores. The parent is asked a series of questions pertaining to their child's stuttering and if any family members have ever stuttered.

Section II. Parent Reactions: The items in this section are part of the parent interview.

0 = unconcerned
1 = concerned
2 = very concerned

Child's reactions are part of this section also. Items are scores as:

0 = never observed
1 = observed to a mild degree
2 = observed to a moderate or severe degree

Section III. Part-Word Repetitions: These are scored according to number and quality of repeated sounds or syllables. Each repetition is to be phonetically transcribed and the most severe example is scored as follows:

0 = none
1 = 1 to 3 repetitions
3 = 4 or more repetitions

The quality of the repetitions is scored according to the degree of abnormality.

0 = normal
1 = mild
2 = moderate
4 = severe

Section IV. Prolongations: Each type is cored as follows:

Vowel Prolongations:

0 = less than 1.5 seconds
2 = 1.5 to 2 seconds
4 = 2 to 4 seconds
6 = more than 4 seconds

Phonatory Arrest:

0 = none
4 = estimated duration is less than 1 second
8 = estimated duration is 1 to 3 seconds
12 = estimated duration is more than 3 seconds

Articulatory Posturing (scored same as phonatory arrest)

Section V. Frequency: Number of stuttered words per 100 words is determined. A dot (.) is made for each fluent word and a diagonal line (/) for each stuttering event. The percentage of stuttered words is scored as follows:

0 = 0%
2 = 1%
3 = 4%
4 = 4%
5 = 5% to 6%
6 = 7% to 9%
7 = 10% to 14%
8 = 15% to 28%
9 = more than 28%

The subtotal scores for Sections II through V are added to get the total score. Total scores range from 0 to 40.

APPENDIX H

INSTRUCTIONS FOR SELECTION OF CONTENT TRANSCRIPTS FOR RELIABILITY TESTING

INSTRUCTIONS FOR SELECTION OF CONTENT TRANSCRIPTS FOR RELIABILITY TESTING

Videotapes have been made of the investigator and a child interacting in a parallel talk situation. The children's conversations have been transcribed verbatim, and these transcripts are what you will be selecting utterances from. You will select ten consecutive utterances from each of five transcripts you are given and form a content transcript for each one. A content transcript can be defined as the basic information of an utterance provided by the child, with disfluencies deleted, and without any additional words the child did not specifically speak. There are specific guidelines for you to following when developing the content transcripts.

Guidelines

1. Use ten consecutive utterances from each of five transcripts to form content transcripts.

2. Use only those words present in the original transcripts. Do not add additional words.

3. Do not include any disfluencies from the original transcripts. This includes repetitions, interjections, revision-incomplete phrases, articulatory posturing, vowel prolongations, and phonatory arrests. For example, "I-I-I have a dog" would be written "I have a dog," and "uh, I want, um, to go," would be written "I want to go."

4. Use the most complete form of the utterance when transcribing revision-incomplete phrases. For example, "It's a li-it is a tiger," would be written "It is a tiger."

5. Do not include the following words in the content transcripts as they were not included in the original transcriptions: unintelligible utterances or utterances which include unintelligible words and isolated yes and no responses.

EXAMPLES OF ORIGINAL TRANSCRIPTION AND CORRESPONDING CONTENT TRANSCRIPTION

Original Transcription	Content Transcription
1. I don't like him.	1. I don't like him.
2. He, she, he ran away.	2. He ran away.
3. W-w-when are you going?	3. When are you going?
4. I might, I might eat it.	4. I might eat it.
5. I went, uh, to school.	5. I went to school

APPENDIX I

INSTRUCTIONS TO RELIABILITY JUDGES

INSTRUCTIONS TO RELIABILITY JUDGES

General Instructions

You will be given five partially completed transcripts of ten utterances each. These transcripts do not include any types of disfluencies. They contain only the content of each utterance. Listen to the entire utterance and see if you agree with all the words that have been included, and add any additional words that you hear along with the disfluencies.

The purpose of reliability testing is to determine the investigator's accuracy at identifying part-word repetitions along with the number of repetitions and abnormality of the repeated syllables; vowel prolongations and duration; phonatory arrest and duration; and articulatory posturing and duration. These particular types of disfluencies are scored in the Stuttering Prediction Instrument (Riley, 1981). The following are definitions of these disfluencies:

1. Part-word repetition: A type of disfluency which involves at least one reiteration of a sound or syllable within a word (p-p-paper, ta-table). This also includes repetitions of single-syllable words (he-he, it-it; Riley, 1981).

2. Vowel prolongation: Occurs when a vowel is held long enough to call attention to itself (Riley, 1981).

3. Phonatory arrest: Occurs when the attempt to initiate a vowel is prevented by abnormal closure of the glottis. There may be complete closure of the glottis, with the speaker open-mouthed with no sound being produced. There may also be less than complete closure resulting in sounds that cannot be recognized as vowels (Riley, 1981).

4. Articulatory posturing: Occurs when the voice-air stream is obstructed or severely distorted so that production of an initial consonant cannot be accomplished in a short amount of time (Riley, 1981).

Procedure for Transcription and Identification of Disfluencies

A graduate student in Speech and Hearing Sciences at Portland State University who is not involved with this study will prepare five content transcripts of ten utterances each. Remember that the transcripts may not be correct and mistakes may have been made in determining the content of each utterance. Make sure you agree with all the words that have been included in the content transcripts. Reliability judges will be given these transcripts. The investigator will then play the corresponding segments of the videotape that matches each content transcript. The investigator will initially show all ten utterances on a content transcript at once and the judges will view them in their entirety. The investigator will then play each utterance one at a time. The judges will fill in all missing parts of the transcripts, including deleted words and disfluencies. The judges will identify the target disfluencies and assign a repetition count or duration count.

The judges may review the utterances as many times as requested. There is no talking during reliability testing, except for requests to view an utterance.

The following rules should be used when transcribing and identifying disfluencies:

1. Judges are responsible for identifying part-word repetitions and three different types of prolongations, vowel prolongations, phonatory arrest, and articulatory posturing.

2. Judges will identify disfluencies with the following markings above the disfluencies:

   PWR Part-word repetition
   VP Vowel prolongation
   PA Phonatory arrest
   AP Articulatory posturing

3. Judges are responsible for recording the number of repeated syllables above each part-word repetition.

4. Judges are responsible for transcribing part-word repetitions and assigning a severity rating with respect to abnormality of repeated syllables (normal, mild, moderate, or severe).

5. Judges are responsible for counting the duration of each prolongation and placing the number of seconds above each prolongation.

6. Judges are to credit repetitions of syllables or single words as one disfluency no matter how many repetitions were produced.

7. Judges are to credit each type of disfluency if a combination of disfluencies occurs on a single word.

8. Judges are to credit repetitions occurring in the beginning of contractions (I-I-I'm, sh-sh-she's).

9. Judges are not to credit false starts as disfluencies (He is a li-, no, he is a tiger).

10. Judges are to credit repetitions of single syllable words as part-word repetitions (Riley, 1981).

11. Judges are not to credit repetitions if the insertion of a yes, no, um, etc., occurs between the repeated words (I like my little, um, little sister).

Reliability Training

A training session will be conducted by the investigator using the same procedures as outlined above. The training session will include practice identification of three different content transcripts. Differences will be discussed until 100 percent agreement is reached over disfluency identification and scoring.