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Disfluency characteristics of nonstuttering children and children with attention deficit-hyperactivity disorder

Melissa Anne Hiller Hannah

To the Graduate Council:

I am submitting herewith a thesis written by Melissa Anne Hiller Hannah entitled "Disfluency characteristics of nonstuttering children and children with attention deficit-hyperactivity disorder." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Speech Pathology.

Pearl Gordon, Major Professor

We have read this thesis and recommend its acceptance:

Lori Swanson, Gary McCullough

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

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DISFLUENCY CHARACTERISTICS OF NONSTUTTERING CHILDREN AND CHILDREN WITH ATTENTION DEFICIT-HYPERACTIVITY DISORDER

A Thesis

Presented for the

Master of Arts Degree

The University of Tennessee, Knoxville

Melissa A. Hannah

May 2001

DEDICATION

This thesis is dedicated to

the children who attended

the University of Tennessee Camp for Kids who Stutter.

All the work we did that summer

and

all that I learned as a person and a clinician

from the campers and camp director

inspired the topic of this thesis

and

fostered my interest in fluency disorders.

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ABSTRACT

The purpose of this study was to compare the frequency and type of disfluencies elicited by children with Attention Deficit Hyperactivity Disorder (ADHD) and Typically Developing children (TD). Fourteen children age 7-6 to 10-6 years old were analyzed for disfluencies on an Original Story Telling Task (OST) and a Story Telling Task with Pictures (ST-P) tasks. Conture's within-word and between-word classification system was used to identify and tabulate the frequency and type of disfluencies. The following research questions were asked: (1) Are children with ADHD more disfluent than their TD peers? (2) Are the Disfluencies elicited by children with ADHD qualitatively different from those elicited by the TD children? (3) Are the type and frequency of disfluencies produced on the Original Story Telling Task (OST) different from those produced on the Story Telling Task with Pictures (ST-P)?

A four way ANOVA was utilized to answer all research questions and the Wilk's Lambda analysis was used to determine significant differences. Analysis indicated there were significant differences between the TD and ADHD participants for percent and type of disfluencies. The participants with ADHD were significantly more disfluent than the TD participants ($p=0.046$). Disfluencies were identified by type using Conture" (1990) classification system. Results indicated that there was a significant difference between the type of disfluencies for children with ADHD compared to TD children ($p=0.023$). Overall the two groups (ADHD and TD) exhibited significantly more Normal

Disfluencies (mean-3.5%) than Stuttered Disfluencies (mean=2.2%). Overall the ADHD participants were more disfluent that the TD participants, but the story telling task did not appear to affect the disfluencies for either group. Thus indicating that there was not a significant task effect for either group. The difference between the mean percent of disfluencies on the OST and the ST-P for the TD participants was 0.118% and for the participants with ADHD the mean difference was 0.506%. This difference was not significant.

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CHAPTER I

Review of the Literature

Research has revealed considerable overlap between normal disfluencies and disfluencies of persons who stutter (Conture, 1990; Guitar, 1988; Haynes & Hood, 1977; Peters & Starkweather, 1989; Schwartz, Zebrowski, & Conture, 1990; Yairi & Ambrose, 1992; Zebrowski, 1995). The basis of this observation begins with an investigation of the relationship between language and disfluencies. Stuttering is described as a "childhood disorder" because the mean age of onset is 4 years of age, which is an important period of language acquisition. Many studies have observed that syntactic complexity, situational variability, and narrative discourse affect the disfluencies of both stutterers and nonstutterers; however,, many researchers have attempted to clarify the relationship by looking to populations which are not only highly disfluent, but also speech and language disordered.

The variety of disfluencies produced by various clinical populations has been studied by a number of researchers (Bloodstein, 1995; Chapman & Cooper, 1973; Cooper, 1986; Devenny, Silverman, Balgley, Wall, & Sidtis, 1990; Hall 1996; Nettelbladt & Hansson, 1997; Patterson & Reed, 1981; Paul, 1998; Preus, 1990; Roth, 1986; Willcox, 1988). However,, there are a number of subgroups for which disfluencies are a characteristic feature. Chapman and Copper (1973), Devenny et al.,(1990), Miller and Leddy (1998), Preus (1990), and Willcox (1988) examined the disfluencies of persons with mental retardation and Down Syndrome. It is unclear if

these disfluencies are stuttered disfluencies because reports indicate the presence of "ordinary" stuttering while others claim it is not stuttering because most individuals with mental retardation and Down Syndrome lack secondary characteristics. P. Hall (1977), N. Hall (1996), Patterson and Reed (1981), and Roth (1986) have also described the disfluencies of learning disabled children; these are described in the child-language literature as mazes, repetitions, pauses, false starts, and revisions (Nettelbladt & Hansson, 1997). Within this population it is questionable if the disfluencies are stuttered disfluencies or breakdowns as a result of language formulation difficulties. The impulsive behavior of children with Attention Deficit-Hyperactivity Disorder (ADHD) has led a number of researchers to investigate the relationship between impulsivity and fluency breakdowns in the speech of this population. Like stuttering, ADHD is a childhood disorder and if there are characteristic disfluencies in the speech of ADHD children, the differential diagnosis of stuttering or nonstuttering for the speech-language pathologists is made more difficult. It is the general purpose of this study to examine the frequency and type of disfluencies in the speech of ADHD children. However,, a review of the research and clinical literature in several areas is required before beginning the study.

Fluency

Starkweather (1987) describes fluency as a multidimensional behavior, influenced by a number of different variables, like continuity, smoothness, and rate of speech, the effort a speaker makes in producing speech, and the rhythmic structure of speech. In short, fluency is the continuous forward flow of speech, and the motor and neuromotor

behaviors of human sound production for the purpose of conveying information through language (Starkweather, 1987). Speech should flow without hesitation or stoppages, which is judged by the ease and grace with which a fluent speaker speaks.

An important dimension to fluency is the flow of information. "Language fluency refers to (1) the knowledge of syntactic, semantic, and pragmatic rules for conveying information and (2) the behaviors, other than speech production, that result when people use these rules" (Starkweather, 1987, 10). These important dimensions of language influence the fluency of information flow. For instance, if a speaker is syntactically fluent he has the ability to encode highly complex sentences. A semantically fluent speaker has a large vocabulary, to which they have full and ready access; while a speaker who is pragmatically fluent can successfully respond in a variety of social circumstances. Finally, phonologically fluent speakers have the ability to pronounce long strings of syllables in unfamiliar combinations correctly and accurately (Starkweather, p. 11). All four types of fluency have an influence upon the language demands of a speaker. "The reason for mentioning language fluency is to make it clear that language fluency does not seem to be part of the problem of stuttering" (Starkweather, 1987, p. 11). There appears to be a distinction between knowledge and skill and an advanced level of linguistic knowledge may stress the child's motor skills.

Normal Disfluencies

Speech fluency is a normal level of skill in the production of speech resulting in the ability to talk with normal levels of continuity, rate, and effort (Starkweather, 1987). Speech disfluency is a break in the continuity of speech production. Fluency and periods

of disfluency are a normal developmental process experienced by young speakers as language skills change with age and maturation. Guitar (1988) reported that "the typical, normally nonfluent child repeats syllables or words once or twice" (p.112). The disfluent episodes come and go with more frequent spurts during periods of language or gross motor development. These repetitions and hesitations occur in less than 3% of a child's utterances, there are no signs of tension or struggle, and there is usually no awareness of the problem (p. 113). As a child matures, periods of fluency will increase while periods of disfluency decrease. Research has revealed that there is a tendency for the frequency of disfluency in normal speakers to decrease with age (Conture, 1990; Gordon & Luper 1989; Guitar, 1988; Haynes & Hood, 1977; Peters & Starkweather,1989; Starkweather, 1987).

Haynes and Hood (1977) conducted a cross-sectional study that investigated the frequency and type of disfluencies in 30 nonstuttering elementary school children 4-, 6-, and 8-years old. The purposes of this study were to (1) determine if the frequency and type of disfluencies are related to measures of language complexity and (2) evaluate changes in the disfluency frequency and type as a function of chronological age (p.59). Language samples were collected using general conversation and then analyzed using the DSS and the occurrence of 8 types of disfluencies: interjections, part-word repetition, word repetitions, phrase repetitions, revisions, incomplete phrase, disrhythmic phonation, and tense pause. Haynes and Hood found that the mean total words spoken and mean DSS increased with chronological age and that the mean total disfluencies remained similar between the 4- and 8- year old subjects. However,, differences were apparent in

the frequency of occurrence of some disfluencies as a function of chronological age (p.61). There was no significant difference in total frequency of disfluencies per 100 words but there was between the age groups and the increase in the number of interjections. Part-word repetitions, phrase repetitions, revisions, and disrhythmic phonations demonstrated very little change between age groups while both groups demonstrated a decrease in the number of word repetition as chronological age increased (p. 69).

