THE SPEECH DISFLUENCIES OF NORMAL-TALKING SIX-YEAR-OLD CHILDREN

THESIS

Presented to the Graduate Council of
Southwest Texas State University
in Partial Fulfillment of
the Requirements

For the Degree

Master of ARTS

By

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San Marcos, Texas
May, 2000

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ABSTRACT

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This study presents the fluency characteristics of 12 male and 13 female normal-talking 6-year old children. All subjects were disfluent. The disfluency categories that the subjects displayed most frequently included fillers, revisions/sentence changes, word repetitions, and interjections. The categories that occurred with least frequency were part-word repetitions, incoherent sounds, and dysrhythmic phonations, and only one of the subjects produced prolongations. The methodology of the interview had little to no impact on the amount of disfluency that the subjects produced. The results provided information about the disfluencies of the 6-year-old population in an interview situation. The results also concurred with pre-existing data spanning various age groups.

INTRODUCTION

The Speech-Language-Hearing Clinic at Southwest Texas State University has a history of clinical programs in stuttering. In the past, adults who stutter were treated using the Precision Fluency Shaping Program (Webster, 1980). This intensive three-week therapy program was used to teach clients to control fluency by modification of the physical system of speech. Presently, the stuttering program at Southwest Texas treats children using family-centered therapy (Rustin, 1987; Mallard, 1998), which includes the family in assessment and treatment. The assessment process includes a family interview as well as an evaluation of the child's fluency and rate in conversation and reading samples.

It is standard practice to assess a client in conversation and reading before treatment is initiated. Diagnostic results are typically compared with norms in order to establish a client's performance level. As a part of the assessment process, a conversational speech sample is typically obtained, often in a variety of speaking situations (Brutten, 1975; Costello & Ingham, 1984; Culp, 1984; Riley, 1972; Ryan, 1974; Wertheim, 1974; Williams, 1978). Because conversational samples are such an integral part of the stuttering assessment, it is necessary to obtain information regarding the performance of nonstuttering subjects in an interview situation in order to establish a reference with which to compare clients seen in a clinical setting. Studies have provided guidelines concerning the speech disfluencies of both adults and children.

Johnson (1961) studied the disfluency in the speech of 100 adults who stutter and 100 control subjects in conversation and reading. Results revealed much overlap in the types of disfluencies produced by the normal-talking and abnormally dysfluent groups. His study revealed that disfluency is a part of the speech of normal as well as abnormal speakers.

Lutz and Mallard (1986) provided data for young adult speakers in an interview situation, including percentage of disfluency in reading (1.0 % median rate in words) and speech (3.4 %) as well as rate of speech (158.8 words per minute average). Results were similar to those of previously completed studies, revealing that normal adult speech contains disfluency.

Research has also been completed on the speech development of normal children. A review of the literature revealed that the focus of research was on the speech of preschool children, typically ranging in age from two to 4 or 5, depending upon how preschool is defined. * School-aged children have not received as much emphasis in the literature as have preschool children. More research is needed examining the disfluencies of young school-aged children.

The above research concerning the speech development of preschool and school-aged children displays an impressive variety of methods to obtain the speech sample. Samples have been elicited using free-play, monologue, an interview with an examiner or parent, the retelling of a story, demand speech, discussion of pictures, a narrative, and

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* It should be noted that several of the preschool studies discussed in this paper have placed an emphasis on stuttering subjects and contain nonstuttering matched controls. Therefore, the normal speakers used as subjects in these studies may not be representative of the entire population. These studies were used because they provide valuable data about normal speakers where little data exists.

sentence modeling or imitation. However, of the school-age studies completed, little emphasis was placed on documenting the performance of normal-speaking school-aged children in an interview situation. Two school-aged studies used the methodology of interview. Haynes and Hood (1977) used a structured interview and picture-description task with the purpose of comparing the variables of disfluency and language ability in the speech of 4, 6, and 8-year-old children. Enger, Shulman, & Hood (1988) used an interview to establish referential data in the speech of preschool and school-aged linguistically advanced children. No other studies exist that examined the speech of young school-aged children in an interview situation.

Percentage of Disfluency

Percentage of disfluency is the overall amount of disfluency that subjects exhibit. Several researchers have provided referential data for percentage of disfluency for abnormally dysfluent children as well as normally fluent matched controls (Adams, 1977; Culp, 1984; Lees, Anderson, & Martin, 1999; Yairi & Lewis, 1984). Adams (1977) compiled information about normal and abnormal disfluency from a "large fund of available data" (Adams, 1977, p. 142) taken from previous studies. He stated that persons who stuttered averaged 10 or more disfluencies per 100 words spoken, whereas normally disfluent children averaged no more than five to six per 100 words. Culp (1984) found that preschool children who stuttered had a significantly higher percentage of disfluency than did their normal-talking peers (11.2 % and 3.5%, respectively). Culp notes that the percentage of disfluency produced by the normal-talking children in her study was lower than that of previous studies cited in her work. The normal-talking subjects in Meyers (1986) produced less disfluency that the subjects who stuttered (3.3%

and 15.4%, respectively). Lees et al. (1999) found that 5-year-old children who stuttered with (14.2%) and without language impairment (10.2%) had a significantly higher percentage of disfluency than normal-talking subjects with (3.9%) and without language impairment (3.0%).

The following studies provided percentage of disfluency data for normal-talking preschool and school-age children. Yairi and Clifton (1972) found that preschool subjects were disfluent on 7.7% of their words, while high school seniors demonstrated a 3.8% disfluency. Haynes and Hood (1978) determined that 5-year-old children were disfluent on 6.6% of words spoken. In a study of linguistically accelerated children, Enger et al. (1988) demonstrated that preschool subjects were less disfluent that the school-aged subjects (5.9% and 7.7%, respectively). Wexler and Mysak (1982), on the hand, found that the disfluency percentages produced by their 2-, 4-, and 6-year-old subjects decreased with age (14.6%, 9.1% and 9.1%, respectively). DeJoy and Gregory (1985) established similar results with their 3.5- and 5-year-old normal-talking subjects (11.4% and 9.3%, respectively), as did Haynes and Hood (1977) in the speech disfluencies of their 4-, 6-, and 8-year-old subjects (7.0%, and 7.2%. and 6.8%, respectively). To summarize, the subjects in the studies cited in this paragraph were normal speakers ranging in age from 2 to 17 and 18. The percentages of disfluency cited here ranged from 3.8% (produced by the teenage subjects) to 14.6% (produced by the 2-year-old subjects). In each of the above studies, at least one group of subjects produced percentages of disfluency higher than the guidelines set by Adams (1977) of five to six percent disfluency for normal-speaking children.

Categories of Disfluency for Preschool Children

Research concerning the normal and abnormal disfluencies of preschool children began in the late 1930s and has continued to be of interest to modern researchers, as many studies have explored this topic (Culp, 1984; Davis, 1939; DeJoy & Gregory, 1985; Johnson, 1967; Metraux, 1950; Meyers, 1986; Pearl & Bernthal, 1980; Yairi, Ambrose, Paden, & Throneburg, 1996; Yairi & Clifton 1972; Yairi & Lewis, 1984). Culp (1984) collected data for 30 normal-talking children and 30 children who stuttered ranging in age from 3- to 5-years-old. Culp obtained a speech sample using a monologue, dialogue, the retelling of a story, free-play, and speaking under pressure. Analysis revealed that the normal group exhibited significantly less part-word repetitions, dysrhythmic phonations, and tense pauses than the dysfluent group. In fact, dysrhythmic phonations, tense pauses, and "multiple-unit repetitions of any sort" (Culp, 1984, p. 56) were rare among the normal group. The normal group most frequently produced interjections, whole-word repetitions, and phrase repetitions.

DeJoy and Gregory (1985) collected data using a spontaneous language sample for 60 male preschoolers, 30 of which were 3.5 years of age and 30 of which were 5-years-old. The speech sample, which was obtained using free play and discussion of pictures from picture books, was analyzed for disfluencies, including grammatical and nongrammatical silent pauses, the latter being defined as those pauses that fall at ungrammatical moments in the flow of speech. Analysis revealed that the 3.5-year-old children exhibited significantly more total disfluency than the 5-year-old children and were more disfluent on all types of disfluencies except grammatical pauses. This younger group demonstrated significantly more part-word repetitions, word repetitions,

phrase repetitions, incomplete phrases, and disrhythmic phonations than their older counterparts. Such disfluencies, the researchers theorized, may be indicative of immature speech development and may decline as a normal child's speech system develops. The 5-year-olds, on the other hand, produced significantly more grammatical pauses than the 3.5-year-olds. Grammatical pauses, it was theorized, may be indicative of later speech development. The two groups did not differ significantly in the production of ungrammatical pauses, revisions, or interjections. Because these types of disfluencies appeared in the speech of both age groups, the authors theorized that they may also be characteristic of adult speech rather than a particular developmental stage of childhood speech (DeJoy & Gregory, 1985).