Haynes and Hood (1977) concluded that a trend was evident in the decrease of the frequency of disfluencies and an increase of chronological age. The topography of the disfluencies were significantly altered as an increase in chronological age, especially with the increase in the number of interjections used. No high correlation between the language and disfluency variables were found in this study; however,, the authors suggested it was a result of using the DSS as the single measure of the child's syntactic complexity and found this measure alone was not sufficient in differentiating fluent from disfluent children (p. 71).

Peters and Starkweather (1989) compared the normal and abnormal disfluencies of persons who are normally nonfluent and those who stutter throughout their life span. In this comprehensive review, they concluded that typically developing children increase their motor control through out the preschool years. The coordination of speech is more consistently timed and better organized. As a result, there is a reciprocal increase in rate, coarticulation, and a decrease in vocal reaction times and infantile speech patterns (p. 305). Children's speech becomes more continuous, smooth, and accurate in

pronunciation. As a child's linguistic skills improve the communication demands of the parent increase. Parent's rate, length, and complexity of sentences continues to increase which leaves the child a few steps behind, thus, creating a linguistic demand for the child. While the child with normal disfluencies can make the adjustment, he is likely to experience periods of disfluency. For typically developing children there is a decline in the number and shift in the type of discontinuities between the ages of 2, 4, and 6 (Peters & Starkweather, 1989).

During the early school years, normally disfluent children continue to develop more adult-like motor speech coordination. Their speech productions become more automatic and the rate, length, and complexity of utterances continue to increase. At this time it is also important to consider the decrease in the use of silent pauses and an increase in the use of parenthetical remarks like "you know what I mean". Peters and Starkweather (1989) explained that the use of parenthetical remarks is a reflection of a more sophisticated control over utterance continuity as a result of a growth in metalinguistic and vocabulary skills (p. 310).

As young children develop motorically and linguistically, normal disfluencies occur, especially if the demands exceed the child's capacity. It is the overlap between normal disfluencies and those of an incipient stutterer, which make the diagnosis of stuttering difficult (Conture, 1990; Guitar, 1988; Peters & Starkweather, 1989; Starkweather, 1987). For children who stutter, their disfluencies are similar to normal disfluencies, yet they occur at an abnormally high frequency. The duration of repetitions, prolongations, and pauses are accompanied by abnormal amounts of effort, avoidance

and coping behaviors (Conture, 1990; Peters & Starkweather, 1989; Schwartz, Zebrowski, & Conture, 1990; Starkweather, 1987; Yairi & Ambrose, 1992; Zebrowski, 1995).

Conture (1990) warns that the biggest problem in differentiating children who stutter from those who do not is the observed overlap in the number and nature of speech disfluencies exhibited.

Characteristics of Stuttering

Stuttering can be described by its primary symptoms: abnormally high frequency and long durations of sound, syllable, and word repetitions and abnormally high frequency and long durations of sound prolongations and pauses (Starkweather 1987, p.13). There are usually accompanying signs of tension and effort evident either acoustically or physically. Other symptoms can be avoidance of sounds, words, or situations and increased fear and anxiety in response to speaking situations. The person who stutters may develop strategies in order to cope with the stuttering behaviors that are helpful initially, however, later become part of the struggle. Conture (1990) explained that stuttering onset typically begins at the mean age of four years old. It is usually gradual and episodic. Disfluencies of preschool children who stutter are usually characterized by whole word repetitions and interjections; however, there are developmental changes that occur over time leading to part-word repetitions and the insertions of the schwa (Starkweather, 1987; Guitar, 1988; Peters & Starkweather, 1989; Conture, 1990).

Yairi and Lewis (1984) examined 2- to 3-year old children's disfluencies at or around the onset of stuttering and compared them to their normally disfluent peers. The results indicated differences in the frequency and types of disfluencies between the two groups. On average, the stuttering children were three and a half times more disfluent overall than their normally disfluent peers (21.54 vv. 6.16 per 100 syllables). Yairi and Lewis concluded that the overall frequency of speech disfluencies decrease over time.

Schwartz, Zebrowski, and Conture (1990) also assessed the number and nature of behaviors associated with stuttering in young stutterers close to stuttering onset. Ten young stutterers with a mean age of 4:1 years old were examined within 12 months of stuttering onset as reported by their mothers. Schwartz et al. analyzed a conversational speech sample that occurred between mother and child. The results indicated that all ten of the children exhibited behaviors in association with their stuttering. The most frequently produced stuttering types were sound/syllable repetitions or sound prolongations. Results also revealed a moderate correlation between duration of the interval between the onset of stuttering and data collection with the most frequently occurring speech dysfluency. Schwartz et al. concluded that the findings support the hypothesis that all children who stutter, regardless of the duration from the onset of the problem, produce behaviors in association with their stuttering (p. 83). This study did not find a relationship between chronological age and (1) the frequency of stuttering, (2) duration of stuttering, (3) type of stuttering, or (4) number and variety of associated behaviors, thus, suggesting it may be more important to concentrate on differences or changes in stuttering type (p. 84).

Yairi and Ambrose (1992) studied the onset of stuttering in relation to gender, age, genetic background, stress, type of onset, and stuttering severity in 87 preschool children. Data was collected through parent interviews and a standardized questionnaire within 12 months after first diagnosed. Researchers also analyzed a 30-40 minute parent child interaction. Results indicated that children under age 3 are at the greatest risk for beginning stuttering. Results are skewed, however, there was a large difference in the mean age at onset between males and females with females exhibiting an earlier onset. Other results indicated that 44% of the mothers reported that onset of stuttering was sudden, more reported an experience onset without prior physical or emotional stress. The stuttering behaviors were rated mild for 70% and moderate for 28% and there was a high familial incidence and related to gender. Despite these findings, there was not a statistically significant relationships between any factors. Yairi and Ambrose concluded that the "large number of subjects that began stuttering at such an early age should draw more attention to a possible relationship between the onset of stuttering and maturational processes, neurological or otherwise, that are taking place within this specific age range" (p. 787).

Characteristics of stuttered speech can be divided into core and accessory behaviors. For instance, core behaviors would be part-word repetitions, prolongations, and blocks. The frequency and duration with which these core behaviors occur determines the severity. Accessory behaviors are the behaviors used in an attempt to postpone, interrupt, escape from, avoid, or disguise the core behaviors. They seem to be a learned way of coping with the core behaviors (Starkweather, 1987; Conture, 1990).

Peters and Starkweather (1989) described the development of stuttering and explained that there is overlap between the stages of development. They describe three aspects of stuttering that change with development: (1) speech motor behavior, (2) linguistic knowledge and performance, and (3) social, emotional, and cognitive behavior. Preschool is the phase of life in which stuttering usually begins and it is not associated with physical or emotional stress. Preschool children who stutter, when compared to children who do not stutter, have speech motor skills that are less well developed. They react less quickly to external stimuli, speak at a slower rate, have more frequent errors, and show unusually high frequency and duration of repeated elements (Starkweather, 1987; Peters & Starkweather, 1989). The linguistic demands for a preschool child who stutters result in the use of less complex language than that of their peers, suggesting that formulation of language may make stuttering more likely. When stuttering first begins the preschool child demonstrates little awareness; however, gradually through this first phase the child begins to develop a negative attitude toward stuttering and speech, and thus, develops emotional reactions.

The next phase of development described by Peters and Starkweather (1989) includes the early school years, between the ages of 6 and 12. They warn that if the patterns of stuttering have not been removed they will become resistant to change. It is at this time the child begins to react to his stuttering with tension, struggle, and avoidance (Starkweather, 1987; Peters & Starkweather, 1989; Conture, 1990). As the linguistic demands for these children increase stuttering moments can become more severe and more frequent. An increased vocabulary, longer sentences, greater pragmatic variations

demand more from the child's motor speech skills. It is also at this time that growing awareness that stuttering is a deterrent to success that leads to further reactions to stuttering like avoiding speech, pretending to not know the answer, and changing words. These strategies are all designed to hide or minimize the problem. Toward the later part of this phase the child begins to realize he has a problem, resulting in shame, embarrassment, guilt, and a sense of failure as a speaker.

Similarly, Zebrowski (1995) provided a summary of selected representative research in the topography of early stuttering. Like Starkweather (1987), Peters and Starkweather (1989), and Conture (1990), Zebrowski described the features of disfluency produced by young children who exhibit beginning stuttering and how these behaviors might differentiate children who stutter from their normally disfluent counterparts. In a review of the frequency of speech disfluencies, Zebrowski found that children who stuttered were at least twice as disfluent as nonstuttering children. In regard to the type and proportion of speech disfluencies Zebrowski (1995) concluded that "regardless of age or the duration of the interval between data collection and onset, there is considerable overlap between children who stutter and their nonstuttering peers in the types of disfluencies that produced" (p. 79).

Language and Disfluencies

The relationship between the development of stuttering and language acquisition is not clear; however, research documents many factors which influence fluency, or may be related (Hall, 1996; Logan & Conture, 1995; Ratner, 1995; Scott et al., 1995; Sillman & Leslie, 1983; Silverman & Ratner, 1997; Starkweather, 1987; Wall & Myer,

1982; Weis & Zebrowski, 1994;). Research has found that during periods of language acquisition, stuttering onset is frequently observed (Wall & Myers, 1982; Yairi & Ambrose, 1992). Wall and Myers (1982) completed a comprehensive review of the linguistic factors commonly associated with normal disfluencies and early stuttering. They concluded that the development of nonfluencies of normal communication development and perhaps the disfluencies of stuttering are related to language acquisition (p.447). The purpose of their review was to examine the emergence of normal nonfluency, the relationship between early stuttering and language acquisition, and the psycholinguistic aspects of stuttering in young children (p. 442). Although the relationship between fluency and language is not clear, research has found several notable factors.

Colburn and Mysak (1982) investigated the fluency of speech production of 2 to 3 year old children, beginning to produce multiword utterances, focusing on the specific syntactic structures. They determined that the increases and decreases in disfluency were consistent with development of particular structures. Developmental disfluency appeared to attach itself to structures that were learned and used regularly (p. 424). For instance, an early developing structure is "recurrence". Initially there was a loss of smooth forward flow of speech during production of these syntactic features and as mastery increased disfluencies decreased. As new structures were introduced, like utterances containing more than one semantic-syntactic structure, disfluencies decreased as mastery increased. Ratner (1995) similarly observed that normal disfluencies increased with

attempts to produce difficult or newly mastered grammatical structures; however,, the disfluencies would decrease when mastery was attained.

Sillman and Leslie (1983) reviewed several studies and explained that it is important, when comparing fluency, to analyze the ease with which verbal information is organized. As a child matures, organization and execution of language is clearer, resulting in a decreased number of disfluencies with increased chronological age. As the child develops more language awareness he becomes more sensitive to the need for phonological, lexical, morphological, and syntactic repair. This sensitivity can disrupt the production of language fluency by interfering with verbal planning. Planning and self-correction indicate deliberate selection (or reselection) and correction of linguistic elements to meet social expectations for effective communication (Sillman & Leslie, 1983). Planning and self-correction abilities vary among children and creates a temporary gap between awareness of what is known at any specific developmental level and how that knowledge is applied in a particular discourse context (Sillman & Leslie, 1983).

According to Wall and Myers (1983), psycholinguistic influences on fluency are important to consider when looking at information flow and organization. They stated that fluency can be related to the pauses that occur because of syntactic organization of sentences or the effect of constituent structures, meaning the speaker is involved in the cognitive process of sentence planning (442). Several studies have examined this influence of sentence structure and planning and its effects on fluency.

Gordon and Luper (1989) investigated the differences in the frequency of disfluencies of thirty-six 3-, 5-, and 7-year-old nonstuttering children as syntactic complexity varied in a sentence imitation and a sentence-modeling task. Results indicated that there was an effect of age in relation to the frequency of disfluencies in nonstuttering children. The 3-year-olds exhibited the greatest mean number of disfluencies followed by the 5- and 7-year-olds. The observed decline in the number of disfluencies with an increase with chronological age is consistent with other findings which suggest the number of disfluencies decrease as children get older (Starkweather, 1987; Starkweather & Gottwald, 1980; Peters & Starkweather,1989; Conture, 1990). A significant difference in the number of disfluencies among the three sentence types for all age groups was also demonstrated. Gordon and Luper (1989) suggested that the disfluencies of nonstuttering children are significantly affected by syntactic complexities. In addition, all subjects demonstrated an increase in the number of disfluencies during the sentence modeling as compared to the sentence imitation task. The authors concluded that the sentence modeling task required greater language formulation. This was linguistically demanding and resulted in an increase in the number of disfluencies.

Gordon (1991) examined the effects of language-elicitation tasks on disfluencies in young stuttering and nonstuttering children. She compared 7 children who stutter to 7 children who do not stutter on the same language elicitation tasks as Gordon and Luper (1989). Results indicated that the stuttering subjects exhibited more disfluencies on both tasks, yet the difference was not statistically different. There were marked differences between groups for the number of same specific types of disfluencies. The stuttering

group had noticeably more part-word repetitions, disrythmic phonations, and more word repetitions (p. 282); yet the nonstuttering group also exhibited some types of disfluencies commonly associated with stuttering (p. 283). This finding illustrates Conture's (1990) idea of "behavioral overlap" between stutterers and nonstutterers. Also, Gordon (1991) found a significant interaction between number of disfluencies for both groups and the demands of each task. For instance, the modeling task, a more linguistically demanding task due to language processing and formulation, was more difficult for both nonstutterers and stutterers. Gordon (1991) concluded that the "abnormally high, linguistic demands of the modeling task may have exceeded the subjects' normal capacities" (285), resulting in more fluency breakdowns.

Logan and Conture (1995) assessed length, grammatical complexity, and articulatory speaking rate differences in disfluencies and perceptibly fluent conversational utterances produced by 3-5 year-old males who stutter. Results indicated that stuttered conversational utterances were significantly longer than the perceptibly fluent conversational utterances produced (150). These researchers suggested that the differences in the length of the utterances are independent of articulatory speaking rate, but not independent of grammatical complexity (151). However, results of the DSS analysis determined no significant difference in grammatical complexity. Even though there were no statistical differences in the grammatical complexity one reason for the increase in disfluencies could be that that particular disfluent grammatical structure exceeded the capacities of the speaker.

Silverman and Ratner (1997) compared fourteen adolescents (7 who stuttered and 7 who did not) on a sentence imitation task and evaluated how syntactic complexity interferes with fluency. These authors wanted to determine if stuttering was more likely to occur on major syntactic boundaries and if stuttering varied as a function of syntactic complexity (p. 95). Results indicated that both stutterers and nonstutterers increased the number of normal disfluencies as syntactic complexity increased. Moreover, certain sentence types seemed to present linguistic challenges for both stutterers and nonstutterers as manifested by an increase in the number of disfluencies. They concluded that these effects appeared to be minimal as the child reaches adolescence, meaning utterance complexity contributed little to fluctuations in stuttering frequency (p. 105). Effect either plateaus or are nonfactors as children stabilized the use of rules (Coburn & Mysak,1982; Gordon & Luper,1989; Silverman & Ratner,1997). Results of this study supported the idea that as chronological age increased the number of fluency breakdowns decreased due in part to the stabilization of language development rules.

Conversational speech and the speaking situation have also been explained in the study of the relationship between language and disfluency. Yaruss (1997) examined situational variability in the conversational speech of children who stutter. Variability is one of the hallmarks of stuttering (p. 187). Yaruss compared speech fluency of preschool children in five different situations: (1) story retelling, (2) picture description, (3) conversation while playing with parent, (4) conversation while playing with the clinician, and (4) conversation while playing with clinician when experiencing increased communicative pressure (p. 190). The purpose was to examine the relationship between

situational variability, frequency and type of disfluencies, and to determine which situations were more likely to result in the greatest degree of variability. It was revealed that a significant difference in the frequency of disfluencies among situations exists. The lowest frequency of less typical disfluencies were exhibited during "picture description" and "story retelling," suggesting that tasks involving conversational partners were likely to elicit more disfluencies than tasks involving monologue.