Meyers (1986) examined the disfluencies emitted by 12 children who stuttered as well as a matching set of normal-talking control subjects. The subjects ranged in age from 4 years to 5:11. Spontaneous speech samples were obtained as each child interacted in free play with either his own mother, the mother of a normal-talking subject, or the mother of a child who stuttered. Analysis revealed that the children who stuttered produced significantly more part-word repetitions, prolongations, and tense pauses than did the normal-talking subjects, while the normal-talking subjects produced few part-word repetitions and no prolongations, tense pauses, or broken words. The control group did, however, produce significantly more whole-word repetitions and revisions than did the subjects who stuttered. The children who stuttered and the normal-talking children did not differ in the production of other nonfluencies considered normal, including phrase repetitions, incomplete phrases, and interjections.

In summary, research in the area of preschool disfluency revealed that disfluency is a typical phenomenon among normal-talking preschool children. Subjects typically exhibited revisions/incomplete phrases, interjections, and word- and phrase-repetitions while producing very few instances of disfluencies considered abnormal, including part-word repetitions, prolongations, tense pauses, broken words, and dysrhythmic phonations. In addition, results revealed that disfluencies may be a factor of age and may change as the person matures.

Categories of Disfluency for School-Age Children

Of less frequent focus in the literature has been school-age children's disfluencies. Several studies have established preliminary norms for school-age disfluency patterns (Enger et al., 1988; Haynes & Hood, 1977; Kools & Berryman, 1971; Kowal, O'Connell, & Sabin 1975; Wexler & Mysak, 1982; Yairi & Clifton, 1972). Kowal et al. (1975) studied the disfluencies of normal-talking male and female children at seven grade levels, including kindergarten, second, fourth, sixth, eighth, tenth, and twelfth grades. Twenty-four subjects at each grade level invented a spontaneous narrative based on a series of Snoopy cartoon pictures. The authors defined disfluencies as unfilled and vocal hesitations, the former category being defined as silent pauses and the latter category including filled pauses, repeats, false starts, and parenthetical remarks. False starts, filled pauses, repetitions of words (whole or part), and parenthetical remarks were a part of the speech of all 168 subjects, but to a varying degree. Parenthetical remarks tended to increase as the child matured; however, filled pauses declined very little from the time the child advanced from kindergarten to twelfth grade. False starts and repetitions declined more significantly throughout the school years than did filled pauses; only

kindergarten-, second-, and fourth-grade children emitted repetitions at the syllable level. Of the total repetitions produced, 47.4% were single-word repetitions, and 28.6% of the repetitions were of more than one word.

Wexler and Mysak (1982) studied the disfluencies of 36 male subjects who were 2, 4, and 6 years in age. Wexler and Mysak elicited a speech sample during a free-play session in which the children also conversed with an examiner. No communicative stress factors, such as questioning, interruptions, and requests for repetition were placed upon the child. Analysis of the samples revealed that revision/incomplete phrases and interjections were the two most frequent disfluencies at the three age levels. Dysrhythmic phonations and part-word, phrase, and word repetitions occurred the least in the speech of the 4- and 6-year-olds. The least occurring disfluency type for the 2-year-old speakers was part-word repetitions.

Enger et al. (1988) examined the disfluencies of preschool and school-aged children with advanced communication skills. Ten preschool subjects ranging in age from 39 to 51 months and ten school-aged subjects ranging in age from 73 to 85 months participated in the study. A spontaneous language sample was elicited in an interview situation in which the child and examiner discussed favorite toys, television shows, and hobbies. Analysis revealed that the younger subjects produced significantly less total words than the older subjects produced. Their mean length of utterance (MLU) was also significantly less. Although the difference was not significant, the younger children were less disfluent than the older group (5.9% and 7.7%, respectively). A comparison of the two groups' production of disfluency types showed that the older group produced significantly more interjections than the younger group. Both groups produced more

interjections, revisions, and word repetitions than any other disfluency type. None of the subjects produced tense pauses or prolongations. Both groups of children appeared to use language characteristic of older children, based on the fact that their MLU's were higher than expected for their age groups, indicating language use that was more complex than expected for their age groups.

In summary, the results of the school-aged studies were similar to preschool studies in that children typically demonstrated disfluencies characteristic of normal speech, such as interjections, word repetitions, revisions, and incomplete phrases. However, they produced relatively few instances of those disfluencies typical of abnormal dysfluency, such as part-word repetitions, disrhythmic phonations, and tense pauses. Results also revealed that disfluencies change as the child matures.

Speaking Rate

Another variable that has been studied by researchers is the speaking rate of preschool and school-aged children (Kowal et al. 1975; Pindzola, Jenkins, & Lokken, 1989; Roeser, Pearson, & Tobey, 1998; Ryan, 1984, as cited in Pindzola et al. 1989; Ryan, 1992). Ryan (1984, as cited in Pindzola et al. 1989) studied the speaking rates of preschool children ranging in age from 2 to 5 years. These subjects spoke at an average of 157 words per minute. Roeser et al. (1998) provided the speaking rates for school-aged children in words and syllables per minute. Speech rates increased steadily from the first to the fifth grade, with first graders producing 124.9 words per minutes and 147.7 syllables per minute and fifth graders producing 141.8 words per minute and 170.0 syllables per minute.

The findings of Roeser et al. (1998) support those of other studies examining the speech rate of children (Hall, Amir, & Yairi 1999; Kowal et al. 1975; Pindzola et al. 1989). In a study of the speech rate of 3-, 4-, and 5-year-old normal-talking children, Pindzola et al. (1989) determined that preschool children's speech rates do not change significantly on a yearly basis but instead develop sporadically at certain age levels. Hall et al. (1999), studying the speaking rate of children who stuttered and a matched control group, found that articulatory rates (measured in syllables and phones per second) increased significantly over the two-year period that the study took place for both the control and the abnormally dysfluent group.

Kowal et al. (1975) established that the speaking rate of normal-talking children consistently increased with age until the sophomore year, when it plateaued. The authors attributed this increase in rate to several factors. First, younger children produced less syllables between unfilled pauses as well as needed more time to plan these short utterances. Conversely, all of the subjects demonstrated a steady reduction of unfilled pauses with increasing age. These two factors accounted for the slower speech rate of the younger subjects as well as the increased speech rate demonstrated with as age increased.

In summary, the findings of current research suggests that the speech rate of normal-talking children increases with age. Roeser, et al. reported that first-grade children produced a speaking rate of 124.9 words per minute and 147.7 syllables per minute.

Gender

Several researchers have included in their studies the variable of gender (Haynes & Hood, 1977; Kools & Berryman, 1971; Kowal et al. 1975; Ryan 1984 as cited in

Pindzola, 1989; Ryan, 1992). Kools and Berryman (1971) studied the relationship of disfluency and gender in 92 male and female first-grade children ranging in age from 6 to 7 years. Spontaneous speech samples were obtained as the subjects responded to 10 picture cards. Kools and Berryman found that overall the male subjects were more disfluent than the female subjects, but the difference was not statistically significant. In comparing the productions of individual disfluency types for male and female children, analysis revealed that the mean scores of the male children were significantly greater only for the category of incomplete phrases.

Haynes and Hood (1977) studied the speech disfluency of thirty 4, 6, and 8-year-old normal-talking children. Results revealed that the 6- and 8-year old male subjects were more disfluent than the female subjects, though not significantly so. However, the 4-year-old female subjects were more disfluent that the male subjects. Haynes and Hood found that with the three age groups collapsed, there was no significant difference between the male and female children in the total frequency of disfluency. In addition, Haynes and Hood determined that the 6- and 8-year-old male subjects had a greater mean number of words than did the females. However, the 4-year-old females had a greater mean number of words than did their male counterparts.

Linguistic Complexity

Several researchers have studied the impact that sentence length and linguistic complexity have had on children's disfluencies (Bernstein Ratner & Costa Sih, 1987; Gordon, Luper, & Peterson, 1986; Haynes & Hood, 1978; McLaughlin & Cullinan, 1989; Pearl & Bernthal, 1980; Yaruss, Newman, & Flora, 1999). Haynes and Hood (1978) examined the impact created by sentence length and linguistic complexity on the

disfluencies of 40 normal-talking 5- and 6-year-old children. The subjects produced sentences of a structure similar to ones of varying complexity that had been modeled for them. Analysis revealed that subjects demonstrated significantly more disfluencies when creating complex sentences as opposed to simple sentences. In addition, the children used significantly more word repetitions, revisions, and disrhythmic phonations when using complex sentences as opposed to simple sentences. It was hypothesized that the children's familiarity with a linguistic structure may have contributed to how fluently they produced that structure. Sentence length, however, was not found to have a significant effect on percentage of disfluency.

The results of Haynes and Hood (1978) support the findings of research using similar methodology (Bernstein Ratner & Costa Sih, 1987; Gordon et al. 1986; McLaughlin & Cullinan, 1989; Pearl & Bernthal, 1980). These studies, which used sentence imitation and/or modeling tasks to elicit speech samples, found that preschool and school-aged subjects demonstrated a relationship between linguistic complexity and disfluency rate as they progressed from simple to more complex sentences. As language complexity increased, the children became more disfluent. In addition, children demonstrated disfluencies considered typical of normal speakers, including interjections, word repetitions, and revisions (Pearl & Bernthal, 1980). Thus, based on previously cited research, these disfluencies are typical of normal speakers and are influenced by grammatical complexity when occurring during the experimental tasks described above.

Yaruss et al. (1999) found results that conflict with the findings of the above-cited studies. These researchers completed an analysis of length and linguistic complexity in the conversational speech of 12 preschool children ranging in age from 44 to 64 months.

Spontaneous speech samples were collected as these children played and described their play. The examiners also used parallel play to elicit utterances. Similar to the previous studies, the subjects were more disfluent as a group on longer and more syntactically complex utterances than on shorter, less complex utterances. However, a close analysis of the children's individual utterances revealed that there was a significant relationship between length (measured in words or syllables) in only two of the 12 subject's utterances. Furthermore, this analysis revealed that there was a significant relationship between syntactic complexity (as measured by the Developmental Sentences Scoring results) and disfluency in the utterances of only one subject. Thus, length and syntactic complexity were related to the disfluencies of only a few of these normal-talking subjects. Yaruss et al. noted that the children did not demonstrate the wide array of sentence types that were seen in the modeling and imitation tasks used in the previously cited studies. They also noted that tasks that use these sentences are important in that they examine sentence types that might not regularly occur in the speech of children. However, the conversational task examined the actual sentence types that were produced by the children in every day speech (Yaruss et al. 1999). Consequently, in the above studies, the children's familiarity with sentence structures as well as the frequency with which they were used contributed to the degree to which length and linguistic complexity impacted the children's speech disfluencies, as did the context in which the structures were used (modeling and imitation versus conversation).

Disfluency in an Interview Situation

Several studies have examined the effect that the interview has on preschool children's disfluencies (Martin, Haroldson, & Kuhl, 1972a, 1972b; Silverman, 1972).

The findings of these studies are contradictory. Martin et al. (1972a, 1972b) interviewed 10 male and female preschool children in four different speaking situations to determine whether changes in environment had an effect on number and type of disfluencies as well as production of words in children's speech. The children talked to a puppet and to an adult examiner in study A. The same adult spoke to the children in both situations. The interview was not controlled in that the child was free to talk about any subject he wished in both speaking situations. In study B subjects spoke with their mothers and with another subject for 10 minutes. In both studies, analysis revealed that the children were not significantly more disfluent in one situation over the other. The children uttered more words when speaking to the puppet than to the adult, but the difference between the two conditions was not significant. The percentage of disfluencies did not vary significantly from one situation to the other, indicating that the environment did not affect the amount of disfluency produced by the children. These two studies emphasized the continuity of children's speech performance across a variety of speaking situations.

Silverman (1972) offers a contrasting viewpoint. Silverman obtained speech samples of ten 4-year-old boys with the purpose of determining the extent to which an interview-generated speech sample could be compared to the disfluencies produced in the classroom. Subjects were recorded in structured interviews with the examiner and as they participated in their daily preschool activities. During the interview, the subjects were asked to answer questions about themselves. They were then instructed to tell a story describing picture cards. They were then asked to draw a picture of a man and describe his actions as he was drawing. Finally, they played with a variety of toys and were encouraged to verbalize while playing. Speech samples were analyzed for type and

frequency of disfluency. In the preschool classroom, subjects' verbalizations were tape recorded as they participated in normal classroom routine. Results revealed that the children were disfluent in both speaking situations. However, they were significantly more disfluent during the interviews. The data revealed that children were more disfluent while talking with an interviewer than while talking with peers. Therefore, according to Silverman, it cannot be assumed from the data that disfluency rates collected in an interview will generalize to all children in everyday speaking situations.

Examining the discussion put forth by all three studies, it is not immediately clear why the studies contradict each other. One of Silverman's (1972) purposes was to demonstrate that had Johnson (1961) used a variety of speaking situations to obtain his sample, Johnson would not have been so readily able to prove his semantogenetic theory, which assumed that the mother of a child who stuttered was responsible for that child's stuttering. Martin et al. (1972a, 1972b) had no such purpose. In addition, despite the fact that all three studies obtained conversational speech samples, the methodology of obtaining these samples was different. Martin et al. (1972a, 1972b) did not use a controlled interview situation while Silverman (1972) did. The more controlled nature of the interview in the latter study might account for the increased disfluency in the interview situation. It should also be considered that both studies had a small number of subjects. Silverman (1972) had 3, while Martin et al. (1972a, 1972b) had 10. These might not be considered representative samples. All of the factors discussed here may have influenced results or interpretation of data. What is clear is that more research is needed to determine the impact that the interview situation has on normal-talking children's speech disfluency.

The studies discussed above revealed that disfluency is a typical part of the speech of preschool and school-age children. These studies also found that the disfluencies produced by normal-talking children were different in quality and quantity from those of abnormally disfluent children. The normal-talking children typically demonstrated disfluencies characteristic of normal speech, such as interjections, word repetitions, revisions, and incomplete phrases, but produced relatively few disfluencies characteristic of abnormal disfluency, including part-word repetitions, disrhythmic phonations, prolongations, and tense pauses. Linguistic complexity typically influenced the disfluencies of normal children, in that as complexity increased, so did disfluencies. However, the relationship between linguistic complexity and speech disfluency has not been completely established. The above-cited literature also found that speaking rates of normal-talking children increased with age. A review of this literature has also revealed that there is a dearth of research concerning school-age disfluency, especially concerning children's performance in an interview situation. The literature is summarized in Table 1, which displays the various studies discussed in the present study according to the variables of childhood and adult percentage of disfluency, categories of disfluency, age and/or gender, speaking rate in words per minute, and linguistic complexity.

The purpose of the present investigation was to establish referential data describing the speech disfluencies of normal-talking 6-year-old children participating in an interview. As stated earlier, it was not known at the outset of this study how normal-talking 6-year-old children would perform in a structured interview. However, based on the above literature, it was hypothesized that the children would produce a percentage of disfluency that ranged from three to nine percent, based on the findings of the previously

cited school-aged studies. It was also hypothesized that the subjects would demonstrate those disfluencies characteristic of normal speech (filled pauses, interjections, word or phrase repetitions, incomplete phrases or sentences, and sentence changes or revisions). The subjects would not be expected to demonstrate a high frequency of those disfluencies characteristic of abnormal fluency (part-word repetitions, prolonged sounds, and dysrhythmic phonations).

Table 1

Summary of research concerning childhood and adult percentage of disfluency (%), categories of childhood disfluency (Cat.), the variables of age and/or gender (Age/Gen.), speaking rate in words per minute (WPM), and linguistic complexity (Ling.).