Weis and Zebrowski (1994) compared the narrative abilities of 16 children (8 stutterers and 8 nonstutterers) on a story-retelling task and completion of three original stories. The subjects were asked to complete three oral narrative tasks: a story retelling to a "naive" listener, a retelling of the same story to a listener who was already familiar with that story, and the creation of three original stories (p. 43). Results indicated that most stutterers produced shorter stories that had fewer completed episodes than those produced by their age- and gender-matched peers. Nonstuttering subjects produced a higher proportion of mazes. Weis and Zebrowski concluded that because mazes for the two groups differed significantly when compared across the two story retelling tasks and the three original stories produced, the "density" of maze production appeared to be affected differentially by the type and difficulty of narrative task employed and its difficulty (p. 51). Weis and Zebrowski (1994) explained that the stutterer was unable to demonstrate a more dynamic repertoire of narrative competencies when there was an increased challenge to remain fluent (56).

Hill (1995) explained the relationship between task demands and disfluencies in 5-year old nonstutterers during a sentence imitation, sentence modeling, and storytelling

tasks. Statistically significant differences in disfluency production were reported between the sentence imitation and sentence modeling tasks, sentence imitation and story telling task; but not between the Sentence Modeling and Storytelling tasks. Results indicated that as the complexity of the narrative increased so did the number of disfluencies (p. 81). She concluded that "the relationship between disfluency production and complexity appears to be related to the subjects' attempts to link together elements of the story in a single cohesive unit" (p. 82).

Scott, Healy, and Norris (1995) compared 12 children who stutter and age matched normally fluent peers on a story-retelling task. They analyzed the inclusion of story grammar components and level of sophistication. The purpose of this study was to determine if children who stutter produced less sophisticated narratives when compared to their normally fluent peers. Additionally, they wanted to determine if the number of disfluencies produced during story-retelling tasks were related to the sophistication of the narrative structure. (p.282). Results indicated that differences specified were not statistically different. Scott et.al. (1995) concluded that for some of the children in the study "subtle language impairment may be a component of the fluency problems" (p.287). Organization and relating information in a structured manner may have placed a demand on the child's language system. As a result, there was an increase in the number of disfluencies, or in an effort to avoid disfluencies the child used less complex narrative structures.

All factors considered, the development of nonfluencies, normal communication development, and perhaps the disfluencies of stutterers, are related to a number of

language variables. Research notes that there is a relationship between language and fluency (Hall, 1996; Logan & Conture, 1995; Ratner, 1995; Scott et al., 1995; Sillman & Leslie, 1983; Silverman & Ratner, 1997; Starkweather, 1987; Wall & Myer, 1982; Weis & Zebrowski, 1994;). For the most part subjects in the studies that examined the relationship between language and fluency did not have clinically significant language disorders. However,, some researchers have commented on or examined subjects on the two extreme ends of the language continuum – language precocious and language impaired children.

Enger, Hood, and Shulman (1988) observed the language and fluency characteristics of children judged to be "linguistically precocious talkers" . These researchers studied twenty children between the ages of 39 – 85 months. All children attended a private school for gifted children who proved to have language skills "higher than expected of normal children of the same chronological age". The children were asked to discuss topics about their favorite toys, televisions shows, and hobbies. Results indicated the subjects used language characteristics of older children. The younger children were more disfluent on 5.91% of words spoken while older children were 7.72%. These results were not in agreement with other studies that indicated that as children mature their disfluencies will decrease. The authors suggested that the discrepancy could be due to the children's use of more complex language. In using more complex language, these children increased their 'grammatical load' by speaking over their linguistic processing and encoding systems. That is, the highly verbal and linguistically sophisticated preschooler may have exceeded the capacities of their

linguistic processing and encoding system to the extent that the overload resulted in fluency disruptions or breakdowns. Starkweather and Gottwald (1990) speculated that the linguistically inferior and linguistically superior may be at risk for stuttering. They used a similar "Demands and Capacities Model" to explain their premise.

Adams (1990) explained the premise of the Demands and Capacities Model (DCM) as "fluency breaks down when environmental, and/or self-imposed demands exceed the speakers' cognitive, linguistic, motoric, and/or emotional capacities for responding" (136). Starkweather and Gottwald (1990) explained that the DCM "is not an explanation for the etiology of stuttering but instead as a way of organizing what is known about the development of fluency and stuttering in children" (143). As noted earlier, the relationship between language and fluency is unclear, yet there are variables which are influential. For instance, stuttering is likely to occur at locations and situations that are linguistically demanding (Colburn & Mysak, 1982; Starkweather, 1990; Scott et.al, 1995; Weis & Zebrowski, 1994; Yaruss, 1997; Gordon & Luper, 1989; Gordon, 1991; Silverman & Ratner,1997) and linguistically superior children become more disfluent on linguistic forms they are just beginning to use (Starkweather & Gottwald, 1990; Enger et.al., 1988). For both the linguistically superior and linguistically inferior, "language can be a demand by itself however, it can also place a strain on the child's motor capacity" (144).

The disfluencies of the linguistically precocious child may demonstrate an imbalance in the child's capacities for fluent speech as a result of the linguistic overload from high-level semantic, syntactic and other linguistic features on a still developing

neurological, motor, and cognitive system. It is reasonable to assume that similar effects might be observed in a linguistically inferior child. In this, normal or excessively high demands for fluent speech might exceed the child's inferior capacity to produce an utterance fluently.

P. Hall (1977) reviewed two cases of language disordered children who became excessively disfluent during the course of language therapy. She proposed that disfluencies occurred as a result of the struggle to cope with the subject's efforts to master new language skills (p.364). Further evaluation of the two subjects revealed severely impaired language abilities, early syntax levels, and abnormal fluency patterns. After an extensive 6-week summer residential program, both subjects became excessively disfluent. However,, as language skills improved, disfluencies decreased. P. Hall (1977) suggested that children with abnormally developing language skills experienced disfluencies during language acquisition similar to children with normally developing language skills during language acquisition. (p.367). Also, as the language skills improved, the disfluencies decreased (p.367), suggesting that as a balance between capacities and demands develops, a decrease in disfluencies occurred.

N. Hall (1996) examined the changes in language and fluency in 9 children with language disorders as measured by a battery of language tests and an analysis of spontaneous speech samples. Research suggests that fluency may be a signal for variation in language development, at least for some children with language disorders. Results indicated an association between improved language and greater fluency. Although a majority of the subjects demonstrated higher-than-average rates of total

disfluencies, a complementary decrease in normal type and stuttered type disfluencies were noted. From these results two patterns emerged. The first suggested that "continued impairment in expressive morphosyntactic skills appears to produce greater frequencies of stuttering-type disfluencies than observed in other subjects" (p.25). Second, subjects "continue to present increased disfluencies on follow-up, however, normal types of disfluencies predominates" (p.26).

Researchers have investigated many factors, which influence the flow of information for both persons who stutter and persons who do not, resulting in populations that are atypical i.e. due to language impairments, learning disabilities, and cognitive delays.

Atypical Stutterer

St. Louis (1986) says that an atypical stutterer is one whose "atypicality" results from "cultural influences, gender, severity, psychological adjustment, cognitive ability, symptom complexity, and known neurogenic etiology" (p.4). Within the population of children who stutter, there are those who are disfluent yet there is a difference in their disfluencies. Curlee (1999) describes this type of stuttering, "a different but related disorder of fluency". For the purpose of this paper, we will limit the discussion to certain "atypical" populations. The problem of stuttering seems more complex when we see features of disfluency in the speech of other special populations. For instance disfluencies have been noted in the following special populations: children with mental retardation (Bloodstein, 1995; Chapman & Cooper; Cooper, 1986 Preus, 1990), children with Down Syndrome (Devenny et.al., 1990; Miller & Leddy, 1998; Willcox, 1988), and

children with language impairments (Hall 1996; Nettelbladt & Hansson, 1997; Patterson & Reed, 1981; Roth, 1986).