Study	Child	Adult	%	Cat.	Age/ Gen.	WPM	Ling.
Davis, 1939	X			X			
Metraux, 1950	X			X			
Johnson, 1959	X			X			
Johnson, 1961		X		X			
Kools & Berryman, 1971	X				X		
Yairi & Clifton, 1972	X		X	X			
Rochester & Gill, 1973		X					X
Kowal et al. 1975				X	X	X	

Table 1 Continued

Study	Child	Adult	%	Cat.	Age/ Gen.	WPM	Ling.
Silverman, 1975	X						X
Adams, 1977			X				
Haynes & Hood, 1977	X		X		X		X
Haynes & Hood, 1978	X		X				X
Pearl & Bernthal, 1980	X		X				X
Wexler & Mysak, 1982	X		X	X			
Culp, 1984	X		X	X			
Ryan, 1984	X					X	
Yairi & Lewis, 1984	X			X			
DeJoy & Gregory, 1985	X			X			
Gordon et al. 1986	X						X
Meyers, 1986	X			X			

Table 1 Continued

Study	Child	Adult	%	Cat.	Age/ Gen.	WPM	Ling.
Lutz & Mallard, 1986		X	X			X	
Bernstein Ratner & Costa Sih, 1987	X						X
Pindzola et al. 1989	X					X	
Enger et al. 1988	X		X	X			
McLaughlin & Cullinan, 1989	X						X
Ryan, 1992	X					X	
Yairi et. al. 1996	X			X			
Roeser et al. 1998	X					X	
Lees et al. 1999	X						X
Yaruss et al. 1999	X						X

METHOD

Subjects

Subjects were twenty-five 6-year old children, including 12 boys and 13 girls (M age = 78 MOs; SD = 3.8 MOs). The New Braunfels Independent School District in New Braunfels, Texas, was the study site.

A meeting was arranged in the Fall Semester, 1998, with the Special Education Coordinator for the school district, who examined the proposed methodology for the study. She also presented these materials to the superintendent of the school district, which were subsequently approved. Memorial Primary School was selected as the site where the study would take place. This school contained prekindergarten, kindergarten, and first-grade students and an adequate number of 6-year-old students with English as their first language. Four meetings were arranged with the principal of Memorial Primary to establish procedures for the study, such as the parent permission letter (see Appendix A), the set-up of the test room, and teacher-examiner communication (see Appendix B).

The kindergarten and first-grade teachers were then asked to submit names of students who would be potential candidates for the study. It was requested that each of the teachers refer three students from their class roster who met the following requirements:

1. The students had to be 6-years-old at the time that the study took place. Six

was defined as 6:0 months to 6:11 months.

2. They were required to have adequate language skills and intelligible articulation as measured by a screening. In addition, students identified as Special Education or Learning Disabled would have been disqualified.

3. They had to have a normal intelligence as measured by adequate performance in the classroom.

4. They had to have normal fluency as defined by no history of or treatment for an abnormal fluency disorder.

5. The children were required to have English as their first language. The teachers submitted the names of 54 potential subjects for the study.

The next step was to determine whether these children had passed an on-site hearing screening given by the school nurse. Three children failed this hearing screening and were thus eliminated as potential subjects.

Next, the students' folders, contained in the school office, were examined for the child's birthdate, parent name, and phone number and whether the child had ever received speech-language therapy. By examining the birthdate, each child's age was determined, and thus nine more potential subjects were eliminated because they were either too young or too old for the study. After this initial screening process, 42 children remained. None of these children had received speech-language therapy, as ascertained from their folders.

From the remaining 42 students, 30 students were randomly selected for the study. Parent permission letters were sent home, and 25 were returned. The examiner, a graduate student in speech-language pathology with training in child speech and language

diagnostics, screened the remaining subjects for articulation errors using the Sounds-in-Words Subtest of the Goldman Fristoe Test of Articulation (GFTA, Goldman & Fristoe, 1986). Two children exhibited isolated articulation errors. One demonstrated gliding and another, a frontal lisp of /s/ and /z/, both of which were age-appropriate articulation errors. Testing of these children using the GFTA revealed that they had no inappropriate articulation errors and they were used as subjects.

The examiner also screened the children for receptive and expressive language abilities using parts one through three of the Bankson Language Screening Test (Bankson, 1977), entitled Semantic Knowledge, Morphological Rules, and Syntactic Perception, which consisted of 13 subtests. The fourth and fifth parts, Visual Perception and Auditory Perception, were excluded from the testing because of time constraints and because these subtests were not considered crucial to the screening process. After the screening, each child's performance was compared to test norms. As the entire test was not given, an overall standard score could not be obtained. However, the children had to pass 10 of the 13 subtests in order to be included as a subject. All of the subjects met this criterion of passing 10 of the 13 subtests. 20 of the subjects were within normal limits on all 13 subtests. Four subjects were below normal limits on one subtest and one subject was below normal limits on two subtests.

Interviews

All subjects participated in individual interviews with the experimenter at the child's school. The subjects were escorted from their classroom to an unoccupied classroom. The same test room was used for all children. Each subject sat at a table with the examiner adjacent to him or her. The last subtest of the Bankson Language Screener,

a sentence imitation and discrimination task, was taped during administration to test the equipment and introduce the subjects to the microphone. Subjects were instructed not to touch the microphone or tape recorder. Subjects were then given instructions for the conversational sample, which included the following, "I'm going to ask you several questions, and I'm going to tape record you. Answer the questions as best you can."

Conversation lasting approximately five to ten minutes in length was then elicited based on three open-ended topics, including,

1. "What is your favorite movie? Why do you like (that particular movie)? Tell me about (the movie)."

2. "Describe your classroom for me in as much detail as you can."

3. "Tell what you and your friends do for fun at recess."

These questions were supplemented with prompts from the examiner as needed to stimulate each child's speech. Some prompts were individual to the conversation, but standard prompts that were used as necessary included,

1. "Tell me the story. I've never seen the movie."

2. "Describe the front/side/back walls of the classroom."

3. "Tell me how to play—(any game mentioned in the description of recess)."

Responses were audiotaped using an Optimus CTR-108 cassette recorder (Model 14-1115) and a Radio Shack Pro-302 unidirectional dynamic microphone (Model 33-3002). Mouth-to-microphone distance was maintained at approximately 15 cm from the child's mouth at all times. After the interview, each subject was escorted back to his or her classroom.

Analysis of Disfluency

The disfluency categories selected for analysis were based on the work of Lutz and Mallard (1986). These categories are similar to other studies of normal speech disfluencies (Mahl, 1956; Johnson, 1961; Kasl & Mahl, 1965). All examples given below were taken from speech samples of the subjects in the present study. The categories were:

1. Interjections of words or phrases: This category included nonessential words or phrases, which could be included at the beginning of or within an utterance. Examples included "well," and "you know."

2. Part-word repetitions: This category included the reiteration of phonemes or syllables and took place within the word. Examples included: "h-he" and "c-cause."

3. Word or phrase repetitions: This category included the repetition of one or more words. Examples included: "and—and the kids says uh-oh" and "when he's in the—when he's in the gas station...."

4. Incomplete phrases or sentences: Included in this category were phrases or sentences that were unfinished or that communicated incomplete ideas. An example would be, "And there could be—there's colors that have magnets on the back."

5. Sentence changes or revisions: This category included examples in which the speaker revised or corrected the content of an utterance, including grammatical modifications. An example would be, "It has Dalmatian—it has a Dalmatian pup poster." Another example would be, "And then Roxanne helps her—him."

6. Prolonged sounds: Sounds considered to be abnormally prolonged were placed in this category.

7. Fillers: This disfluency involved meaningless vocalizations, such as "uh," "ah," "er," and "um."

8. Incoherent sounds: Included in this category were incoherent sounds which were not associated with any word.

9. Dysrhythmic phonations: Included in this category were any abnormal phonation behaviors that distorted normally fluent or rhythmic speech. This may have been caused by abnormal tension, inappropriate accenting, a break in voicing, glottal fry, or any other abnormal speaking behavior that contrasted with fluent speech that is not listed above.

Analysis of Recordings

All tapes were reviewed a minimum of three times. During the first reviewed, language samples were orthographically transcribed. Second, the disfluencies were identified and classified according to the categories described above and marked on the transcripts. A total of 1182 disfluencies were classified.

A third review was completed to verify the disfluency count and to time the speech samples. Talking time was defined as the time that elapsed between the starting and stopping points of the subject's speech, including pauses. Talking time was measured by starting a 60-second Timex Ironman Triathlon stop-watch as the subject began speaking and then stopping the watch at the end of each utterance.

The disfluencies were analyzed for the distinct types and the total number of disfluencies in each subject's utterances. These disfluency rates were then converted to frequency per 100 words, thus achieving the percentage of disfluency. Disfluency percentages were calculated by dividing the number of disfluencies by the total number

of words spoken and multiplying that result by 100. Disfluency percentages were dependent on the number of words spoken, which varied from child to child (Lutz, 1985).