Several studies have examined the prevalence and nature of stuttering in the mentally retarded population (Bloodstein, 1995; Chapman & Cooper, 1996; Cooper, 1986) indicating a high prevalence. In Bloodstein's comprehensive review of several studies, he reported the prevalence of stuttering in the mentally retarded population as far higher than the 1% prevalence of stuttering that is usual in the general population (p.258). Since it is clear that disfluencies exist, the greater question is are they the same as stuttered disfluencies. Again reports are contradictory, some explained that persons with mental retardation lack the secondary characteristics, i.e. awareness, fear and avoidance, so the disfluencies must be different. Bloodstein stated that a considerable amount of "ordinary" stuttering in its early stages is accompanied by associated features (p.259). In general, the nature of disfluencies in the mentally retarded population could be accompanied by other disorders of speech and language (Preus, 1990). Although there are some differences, the disfluencies of persons with mental retardation are similar to the disfluencies of stutterers with normal intelligence.

Chapman and Cooper (1973) observed stuttering behaviors in 36 of 1,467 residents of a state institution for mentally retarded persons. In their study they determined that the incidence of stuttering in an institutionalized mentally retarded population was 3.02%. "The incidence of stuttering in an institutionalized mentally retarded population was found to be higher than the incidence generally reported in the non-retarded populations or in persons of an equivalent age range" (p.155).

Cooper (1986) pointed out that the prevalence of stuttering increases as the severity of retardation increases (p.126). From his review several important points were made. For instance, he explained that some studies reviewed found no significant difference between the types and frequency of disfluencies found in their retarded adults and frequency types observed in preschool children (p.130). A stronger relationship was revealed between disfluency frequency and types between adults with mental retardation who stutter and nonstuttering retarded adults than there was between both groups of mentally retarded adults and the disfluency types observed in preschoolers (p.130).

Within the population of persons with mental retardation, researchers found an even higher prevalence of disfluencies in persons with Down syndrome (Bloodstein, 1995; Cooper, 1986; Devenny et al., 1990; Miller & Leddy, 1998; Preus, 1990; Willcox, 1988). Prevalence has been noted as high as 15-60% (Willcox, 1988) and 40% for those with mild-moderate retardation with Down syndrome (Devenny et al., 1990). Bloodstein reported an unusually high prevalence of stuttering in persons with Down syndrome, approximately 33 percent. Despite the high prevalence, there are some researchers who characterize the disfluencies in the Down syndrome population more as cluttering than stuttering. Some speculate that the disfluencies of individuals with Down Syndrome may be related to language difficulties (Bloodstein, 1995; Cooper, 1986; Devenny et al., 1990; Miller & Leddy, 1998; Preus, 1990; Willcox, 1988).

Cooper (1986) reported that cluttering is a central language disorder characterized by short attention span, impaired articulation, a rapid speech rate with frequent breaks in the flow of speech, and a lack of awareness of the disfluencies (p.132). In Bloodstein's

review of the literature, he found an exceptional amount of speech interruptions in the speech of persons with Down Syndrome. Bloodstein (1995) reported that disfluent subjects with Down syndrome, "achieved poorer rating of intelligibility in conversational speech than fluent speakers which suggested their disfluencies are more characteristic of cluttering that stuttering" (p.260).

In a comprehensive review of speech and language skills of persons with Down syndrome, Miller and Leddy (1998) reported that persons with Down Syndrome may exhibit fluency problems; however, it was not clear if these difficulties were speech-based or language-based difficulties. These individuals had particular trouble acquiring productive language skills. Comprehension skills exceeded their production skills thus, comprehension skills were comparable to their nonverbal mental age (p.164). Miller and Leddy described three possible reasons for a higher prevalence of disfluencies within the Down syndrome population. There is a higher prevalence of stuttering in Down syndrome when compared to others with developmental disabilities; however, there is disagreement on whether these disfluencies are the same (p.168). One reported difference is the absence of secondary behaviors of individuals with Down Syndrome as seen in persons who stutter by Bloodstein. Not only was there a high prevalence of stuttered disfluencies, 34 % in individuals with Down Syndrome, but also approximately 29.8% of these cases exhibited secondary characteristics manifested as avoidance behaviors (Preus, 1972). Preus concluded that the disfluencies exhibited by individuals with Down Syndrome may be classified as "genuine stuttering" (p.261). Copper (1986) reported that "Down syndrome is often associated with disfluent speech pattern where 'stuttering-like'

elements are rather pronounced while elements of 'normal' disfluency, though present in a considerable amount, are relatively de-emphasized" (p.131).

Willcox (1988) compared the speech samples of persons with Down Syndrome and developmentally normal subjects matched for language age. Willcox reported that subjects with Down Syndrome exhibited core characteristics of stuttering – whole and part word repetitions, and prolongations (p.154). The purpose of the study was to assess the extent to which the non-fluency in Down Syndrome was similar to normal non-fluency. A comparison of spontaneous speech of five persons with Down Syndrome to five developmentally normal subjects indicated that the total number of non-fluencies differed between the two groups. The mean for the subjects with Down Syndrome was greater than for the controls. Further analysis indicated that the percentage of nonfluencies fall within the normal range; yet some disfluencies exhibited by both groups were characteristic of typical stuttering (p.166). Other differences noted between the groups could be related to problems at the level of planning syntactic structures or lexical selection. It seemed the subjects here were nonfluent at planning and selection points in the same way as adults; however, this was not the case in this study. The relationship in the Down Syndrome group between non-fluency and increased length and complexity of utterance did not support P. Hall's (1977) conclusion that as language skills improve the occurrence of disfluencies will decrease. Willcox concluded that the differences were not only in the nature and extent of non-fluencies, but also in the terms of the underlying language difficulties (p.166). Although the non-fluencies of persons with Down Syndrome shared some of the characteristics of normally developing children, Willcox

concluded that they resulted from a global language deficit rather than as a symptom of the syndrome (p.169).

Willcox (1988) explained that the fluency breakdowns could be described in terms of a breakdown at other levels in the model of speech production. Apart from more obvious facial and oral anomalies and the general hypotonia associated with Down Syndrome, there is evidence for a motor deficit in Down Syndrome subjects that affected the coordination and timing of motor movements (p.168). Miller and Leddy (1998) argued that disfluencies resulted from a motor-control impairment. They hypothesized that neurological factors influenced motor speech production in people with Down Syndrome and these impairments affected a child's ability to adapt (p.166).

Devenny, Silverman, Balgley, Wall, and Siditis (1990) wanted to determine if the motor problems of stutterers with Down Syndrome were restricted primarily to speech, or if they were the result of a more general motor problem. They compared 8 male adults with Down Syndrome who were clinically identified as stutterers to 8 adult males with Down Syndrome who had fluent speech. Speech fluency was evaluated and results indicated the group of stutterers had a significantly greater mean number of disfluencies (24.8%) as compared to the fluent group (7.2%). Researchers noted some secondary characteristics of facial grimacing, eye blinks, and effort in speaking. In addition to a fluency sample, Devenny et al.'s subjects were tested on four tasks. The first two involved simple repetitive motor movement, one in speech production and the other in manual production, i.e. repeat /p∧/, /t∧/, /k∧/ and tapping their index finger as fast as one could in 10 seconds (p.439). The third and fourth tasks involved more complex motor

coordination, like sentence imitation and placing pegs in a grooved pegboard (p.439). The results indicated that stutterers with Down syndrome were faster than the more fluent speakers on those tasks that required simple, repetitive movements like diadochokinesis and finger tapping and they were slower on tasks that required more complex movements (sentence imitation and the pegboard) (p.441). Each task involved some neural organization and researchers suggested a dissociation in motor system for the planning of these different types of motor activities (p.441). Devenny et.al. "also found a significant correlation between diadochokinetic rate and disfluency, which indicated that a higher rate of syllable repetition was associated with greater disfluency during conversational speech" (p.441). Researchers concluded that within the Down Syndrome population, "stuttering was the outcome of a mismatch between an optimal speaking rate and the rate of generation of the component processes of speech, the consonant-vowel units" (p.442).

Crary (1995) observed this phenomenon in persons with developmental motor speech disorders. He reviewed the framework from which a clinical evaluation of developmental motor speech disorders is conducted. Performance load is referred to as the influence on any performance that resulted from increasing the demands of the task being performed. Crary found that as performance load factors increased more errors occurred (p.120). Likewise, Miller and Leddy (1998) offered the explanation that persons with Down syndrome produce mazes, a general class of verbal fluency behaviors, which are an index of language formulation. Mazes are false starts, repetitions, and reformulations that describe the child's progression to a more adult like language competence. These dysfluencies appeared to be associated with generalized intellectual

impairment; the stutterers had, as a group, higher IQs than fluent speakers. Thus, stuttering seemed to be associated with specific deficits within the motor, perhaps speech motor system (p.437).