A two-tailed independent t-test (SPSS for Windows, 1997) was also performed on the variable of gender. Percentage of disfluency, rate of speech, total number of words spoken, and individual categories of disfluency were analyzed statistically. Alpha level equaled .05.

Reliability of Disfluency Data

Intrajudge reliability for identification of disfluency was determined for the experimenter by randomly choosing a speech sample for reanalysis three months following the first analysis. The percentage of agreement for amount and type of disfluency was 100%.

Interjudge reliability was obtained between the experimenter and her supervising professor, who is a licensed speech-language pathologist with over 30 years' experience in evaluating stuttered speech. To obtain interjudge reliability, two tapes were examined by both the supervising professor and the experimenter, who identified and classified disfluencies in the children's speech. During the first trial, interjudge reliability was 81% agreement for identifying disfluencies in a subject's speech. The passages were reviewed, discrepancies were discussed, and 100% agreement in identifying the presence of disfluencies was obtained during the second trial. In classifying disfluencies, interjudge reliability was only 61%. At the time analysis was completed, it was not agreed upon that extra words would be counted as interjections, so once interjections were omitted in the analysis, 100% reliability for classifying disfluencies was achieved.

After further discussion, it was agreed that extra words would be counted when defining interjections.

RESULTS

The results are displayed in Tables 2 through 7, and each table is organized in ascending order by percent disfluency. Table 2 displays the 25 subjects, their gender, total number of words spoken in the speech sample, as well as total and percentage of disfluencies. Table 2 also displays means, standard deviations, and ranges. All applicable values are rounded to the nearest tenth of a decimal point. The mean total number of spoken words in the speech sample was 496, and the mean number of disfluent words was 47. The mean percentage of disfluencies was 9.6%. As can be seen, the standard deviations and ranges revealed a wide range of variability. For example, the range for total number of spoken words was 742 (SD = 182), from a minimum of 123 words to a maximum of 865 words. Also, the range for percent disfluency was 12.6% (SD = 3.7%), varying from 3.8 to 16.4% disfluent. The data in this table demonstrate that all of the subjects were disfluent.

Table 3 presents the individual and total frequencies of those disfluencies described earlier during an interview situation. These disfluency categories were the same as those used by Lutz and Mallard (1986). The disfluency categories are presented from the highest to lowest group mean, moving from left to right. It can be seen that fillers had the highest frequency (M = 16.9) and prolongations had the lowest frequency (M = 0.1). Only one subject produced prolongations. In addition to the means, Table 3 also presents

Table 2

Total number of words spoken in the speech sample (# Words), total (Total Disfl.) and percentage (% Disfl.) of disfluencies in the speech of 25, 6-year-old, normal-speaking male and female subjects.

Subject	Gender	# Words	Total Disfl.	% Disfl.
1	Female	238	9	3.8
2	Female	425	16	3.8
3	Female	532	30	5.6
4	Male	564	32	5.7
5	Male	370	23	6.2
6	Male	692	44	6.4
7	Female	528	38	7.2
8	Female	123	9	7.3
9	Male	865	65	7.5
10	Female	659	51	7.7
11	Female	352	29	8.2
12	Male	752	62	8.3
13	Male	607	59	9.7
14	Male	790	78	9.9
15	Male	371	37	10.0
16	Female	447	45	10.1

Table 2 continued

17	Female	362	40	11.1
18	Female	612	68	11.1
19	Female	656	78	11.9
20	Female	495	66	13.3
21	Male	343	47	13.7
22	Male	291	42	14.4
23	Male	324	49	15.1
24	Male	563	90	16.0
25	Female	450	74	16.4
	M	496	47	9.6
	SD	182	21	3.7
	Range	742	81	12.6

Note. Table 2 is assorted in ascending order according to percent disfluency. Table Includes means, standard deviations, and ranges. Data are rounded to the nearest tenth of a decimal point where applicable.

Table 3

Frequency of individual and total disfluencies produced by 25 6-year-old normal speakers during an interview situation.

Subject	FL	REV/SC	WR	INT	PHR	IP	PWR	IS	DP	PRO
1	1	3	1	0	0	0	0	4	0	0
2	5	4	2	3	1	0	1	0	0	0
3	10	7	1	3	5	2	1	0	1	0
4	5	13	4	1	3	3	2	0	1	0
5	3	7	3	8	2	0	0	0	0	0
6	16	9	5	8	0	4	0	2	0	0
7	26	6	2	1	1	0	2	0	0	0
8	2	5	2	0	0	0	0	0	0	0
9	7	27	13	8	2	6	1	1	0	0
10	13	11	6	11	2	4	2	2	0	0
11	16	8	2	1	0	0	0	0	0	0
12	21	16	8	10	1	3	2	0	1	0

Table 3 continued

Subject	FL	REV/SC	WR	INT	PHR	IP	PWR	IS	DP	PRO
13	20	11	15	0	8	3	1	0	1	0
14	27	21	15	2	4	2	3	1	1	2
15	9	9	2	11	0	2	2	0	2	0
16	23	12	5	3	0	2	0	0	0	0
17	13	10	2	6	4	2	0	0	3	0
18	40	14	4	4	3	0	5	1	0	0
19	39	23	11	1	2	2	0	0	0	0
20	31	19	9	0	4	1	1	0	1	0
21	15	9	1	14	1	3	3	1	0	0
22	8	16	6	10	1	0	1	0	0	0
23	16	5	8	7	7	5	1	0	0	0
24	16	11	46	7	4	2	4	0	0	0
25	41	17	10	2	2	2	0	0	0	0

Table 3 continued

	FL	REV/SC	WR	INT	PHR	IP	PWR	IS	DP	PRO
M	16.9	11.7	7.3	4.8	2.3	1.9	1.3	0.5	0.5	0.1
SD	11.7	6.2	9.2	4.3	2.2	1.7	1.4	1.0	0.8	0.4
Range	40	24	45	14	8	6	5	4	3	2

Note. The above variables are arranged according to mean by greatest to least occurrence. Mean totals, rounded to the nearest tenth, and standard deviations are included. The categories include filler (FL), revision/sentence change (REV/SC), word repetition (WR), interjection (INT), phrase repetition (PHR), incomplete phrase (IP), part-word repetition (PWR), incoherent sound (IS), dysrhythmic phonation (DP), and prolongation (PRO).

standard deviations and ranges, which reveal a wide range of variability. For example, the frequency for fillers ranged from 1 to 41 (SD = 11.7).

Table 4 displays a summary of the percentage of disfluency for the 10 disfluency categories. Of these, the subjects demonstrated disfluency of one percent or more on four of the categories, including fillers (M = 3.4%), revisions/sentence changes (M = 2.4%), word repetitions (M = 1.4%), and interjections (M = 1.2%). The subjects were less than one percent disfluent on the remaining six categories. Standard deviations and ranges are also included in Table 4, and these data again reveal a wide range of variability. Those disfluency types that were most commonly used also displayed the greatest ranges. For example, the categories of fillers and word repetitions, among the most frequently produced disfluency types, both had ranges of approximately eight percent (8.7 and 8.0%, respectively). As the percentage of disfluency decreased, so did the range.

Table 5 displays mean total talk time in seconds and rate of speech measured in words per minute. The table also displays means, standard deviations, and ranges. The subjects had a mean total talk time of 253 seconds, with a standard deviation of 89 seconds and a range of 341 seconds. Their mean rate of speech was 119.1 words per minute (WPM), with a standard deviation of 23.9 WPM and a range of 98.5 WPM. Range and standard deviation data reveal a wide range of variability in the rate of speech produced by the subjects.

In summary, the variability demonstrated by the range and standard deviation data in Tables 2 through 5 indicate that 6-year-old children performing the same conversational task will vary in the number of words spoken, the frequency and percent of disfluency emitted, and the rate of speech produced.

Table 4

Summary of percentage of disfluency of ten disfluency categories (Disfl. Cat.) for 25 normal-talking 6-year-old speakers during an interview situation.

Disfl. Cat.	M	SD	Range
FL	3.4	2.1	8.7
REV/SC	2.4	1.1	4.5
WR	1.4	1.6	8
INT	1.2	1.1	4.1
PHR	0.5	0.5	2.2
IP	0.4	0.4	1.5
PWR	0.3	0.3	0.9
IS	0.1	0.3	1.7
DP	0.1	0.2	0.8
PRO	0.0	0.1	0.3

Note. Mean totals and percentages as well as standard deviations and ranges are included for the disfluency categories, which include filler (FL), revision/sentence change (REV/SC), word repetition (WR), interjection (INT), phrase repetition (PHR), incomplete phrase (IP), part-word repetition (PWR), incoherent sound (IS), dysrhythmic phonation (DP), and prolongation (PRO). Totals are rounded to the nearest tenth.