The idea of mazes is used to describe the disfluencies of individuals with language-impairment. Nettelbladt and Hansson (1997) reported that mazes are repetitions, pauses, false starts, and revisions. The results of their study indicated that there was a higher incidence of part word repetitions suggesting that children with language impairments planned speech differently. Roth (1986) reviewed the oral narrative abilities of learning-disabled students. Within this review she concluded that these children manifested problems in discourse, both conversation and narratives. Conversation and narratives "required a sense of purpose, the selection of relevant information, the clear and orderly exchange of this information, the ability to make necessary repairs, and the ability to assume the perspective of the listener or audience" (p.22). Roth explained that children with language impairments differed from typically developing children in retrieval and comprehension of stories. She found a primary area of disparity in the amount of information recalled indicating that language impaired children do not seem to remember as much information (p.23). Other differences noted were the stories told by language impaired children were shorter and not connected, contain substantially fewer complete episodes, and significantly fewer minor setting statements (p.25).

In addition to difficulties in language formulation abilities of children with language impairment, Patterson and Reed (1981) found speech production deficits.

Reports indicated that language-impaired children may develop episodes of stuttering while receiving speech or language therapy (p.55). Patterson and Reed (1986) investigated the relationship between language delay, language therapy, and disfluency. The results indicated that the language delayed therapy group had a greater mean number of disfluencies than the language delayed nontherapy group, 32.8% and 15.4% respectively (p.57). There was also a significant difference between the language delayed therapy group and controls; however, there was no significant difference between controls and language impaired nontherapy group. Further analysis indicated that there were significant differences in the types of disfluencies between groups, with the language impaired therapy group demonstrating more part-word repetitions and word repetitions (p.57). Patterson and Reed suggested a relationship exists between language therapy and increased number of disfluencies. They provided three potential reasons. First, language therapy created language uncertainty and elicits increased disfluency. Secondly, "communication pressure" from the language therapy may have caused the disfluencies. Thirdly, the disfluencies were not related to therapy at all (p.58). Hall (1996) pointed out that despite these uncertainties, studying the changes in fluency and language in children with language disorders over time may provide insight into the improvement (or persisting impairment) of language ability (p.3).

In addition to these populations, ADHD children demonstrate atypical disfluencies. Research shows that disfluencies can be noted in their spontaneous speech. (Berk & Potts, 1991; Giddan, 1991; Hamlett, Pelgrini, & Conners, 1987; Westby, 1994; Zentall, 1988) The question with the Attention Deficit-Hyperactivity Disorder (ADHD)

population is if the disfluencies they elicit are stuttering or 'stutter-like'. Wall & Myers (1982) pointed out a relationship between the cognitive process of sentence organization and fluency (p.448). This difficulty is evident in the language-delayed population. Children with ADHD not only express some language difficulties but they also have deficits in the executive processes, those mechanisms which 'orchestrate cognition'...effortful applications of self-conscious, deliberate knowledge, as opposed to knowledge that is acquired automatically (Hamlett et al., 1987)

Attention Deficit Hyperactivity Disorder

Attention is a conditional, multidimensional relationship between behavior and environment, resulting in a correlation among events and reactions to them. Since there is an overlap between attention and function, "disturbances in one aspect of attention are likely to have an impact on the other dimensions" (Shelton & Barkley, 1994, p.28). As a result of a deficit in attention, children may demonstrate a variety of characteristics. These may be more prominent in some children while less so in others. Westby and Culter (1994) suggested that deficits in attention refer to problems with alertness, arousal, selectivity, sustained attention, or distractibility. They cautioned that attentional problems cannot be separated from problems with impulsivity or a deficiency in inhibition behaviors in response to situational demands that could result in excessive and developmentally inappropriate levels of motor or vocal activity. Shelton and Barkley (1994) stated that the greatest amount of research in attention deficits is on attention-deficit hyperactivity disorder (ADHD). In the ADHD populations typically displays primary deficits in impulsiveness and the ability to sustain attention. There is some

debate on the deficits consistent with ADHD; however, it remains the most frequently diagnosed childhood psychiatric disorder and the percentages can be 3-5%, (Augustine & Damico, 1995; Austin & Csanyi, 1994; Baker & Cantwell, 1992; Giddan 1991) or as high as 6-9% (Halperin et.al. 1993).

According to DSM IV, (the American Psychiatric Association's Diagnostic Manual,1994), children with ADHD exhibited disturbances in attention and hyperactivity-impulsivity for at least six months, prior to the age of seven, and cannot meet the criteria for Pervasive Developmental Disorder (PDD). This manual provides eighteen behaviors within two specific conditions, attention and hyperactivity-impulsivity. See Appendix A. In order to be diagnosed with ADHD, a child must exhibit at least six of these eighteen behaviors at a considerable greater frequency of occurrence than observed children of the same mental age. If criteria for both factors are met then the individual is diagnosed as having ADHD "combined type". If one characteristic predominates then the child is considered to have ADHD predominately "inattentive type" or predominately "hyperactivity-impulsivity type" (Augustine & Damico, 1995). There are no clear boundaries when diagnosing a child with ADHD, thus, interpretations vary. Since ADHD is chronic and it effects behaviors such as attention, impulse control, distractibility, and hyperactivity, children may evidence a variety of combinations of these eighteen characteristics resulting in various behavioral manifestations.

Due to the multideminsional aspects of attention, various symptoms are associated with ADHD making diagnosis and assessment very difficult. For instance, Augustine and Damico (1995) suspect that the primary symptoms are a result of an

"internal deficit or primary impairment within the child" (p.248). These symptoms consist of impulsivity/hyperactivity and inattention/disorganization. Impulsivity/hyperactivity is defined as a pattern of rapid inaccurate responses to tasks and overactivity (Augustine & Damico 1995; Austin & Csanyi 1994), resulting in poor sustained inhibition of responding, poor delay of gratification, or impaired adherence to commands to inhibit behavior in social situations. Inattention/disorganization causes problems with alertness, arousal, selective and sustained attention, or distractibility with the greatest difficulty in sustaining attention to tasks. In addition, there are secondary symptoms, which are speculated to be a "manifestation of a common underlying problem" (Augustine & Damico, 1995, p.248). These secondary symptoms include: academic difficulties, problems with peer relationships, conduct and aggressive behavior, and language and speech difficulties.

Research shows that children with ADHD are more likely to receive lower grades in academic subjects and lower scores on standardized reading and math tests and over half will fail at least one grade by adolescence. It is reported that approximately 25 – 50% of children with ADHD will have at least one type of learning disability (Austin & Csanyi 1994; Shelton & Barkley 1994). However, it is unclear if these difficulties are due to their inability to attend or a result of their other deficits in language. There is a close relationship between academic success and language abilities and it is not only observed in children with ADHD. Children with significant speech and language disorders have considerably greater risks for psychiatric disturbances than do children

with normal language development. Approximately 17-38% of these children, with a psychiatric disturbance, will be diagnosed with ADHD.

Academics are not the only way language difficulties affect children with ADHD. Giddan (1991) explains that these children have pragmatic dysfunctions because they are oblivious to situational cues and they lack the ability to self- talk. Both of these are important in maintaining appropriate peer relationships. Appropriate relationships are contingent upon the ability to self-talk, which is critical for organization and control of interpersonal skills. The lack of awareness to situational cues leads to difficulties in peer relationships for more than 50% of children with ADHD. It is reported that children with ADHD are "more aggressive, disruptive, domineering, intrusive, and socially rejected than normal children" (Westby & Cutler 1994, p.62). They do not have the ability to vary communication strategies and they view the events that happen to them as out of their control. Their limited language abilities make them more likely to misunderstand warnings, instructions, and reprimands (Westby & Cutler 1994), increasing their frustration and causing them to cry and act out. They also have difficulty waiting turns, talking excessively, interrupting others, not listening to what is being said, and blurting out answers to questions before the question is completed (Westby & Cutler 1994). All of these behaviors accumulate and children with ADHD lose socialization opportunities, which are necessary for successful interactions. It is speculated that these behaviors result in specific reactions from others, which creates an even greater problems, like conduct problems and/or aggressive behavior. It can be assumed that academic and pragmatic difficulties represent a specific correlation between and internal deficit

resulting in an environmental reaction. There may be a connection and possible overlap between the above-mentioned difficulties and language deficits in children with ADHD.