Table 5

Mean total talk time (TTT) in seconds and rate of speech in words per minute (WPM) in the conversation of 6-year-old normal speakers.

Subject	TTT	WPM
1	87	164.1
2	206	123.8
3	232	137.6
4	289	117.1
5	137	162.0
6	428	97.0
7	268	118.2
8	91	81.1
9	289	179.6
10	379	104.3
11	176	120.0
12	382	118.1
13	328	111.0
14	351	135.0
15	180	123.7
16	261	102.7

Table 5 continued

Subject	TTT	WPM
17	190	114.3
18	267	137.5
19	376	104.7
20	254	116.9
21	225	91.5
22	176	99.2
23	229	84.8
24	275	122.8
25	247	109.3
M	253	119.1
SD	89	23.9
Range	341	98.5

Note. Means, standard deviations, and ranges are included. Totals are rounded to the nearest tenth.

Table 6 displays the comparison of total number of words spoken in the speech sample, percentage of disfluency, and mean rate of speech measured in WPM according to gender. An independent t-test revealed that no significant differences existed between the male and female subjects when considering the variables of rate of speech ($t_{.05}$ = .2; df = 2, 25; p = .8), total number of words spoken ($t_{.05}$ = 1.3; df = 2, 25; p = .2), nor percentage of disfluency ($t_{.05}$ = .8; df = 2, 25; p = .4).

Table 7 displays the comparison of mean frequency of individual disfluency categories according to gender. Both males and females produced more fillers, revisions/sentence changes, and word repetitions than any other disfluency type. In addition, both females and males produced less incoherent sounds, dysrhythmic phonations, and prolongations than any other disfluency. In fact, the male and female subjects produced the disfluencies in the same mean rank order, using fillers the most and prolongations the least.

An independent t-test revealed that the male subjects were significantly more disfluent on two categories, interjections ($t_{.05}$ = 3.1; df = 2, 25; p = .006) and incomplete phrases ($t_{.05}$ = 2.6; df = 2, 25; p =.016). The female subjects did not produce any disfluency with a difference from the males that was significant. Table 7 displays the complete results of the t-test analysis. In addition, the independent t-test revealed that the male subjects' mean total disfluency, while greater the female subjects', was not great enough to be significant ($t_{.05}$ = 2.60; df = 2, 25; p= .25).

Table 6

The comparison according to gender of total number of words spoken in the speech sample (# Words), percentage of disfluency (% Disfl.), and mean rate of speech in words per minute (WPM) for 12 male and 13 female, 6-year-old, normal-talking subjects as found in an interview situation.

	# Words	% Disfl.	WPM
		Males	
M	544	10.2	120.2
SD	202	3.8	28.1
Range	574	11	94.8
		Females	
M	452	9.0	118.0
SD	157	3.6	20.4
Range	536	12	83.0

Note. Means, standard deviations, and ranges are given for each variable. Totals are rounded to the nearest tenth of a point.

Table 7

The comparison of mean frequency of disfluency and independent t-test results for 10 disfluency categories (Disfl. Cat.) according to gender. Subjects were 12 male and 13 female, 6-year-old normal-talking children.

	Male			Female			t-Test ($t_{.05}$, df 2,25)	
Disfl. Cat.	M	SD	Range	M	SD	Range	t Value	p Value
FL	13.6	7.2	24	20.0	14.4	40	1.4	0.2
REV/SC	12.8	6.3	22	10.7	6.1	20	0.9	0.4
WR	10.5	12.2	45	4.4	3.6	10	1.7	0.1
INT	7.2	4.2	13	2.7	3.1	11	3.1[a]	0.006
PHR	2.8	2.6	8	1.8	1.7	5	1.0	0.3
IP	2.8	1.8	6	1.2	1.3	4	2.6[a]	.016
PWR	1.7	1.2	4	0.9	1.4	5	1.4	0.2
IS	0.4	0.7	2	0.6	1.2	4	0.3	0.7
DP	0.5	0.7	2	0.5	0.9	3	0.4	0.7
PRO	0.2	0.6	2	0.0	0.0	0	1.0	0.3

Note. The categories include filler (FL), revision/sentence change (REV/SC), word repetition (WR), interjection (INT), phrase repetition (PHR), incomplete phrase (IP), part-word repetition (PWR), incoherent sound (IS), dysrhythmic phonation (DP), and prolongation (PRO).

DISCUSSION

At the outset of this study, it was not known how normal-talking 6-year-old children would perform in an interview situation. Results of this study provide normative data about the speech of 6-year-old normal-talking children in an interview situation that can be used in clinical evaluations. All subjects exhibited disfluency and were disfluent on an average of 9.6% words spoken in conversational speech. Subjects spoke at a mean rate of 119.1 words per minute in conversation. The majority of the subjects' disfluencies were fillers, revision/sentence changes, and word repetitions, respectively. While statistically not significant, male subjects demonstrated a greater percent disfluency, mean number of spoken words, and speech rate than did their female counterparts. Male subjects also produced significantly more interjections and incomplete phrases than did the females.

Percentage of disfluency.

Although the disfluency rate of 9.6% found in this study was on the upper end when compared with previously cited literature, it was compatible with that of previous studies. Table 8 compares the percentage of disfluency between the subjects in the present study and those of previously cited studies. Several cross-sectional studies have found that total percentage of disfluencies decreased with age. Wexler and Mysak (1982)

Table 8

Comparison of mean total disfluency between the present study and previous studies examining the speech disfluencies of children. The age of each subject and size of each study is included.

Study	M	SD	Age	N
Wexler & Mysak (1982)	14.6	5.7	2	12
DeJoy & Gregory (1985)	11.4	4.68	3.5	30
Enger, et al. (1988)	5.9	1.6	3 and 4	10
Haynes & Hood (1977)	7	4.52	4	10
Wexler & Mysak (1982)	9.1	3.2	4	12
Culp (1984)	3.5	1.7	3, 4, and 5	30
Meyers (1986)	3.3	2.5	4 and 5	12
Lees et al. (1999)	3	Not given	5	4
Haynes & Hood (1978)	6.6	3.1	5	40
Yairi & Clifton (1972)	7.7	2.6	5	15
DeJoy & Gregory (1985)	9.3	3.3	5	30
Haynes & Hood (1977)	7.2	2.9	6	10
Wexler & Mysak (1982)	9.1	4.1	6	12
Horkman (2000)	9.6	3.7	6	25
Enger et al. (1988)	7.7	3.1	6 and 7	10
Haynes & Hood (1977)	6.8	2.2	8	10
Yairi & Clifton (1972)	3.8	2.2	17 and 18	15

Note. Mean is the total percentage of disfluency per 100 words. Figures are rounded to the nearest tenth of a decimal point. Table is sorted according to subject age.

found that their 2-year-old subjects were more disfluent than their 4- and 6-year-old subjects, although the difference was not significant (14.6%, 9.1% and 9.1%, respectively). DeJoy and Gregory (1985) demonstrated similar results, with the 3.5 year-old subjects being significantly more disfluent than the 5-year-old subjects. Haynes and Hood (1977) established similar results. Their 8-year-old subjects (6.8%) were less disfluent than their 4- and 6-year-old subjects (7.0% and 7.2%, respectively), although the decrease in disfluency was not significant. Haynes and Hood suggested that the amount of disfluency produced by subjects decreased with age, hypothesizing that this decrease starts at around age 8. Yairi and Clifton (1972) supported this suggestion by demonstrating that disfluency decreased significantly from the speech of their preschool subjects to that of their high school subjects (7.65% and 3.83%, respectively).

Interestingly, when comparing the two groups of linguistically advanced students in Enger et al. (1988), results revealed that the older subjects were more disfluent than their younger subjects (7.7% and 5.9%, respectively). It was possible that their 6- and 7-year-old subjects, like the subjects in the present study, fell into an early school-age group where disfluencies had not reached the point where disfluency starts to decrease (Haynes and Hood, 1977).

Enger et al. (1988) provided further explanation as to why the older group may have been more disfluent than the younger group. Both groups of children demonstrated language use that was more complex than expected for their age groups. Such increased complexity could have placed stress on their linguistic processing and coding systems. Such stress, Enger et al. theorized, might have been more evident in the older than the

younger children's speech, considering that this group had a higher percentage of disfluencies.