Language deficits have an affect on children with ADHD and his/her environment. The question is posed whether the inattention and other ADHD characteristics cause the language difficulties or does the language delay causes the attention deficits. In any case language plays a major role and deficits here overlap many others. A connection could be made between executive processing deficits, language development and frequency and type of disfluencies. Hamlett, Pellegrini, & Conners (1987) investigated the application of executive processes in normal children and children with ADHD. Participants consisted of 16 children who were clinically diagnosed with ADHD and 16 normal controls. First the children were instructed to pick up cards one at a time and to then sort then into at least two categories and no more that seven. Then the children were audio-recorded when asked to explain how to play this game to another child who was the same age and gender. Results indicated no significant differences in performances between the two assessment conditions. There was a significant group difference with regard to executive processes as reflected in the quality of instructions and organizational strategies that children provided the communication effectiveness and the fluency of their communication (p.233). ADHD children were significantly more disfluent and tended to make a greater number of false starts and/or rephrasing in their explanations of the game. The use of private speech failed to occur with sufficient frequency during the sorting task to allow for statistical analysis for groups differences. Hamlett et al. concluded that the greater amount of disfluencies

suggested that explanatory speech and cognitive processing requirement may be more difficult for the children with ADHD (p.236).

Tannock, Purvis, & Schachar (1993) compared 60 boys with and without ADHD on their abilities to retell two folktales on two separate sessions. The stories were analyzed for the amount of information recalled (main idea) and the cohesiveness and organization of that information. Tannock et al. found that the ADHD boys and the TD boys did not differ significantly in their ability to comprehend and extract the main ideas from the story narratives but were different in their ability to organize and create a cohesive account (p.112). The ADHD subjects overall provided less information and had difficulty organizing and monitoring the information they provided. Tannock et al. concluded that "the higher frequency of misinterpretations and word substitutions reflects a failure to monitor the accuracy of the information and, like the other error types, reflects deficits in executive control processes" (p.113). However, attributing these differences solely to deficits in executive processing could not be concluded in the present study. It is also important to consider the deficits in language and or a combination of the two. Tannock et al. concluded that "inappropriate word substitutions, repetitions, delays, time filters (e.g. *um, er, well*), and problems in cohesion, are characteristics associated with both language disorders and deficits in executive processes" (114).

Hamlett et.al. (1988) indicates an incidence of disfluencies in children with ADHD. The characteristics of these dysfluencies may be different from the disfluencies of children who stutter. A comparison of the type and frequency of stuttered disfluencies

and the disfluencies of children with ADHD is important in the differential diagnosis of stuttering. In addition, the present study will extend the understanding of the relationship between speech disfluency and language through an analysis of disfluencies elicited during a story telling task from pictures and original stories from introductory sentences.

Summary

Disfluencies are not only a characteristic of stuttering, but also prevalent in normally fluent children and adults. Normal disfluencies do not occur as frequently and are not accompanied by other accessory features. Research within the area of fluency has compared children who stutter and children who do not on various speaking tasks (Gordon and Luper, 1989; Gordon 1991; Scott et al., 1995; Hill, 1995; Yaruss, 1997). Other researchers have looked to other populations like children with language impairments, mental retardation, and Down Syndrome in order to better understand normal and stuttered disfluencies (Chapman and Cooper, 1973; Cooper, 1986; Devenny et al., 1990; Enger et al., 1988; Miller and Leddy, 1998; Patterson and Reed, 1981; Roth, 1986; Willcox, 1988).

For the purpose of this investigation, children with Attention-Deficit Hyperactivity disorder will be compared to typically developing children. The type of disfluencies produced will also be investigated, i.e. are the disfluencies more characteristic of normal disfluencies or stuttered disfluencies. Finally the influence of the task on the percent of disfluencies produced by each groups will be investigated. From the literature it can be expected that children with ADHD will be more disfluent than the TD children because of their deficits in self-monitoring and language formulation.

Chapter II

Method

The purpose of this study was to compare the nature of disfluencies in children with Attention Deficit-Hyperactivity Disorder (ADHD) and Typically Developing children (TD). Specifically:

1. Are children with ADHD more disfluent than their TD peers?
2. Are the disfluencies elicited by children with ADHD qualitatively different from those elicited by the TD children?
3. Are the type and frequency of disfluencies produced on the Original Story Telling Task (OST) different from those produced on the Story Telling Task with Pictures (ST-P)?

Participants

Two groups of children ranging from 7 years to 10 years of age served as participants in this study. Participants were solicited through newspaper advertisements, word of mouth, and recruitment through summer school and day camp programs for school-age children. One group consisted of 7 children with ADHD (mean age = 9 years 5 months, range 8:6-10:3) while the second consisted of 7 typically developing children without ADHD (TD) (mean age = 9 years 3 months, range 8:9-10:6). The TD children were matched to the children with ADHD according to age, grade level, and gender. A parent questionnaire was administered in order to document pertinent information

regarding the child's health history, speech and language development, and school performance. See appendix B.

Participants demonstrated normal hearing acuity with passing responses to 500, 1000, 2000, and 4000Hz at 20 dB HL in both ears as determined by a Beltone Special Instrument Model 119 portable audiometer. Participants were performing at grade level and did not have a history of repeating a grade in school. Acceptable school performance was documented based on parent report and review of grade cards.

All participants demonstrated normal language skills as measured by scores equal to or greater than the criterion score expected for his/her age on the *Clinical Evaluation of Language Fundamentals – Third Edition Screening Test* (CELF-3, *Screening Test*) (The Psychological Corporation: San Antonio, 1996). The CELF-3 Screening Test was designed to "identify individuals who may need to be referred for further language assessment" (p.1). Participants with a previous history of speech or language disorders were accepted; however, participants could not been in treatment for a speech or language disorder within two years prior to serving as participants in the study.

Participants in the ADHD group met the criteria from the DSM-IV (1994). They had a history of at least six months with the disorder as determined by demonstration of at least 8 of the 14 diagnostic criteria for ADHD from the DSM-IV. Diagnosis of ADHD was confirmed by parent report and written documentation provided by the clinical psychologist, pediatrician, or pediatric neurologist who made the initial diagnosis of ADHD. See Appendix C. Participants were not excluded from study if they were currently using medication as part of treatment of ADHD. For the purpose of this study

all participants were using appropriate medications as prescribed by their physician for treatment of ADHD. The researcher noted the type, frequency, and dosage of medication the child used. A summary of the ADHD history, diagnosis, and medication for all participants in the study is presented in Appendix D. Participants in the TD had no history of neurological or behavior disorders as determined by parent questionnaire. Table 2-1 summarizes the results of the hearing and language screening and reports the academic and medical history of each participant.

Table 2-1. Summary of Hearing and Language Screening Results and Report of Academic and Medical History for Typically Developing Participants (TD) and Participants with Attention Deficit Hyperactivity Disorder (ADHD).

Participant	Hearing Screening	*CELF-3*		History	
		Participant Score	Criterion Score	Academic	Medical
TD01	Pass	22	19	Grade Appropriate	No Dx
TD02	Pass	22	21	Grade Appropriate	No Dx
TD03	Pass	29	19	Grade Appropriate	No Dx
TD04	Pass	21	16	Grade Appropriate	No Dx
TD05	Pass	30	21	Grade Appropriate	No Dx
TD06	Pass	31	21	Grade Appropriate	No Dx
TD07	Pass	26	21	Grade Appropriate	No Dx
AD01	Pass	34	19	Grade Appropriate	Yes – 1995
AD02	Pass	28	21	Grade Appropriate	Yes – 1995
AD03	Pass	20	19	Grade Appropriate	Yes – 1996
AD04	Pass	16	16	Grade Appropriate	Yes – 1997
AD05	Pass	21	19	Grade Appropriate	Yes – 1995
AD06	Pass	31	19	Grade Appropriate	Yes – 1996
AD07	Pass	27	21	Grade Appropriate	Yes - 1998

Procedures

Each participant was seen in one session for screening/training and data collection. Contacts were 40 to 60 minutes in length. All data were collected in the Fluency Research Lab at the University of Tennessee, Knoxville. The lab was furnished with a small table, audio recorder, and an attached small room with a one-way mirror for parent viewing. The examiner and participant were seated across from each other at the table. The examiner and participant were the only persons in the room during screening procedures and data collection; however, parents viewed from an adjoining room with a one-way mirror.