Other studies have examined the effect of language complexity on disfluency (Bernstein Ratner & Costa Sih, 1987; Gordon et al. 1986; Haynes and Hood, 1977; Haynes and Hood, 1978; Pearl and Bernthal, 1980; Yaruss et al. 1999). The relationship between disfluencies and length and linguistic complexity is not as clear. Haynes and Hood (1977) found that subjects used increasingly complex language as age increased. Other studies have established that preschool and school-aged subjects demonstrated significantly more disfluencies when creating complex sentences as opposed to simple sentences when using sentence imitation or modeling (Haynes and Hood, 1978; Pearl and Bernthal, 1980; Gordon et al. 1986; and Bernstein Ratner & Costa Sih, 1987).

Yaruss et al. (1999), in examining the effects of length and linguistic complexity in the conversational speech of preschool children, found that disfluency was related to length and linguistic complexity in the speech of only a small portion of their subjects. The results of Yaruss et al. contradicted the findings of the previously cited studies that found a relationship between linguistic complexity and/or length and speech disfluency. The structures used in the modeling tasks were not among those frequently used in conversation. Perhaps less familiar structures, infrequently used structures or emerging structures result in increased disfluency. This premise would support that of increased disfluency being related to increased stress of the linguistic system. Like the subjects in Enger et al. (1988), it is possible that the increased use of complex language played a role in the increased percentage of disfluency that the children in the present study displayed.

In their study, Enger et al. (1988) provided a second reason that the older subjects' had a higher disfluency percentage than the younger subjects. The older children may have been more disfluent because they had received formal training in grammar and thus they were making an effort to speak correctly. As a result, they had a high percentage of overall disfluency as well as of hesitations and repetitions. The school-age children in the present study may have demonstrated disfluencies higher than some established norms for the reason discussed by Enger et al. The subjects in the present study were kindergarten and first-grade students at the end of their school year who had been exposed to at least a minimum of formal training in grammar. Perhaps they too had an awareness of their speech and the need to speak correctly in a formal situation, as was the case in the interview situation that took place as a part of this research project.

It is also possible, however, that factors other than linguistic complexity affected the children's disfluency. The task itself could have played a part in the disfluency of these children. The interview placed a discourse demand on the subjects in that they were asked to provide description, sequence information, and contribute sufficient information for the listener to comprehend the context of the conversation. Requests for repetition and occasional interruptions occurred throughout the interview. In addition, the children were speaking with an unfamiliar conversational partner in an unnatural speaking context. The interview task, in combination with the other factors listed above, may have influenced the subjects' disfluency.

Disfluency categories

Tables 9 and 10 compare the percentage of disfluency produced by subjects in the present study and those of previously cited preschool and school-age studies. With a few

exceptions, the percentage of disfluency produced by the subjects of the present studycoincided with that of previously cited studies. Word repetitions occurred with a slightly higher percentage than some studies and interjections occurred with a slightly lower percentage than some studies. Examination of the category of word repetitions in the present study revealed variability in the subjects' range of scores. There were two high scores (15) and one extreme score (46), which had the potential to skew the mean. This variability may account at least in part for the somewhat high mean percentage for the category of word repetitions.

The higher-than-average number of word repetitions in the present study might also be attributed to many of the subjects' immaturity in the ability to plan what is to be said. The subjects in both Haynes and Hood (1977) and Enger et al. (1988) changed the types of disfluency produced as age increased. Notably, interjections increased with age. Haynes and Hood (1977) and Enger et al. (1988) have suggested that school-age children move from word-repetitions to interjections when they become aware that interjections are the more socially appropriate of the two. In this study, word repetitions had a much higher mean percentage than interjections, and interjections were lower than the mean average for the percentages of previous studies. It is possible that the 6-year-old subjects in the present study were just beginning to reach the age of awareness that interjections are more appropriate than word repetitions, and therefore, many of the subjects used word repetitions rather than interjections. This pattern was particularly evident with the male subjects, who had a mean frequency of 11 on the category of word repetitions.

Table 9

Comparison of mean percent disfluency for the present study and previously existing preschool studies.

	Study A	Study B		Study C		Study D	Study E	Study F	Study G[b]
FL	3.4	**	**	**	**	**	**	**	**
REV/SC	2.4	2.5	3.5	2.6	2.7	2.4	0.7	1.7	4.4
INT	1.2	1.9	3.0	2.6	1.8	1.7	0.6	1.6	6.2
IP	0.4	**	**	**	0.9	0.6	0.1	**	**
PHR	0.5	0.6	2.2	0.6	1.2	0.7	0.4	0.6	5.2
WR	1.4	1.2	2.1	0.9	1.4	0.8	1.1	1.2	5.9
PWR	0.3	0.6	0.7	0.4	0.8	0.5	0.2	0.7	3.8
DP	0.1	0.7	1.5	0.6	0.9	0.5	0.5	**	0.2
IS	0.1	**	**	**	**	**	**	**	**
PRO	0.0	**	**	**	**	**	0.0	**	**
TP	**	0.1	1.5	1.5	**	**	0.0	**	0
BW	**	**	**	**	**	**	0.0	**	**

Table 9 continued

	Study A	Study B		Study C		Study D	Study E	Study F	Study G
HES	**	**	**	**	**	**	**	0.2	**
REC	**	**	**	**	**	**	**	0.0	**
GP	**	**	**	**	0.2	0.4	**	**	**
UP	**	**	**	**	1.9	1.8	**	**	**

Note. The following categories were included: fillers (FL), revision/sentence changes (REV/SC), word repetitions (WR), interjections (INT), phrase repetitions (PHR), incomplete phrases (IP), part-word repetitions (PWR), incoherent sounds (IS), dysrhythmic phonations (DP), prolongations (PRO) tense pauses (TP), broken words (BW), hesitations (HES), recoils (REC), grammatcal pauses (GP), and ungrammatical pauses (UP). **This particular disfluency was not studied.

The studies listed above included:

A = Horkman (2000) age of subjects: 6

B = Yairi & Clifton (1972) age of subjects: 5

C: = Wexler & Mysak (1982) age of subjects: 2 and 4, respectively

D = DeJoy & Gregory (1985) age of subjects: 3.5 and 5, respectively

E = Meyers (1986) age of subjects: 4 to 5

F = Enger et al. (1988) age of subjects: 4-5 and 6-7, respectively

G = Culp (1980) age of subjects: 3, 4, 5 [b] Culp provided mean frequencies rather than percentages.

Table 10

Comparison of mean percent disfluency for the present study and previous school-aged studies.

	Study A	Study B		Study C	Study D	Study E
FL	3.4	**	**	**	**	**
REV/SC	2.4	2.2	2.3	2.3	2.3	1.6
INT	1.1	1.4	2	1.7	3.4	3.7
IP	0.4	0.6	0.4	**	**	**
PHR	0.5	0.6	0.8	0.7	0.7	0.8
WR	1.4	1.4	0.7	1.3	0.9	0.8
PWR	0.3	0.5	0.4	0.3	0.6	0.4
DP	0.1	0.5	0.3	0.2	0.2	**
IS	0.1	**	**	**	**	**
PRO	0.01	**	**	**	**	**
TP	**	0.05	0	0.2	1.1	**
HES	**	**	**	**	**	0.3
REC	**	**	**	**	**	0.1

Note. Disfluency categories included: fillers (FL), revision/sentence changes (REV/SC), word repetitions (WR), interjections (INT), phrase repetitions (PHR), incomplete phrases (IP), part-word repetitions (PWR), incoherent sounds (IS), dysrhythmic phonations (DP), prolongations (PRO) tense pauses (TP), hesitations (HES), and recoils (REC). The studies listed above included:

Study A = Horkman (2000) age of subjects: 6

Study B = Haynes & Hood (1977) age of subjects: 6 and 8, respectively

Study C = Haynes & Hood (1978) age of subjects: 5

Study D = Wexler & Mysak (1982) age of subjects: 6

Study E = Enger et al. (1988) age of subjects: 6-7

It is also possible that the manner in which disfluency categories were defined may have affected the disfluency percentage for interjections. The present study defined fillers as a separate disfluency category. Therefore, unless the category of fillers was ignored altogether as a type of disfluency in previous research, it could have been eliminated or collapsed in another category. The most logical category in which to include fillers would be with the interjections. Johnson (1961), who carefully defined each category used in his study of adult disfluency, placed interjections of sounds and syllables in the same category as interjected words and phrases. This study is often used as a model for disfluency definitions. However, considering the sheer number of fillers produced by the subjects in the present study, the number of fillers would have increased the overall percentage of disfluency for the interjection category had fillers been included. As it stands, word repetitions had a greater percentage than interjections. Whether it was because the children had not yet developed awareness of the more appropriate disfluency to use or whether it was due to a matter of definition remains a matter for further research.

Rate

Turning now to a discussion of rate, results of the present study indicated that normal-talking 6-year-old children spoke, on the average, 119.1 words per minute in conversational speech. These results are in agreement with previously reported school-age research, which found that first-grade children produced 124.9 words per minutes and 147.7 syllables per minute (Roeser et al. 1998).

The findings of the present study are not in agreement with previously cited preschool research (Ryan, 1984, as cited in Pindzola et al. 1989), which found that

normal-talking preschool children ranging in age from 2 to 5 years spoke at an average of 157 words per minute. The author did not have access to the methodology used in Ryan's study as it was information taken from a conference presentation. However, the age range of Ryan's study and the present study were two very different populations and might have influenced the difference between the two studies' findings.

Gender

While not statistically significant, males were more disfluent overall than their female counterparts. This finding supports what has been noted in previously cited research (Kools and Berryman, 1971; Haynes and Hood, 1977). Both males and the females in the present study were most disfluent on fillers, revisions, and word repetitions and least disfluent on incoherent sounds, dysrhythmic phonations, and prolongations, respectively. Males produced significantly more interjections and incomplete phrases than did females. However, males and females did not significantly differ in the production of any other disfluency type. Kools and Berryman (1971) found that the male subjects produced significantly more incomplete phrases, but the male and female subjects did not differ significantly in the production of any other disfluency. Haynes and Hood (1977) found that, with their 4-, 6-, and 8-year-old age groups collapsed, there were no significant differences between the male and female children among the disfluency types. Overall it appears that male and female school-age subjects tend to be approximately equal in the type and frequency of disfluencies that they produce.

While not significant, the males in the present study had a greater mean number of spoken words. This finding is supported by previously cited results (Haynes and Hood, 1977). In studying the comparison of gender and rate, the results of the present study did

not compare with those of previously cited research (Ryan, 1992). In Ryan (1992), results revealed that females spoke significantly faster than males (mean = 149. 4 WPM and 125.4 WPM, respectively). However, the present study and Ryan (1992) used different sample ages and different tasks to elicit speech samples. In addition, Ryan did not differentiate between the children who stuttered and the normal-talking children when comparing the rate differences between the males and females. The present study had only normal-talking subjects.

Clinical Implications

The results of the present study reveal that the percentages of disfluency and individual categories of disfluency were comparable to the percentages of previous studies using a wide range of procedures. The implication is that environment may have minimal impact on disfluency, in that the children in the present study were no more disfluent than those subjects in studies that used methodologies that varied from the present study. This finding supports the research of Martin et al. (1972a, 1972b). Given several different speaking situations, they found no significant difference in the effect that these situations had on disfluency.

At the outset of this study, it was not known whether the interview would cause the subjects to be more disfluent than in other speaking situations. Previous literature (Martin et al. 1972a, 1972b; Silverman, 1972) provided contradictory and inconclusive findings. The fact that the interview did not cause subjects to be more disfluent than in other speaking situations has clinical applications. Speech-language pathologists often use interviews as part of a stuttering assessment. The present study provides referential data in an interview situation for 6-year-old normal-talking speakers. It also allows for

comparison with other studies demonstrating that the 6-year-old children in the present study were no more disfluent than children in other studies. There was no evidence from this study that the use of an interview results in substantially different percentages or types of disfluency than other procedures reported in the literature.

The results of the present study provide support that the interview is a valid context with which to assess 6-year-old abnormally dysfluent children. These results are tentative pending further research using more age groups that consist of both normal and abnormally fluent speakers. However, while the interview should not be the only tool a clinician uses to measure dysfluency, it is a valuable part of the assessment battery.

APPENDIX

APPENDIX A

Parental Consent Form

Dear Parents:

Your child has been invited to participate in a study of speech development in children at Memorial Primary that has been approved by New Braunfels Independent School District. I am a graduate student at Southwest Texas State University in the Department of Communication Disorders. I am completing this study in coordination with my supervising professor, Dr. A.R. Mallard, Chair, Department of Communication Disorders. This study will be the basis for a Master's Thesis that I will write as part of my graduate studies. Through completion of this study, we hope to learn more about the normal speech patterns of 6-year-old children. Your child was selected as a possible participant of this study because he or she possesses normal speech, hearing and language abilities. Approximately twenty-five total subjects will be chosen to participate in this study.

If you choose to allow your child to participate, the following procedures will be performed during the study.

1. I will briefly take your child to an adjacent classroom in order to tape record a language sample of approximately 150 words.

2. I will ask him or her several simple questions in order to obtain the language sample.* The process should last approximately five minutes. Then your child will be returned to the classroom, thus concluding this part of the study.

3. Your child's language sample will then be written down and analyzed. Once a complete set of language samples are obtained and analyzed, the information we receive from studying these language samples will be categorized and compared to existing data.

4. Finally, findings from this study will be reported in a graduate thesis.

Any information that is obtained in connection with this study and that can be identified with the participants will remain confidential and will be disclosed only with

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* You may see a copy of these questions.

the permission of both you and your child. To ensure their rights and privacy, participants' names will not be used in any way when reporting the results of the data. You may also receive a written report as well as a meeting with me to discuss the results. Your child's decision whether or not to participate will not prejudice his or her future relations with Southwest Texas State University. If your child decides to participate, he or she is free to discontinue participation at any time without prejudice. **

If you have any questions, please call me at 606-2020 or call the Department of Communication Disorders at (512) 245-2330. We will be happy to answer your questions.

You are making a decision whether or not to allow your child to participate in this study. Your signature indicates that you have read the information provided and have decided to give your permission. You may withdraw this permission at any time without prejudice after signing this form, should your child choose to discontinue participation in this study.

Thank you.

Sincerely,

Cheri Horkman

DATE	SIGNATURE OF PARENT OR GUARDIAN
DATE	SIGNATURE OF WITNESS

** You are under no obligation to participate in this study. Your completing and returning this questionnaire will be taken as evidence of your willingness to participate and your consent to have the information used for the purposes of this study.

APPENDIX B

Letter of Recruitment to Teachers

Dear Teachers:

Hello! My name is Cheri Horkman, and Mrs. DeHaven introduced me to most of you at your inservice meetings on January 4. For those of you who didn't meet me, I am a Southwest Texas graduate student who will be completing my thesis research at Memorial Primary. The study I'm conducting will examine the speech disfluencies of normal-talking 6-year-old children.

I need your help in order to complete this study. I will need a pool of at least thirty to thirty-five children from which to select the final group of subjects. Because you know the students better than anyone on this campus, would you please help me by selecting two to three children that meet the criteria for my study? The criteria are listed below.

Each child should...

1. be 6 years of age at the actual time of the study (In March or April of this school year)
2. have normal speech and language abilities
3. have a normal IQ
4. have English as a first language.

These students should not have received speech/language services at any time past or present. Nor should they be qualified for special education services.

There will be an envelope in the office entitled "Speech Project." Please place the names of the children that you have selected in this envelope by Friday, February 19.

Please note that, for your students' protection, any information with potential subjects' names on it should remain confidential. Also note that this study was approved both at the Central Office and by Mrs. DeHaven, and I will also obtain permission from both the parents and the children before completing any testing.

Thank you so much for your help. I cannot complete this study without you. If you have any questions or concerns, feel free to call me at 606-2020.

Sincerely,

Cheri Horkman

Your name: _____

Students:

1. _____ 2. _____

3. _____

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VITA

Cheri Lea Horkman was born in New Braunfels, Texas, on February 22, 1970, the daughter of John Henry Bueche and Patsy Caroline Bueche. After completing her work at New Braunfels High School, New Braunfels, Texas, in 1988, Cheri entered the University of Texas at Austin in Austin, Texas. She received the degree of Bachelor of Arts in English from the University of Texas in May, 1993. During the following years she was employed as a teacher at New Braunfels High School in New Braunfels, Texas. In August, 1998, she entered the Graduate School of Southwest Texas State University, San Marcos, Texas.

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