Participant training: During the screening/training session, hearing was screened, the CELF-3 was administered, and one of the stories for the storytelling task was elicited. The child was given the following sentence and asked to create his/her own original story: "There was a fox and a bear who were friends and one day they decided to catch a chicken for supper."

Experimental Task: The data collection session took place in the Fluency Research Lab where the examiner and participant sat across from each other at the table. After the participant was seated at the table, the examiner began audio recording. Two storytelling tasks were utilized to obtain speech samples for fluency analyses during this session. The first task was a creation of two original-story (OST) when the first sentence was provided (Weiss & Zebrowski, 1994). The two sentences were as follows: (1) "Once there was a woman who needed a tiger's whisker but she was afraid of tigers." and (2) "Judy is going to have a party for her tenth birthday and she would like a hammer and a

saw for presents." The sentences were given in random order one at a time and the participant was told to complete the story so it had "all of the good parts a good story should have" (p.46). Participants were asked to tell the same story, however they were presented in a random order.

The second task was a story telling from pictures (ST-P) task. After viewing David Wiesner's Tuesday, a wordless picture book, the experimenter delivered the following instructions. "I want you to tell me a story. Tell the best story you can." If no response was given, the examiner said: "Tell me a story about what is happening in these pictures." A series of prescribed prompts were used to encourage the participant's narratives. For instance, "Really, what else happened" or "Tell me more about what happened."

The participants' narratives were audio recorded on a Marantz PMD430 portable cassette audiotape recorder with a Shure Prologue 14H table microphone placed approximately six inches from the participant.

Data Criteria

Disfluencies were identified by the classification system used by Conture (1990). Conture's system (1990) identifies within word disfluencies as stuttered disfluencies and between word disfluencies as normal disfluencies (p.12). Table 2-2 shows differences between normal disfluencies and stuttered disfluencies. All disfluencies were typed (e.g. stuttered vs. normal) and tallied for each participant from verbatim transcription of their narratives (stories).

Table 2-2. Conture's Classification of Stuttered and Normal Types of Disfluencies.

Disfluency Type	Within-Word	Between-Word	Examples
Sound/syllable Repetitions	X		"He is run-ruh-running" "It is abou-about time." "See the ba-ba-baby." "You t-t-take it."
Sound Prolongation	X		"Mmmmmmore cake please." "T-(silence while person holds articulatory posture for't')oday is Monday"
Broken Word	X		"I was g-(pause)-oing." Distinguishing broken words from sound prolongations is not always possible or easy.
Monosyllabic Whole-word Repetitions	X	X	"I-I-I can't do that." He-he-he is a big boy."
Multisyllabic Whole-word Repetitions		X	"She really-really is here."
Phrase Repetitions		X	"I was – I was there."
Interjection		X	"I will, uhm, you know, be late."
Revision		X	"She is – she was here."

Source: Stuttering, 1990, p.15.

Reliability

Accuracy of transcription and accuracy of identification of disfluencies for inter- and intra-judge reliability was determined by the use of the Sander's Agreement Index (1961) (Agreement/agreement plus disagreement = SAI) and .90 or higher was acceptable for this study. Data from two randomly selected participants from each group were re-transcribed and re-coded later by a second judge in order to establish interjudge agreement or reliability. This judge was a second year M.A student in Speech Pathology who had at least 150 clock hours of experience, previous clinical experience in language transcription, and fluency counts. She was trained by the researcher to transcribe and identify disfluencies according to the criteria established by Conture (1990). Intrajudge agreement was determined by the experimenter randomly selecting the data of two participants from each group for re-transcribing and re-coding.

Data Analysis

All responses were first transcribed from the audio recording, identified using Conture (1990) classification system, and tallied. The total number of disfluencies for each task was calculated for each participant. These results were converted to a percentage of disfluent syllables by dividing the number of disfluent syllables by the total number of syllables produced during the task.

A repeated measures analysis of variance (ANOVA) was used to evaluate the nature and frequency of disfluencies of children with ADHD and TD children on two different story telling tasks.

The repeated measures ANOVA was used to answer the following research questions:

1. Are children with ADHD more disfluent than their TD peers?
2. Are the disfluencies elicited by children with ADHD qualitatively different from those elicited by the TD children?
3. Are the type and frequency of disfluencies produced on the Original Story Telling Task (OST) different from those produced on the Story Telling Task with Pictures (ST-P)?

Chapter III

Results

The purpose of this study was to compare the nature of disfluencies elicited by children with Attention Deficit Hyperactivity Disorder (ADHD) and Typically Developing Children (TD) while completing two story telling tasks.

Participant Description

Participants of this study included two groups of age and gender matched children. There were seven Typically Developing Children (TD) (mean age = 9 years 3 months, range 8:9-10:6) and seven children with Attention Deficit Hyperactivity Disorder (ADHD) (mean age 9 years 5 months, range = 8:6-10:3). Each participant passed a hearing and language screening. All participants created two original stories when provided a sentence prompt for the Original Story Telling Task (OST) and created one story based on pictures in David Wiesmer's picture book Tuesday for the Story Telling Task with Pictures (ST-P).

Reliability

Two randomly selected transcripts were selected for re-scoring by the experimenter and another independent examiner. The independent examiner was a second year master's level student in Speech Pathology who had at least 150 clock hours of experience, previous clinical experience in language transcription , and fluency counts. She was trained by the researcher to transcribe and identify disfluencies according to the criteria established by Conture (1990). Both examiners re-evaluated the transcripts for percent and type of disfluencies.

Interjudge and intrajudge agreement for the total number of disfluencies was determined by the Sander's Agreement Index (Sander, 1961). Sander proposed this formula for inter- and intra- agreement reliability: Agreement/Agreement+Disagreement = Agreement Index.

Interjudge reliability for frequency of disfluencies was 0.97. Inter-experimenter reliability for the identification of the type (stuttering versus normal) of disfluencies was 0.98. Intra-experimenter reliability for the frequency of disfluencies was 0.96. Intra-experimenter reliability for the identification of the type (stuttering versus normal) of disfluencies was 0.97

Results

A four way ANOVA was utilized to answer all research questions and the Wilk's Lambda analysis was used to determine significant differences. Analysis indicated there were significant differences between the TD and ADHD participants for percent and type of disfluencies. However, there was not a significant difference in the occurrence of disfluencies for each group between the Original Story Telling Task (OST) and the Story Telling Task with Pictures (ST-P).

Group Differences

The variability in the total number of words spoken among participants necessitated the use of percentages rather than total disfluencies. The mean percent of disfluencies for both groups on each task is provided in Table 3-1. The analysis of variance is summarized in Table 3-2. The total percent of disfluencies for the Typically Developing children (TD) ranged from 1.55% to 6.63% with a mean of 1.7%. The total percent of disfluencies for children with ADHD ranged from 5.10% to 18.74% with a

mean of 3.9%. The participants with ADHD were significantly more disfluent than the TD participants (p=0.046). This difference is illustrated in Figure 3-1.

Type Differences

Disfluencies were identified by type using Conture's (1990) classification system. Results indicated that there was a significant difference between the Type of disfluencies for children with ADHD compared to TD children (p=0.023). See Table 3-2. Overall the two groups (ADHD and TD) exhibited significantly more Normal Disfluencies (mean =3.5%) than Stuttered Disfluencies (mean = 2.2%). Mean percent of disfluencies is illustrated in Figure 3-2.

Although both groups of participants exhibited a greater number of Normal Disfluencies; there was not a significant difference in the occurrence of the Type of disfluencies within each group (p=0.598). See Table 3-2. That is, the Type of disfluencies (Stuttered vs. Normal) did not vary significantly for the ADHD participants, nor for the TD participants. See Table 3-2. For instance, for the TD group the mean percent of Normal disfluencies (2.514%) is not significantly greater than the mean percent of Stuttered disfluencies (0.912%). Nor is the mean percent of Stuttered disfluencies (3.478%) significantly greater than the mean percent of Normal disfluencies (4.409%) for the ADHD group. See Table 3-3 and Figure 3-3 for further illustration of this non-significance difference.

Table 3-1. Total and Mean Percent of Number and Type of Disfluencies for Typically Developing (TD) and Attention Deficit Hyperactivity Disorder (AD) Groups on the Original-Story Telling Task (OST) and the Story Telling Task with Pictures (ST-P).

	OST			ST-P			Overall
PARTICIPANT	Stuttered	Normal	Total	Stuttered	Normal	Total	Mean
TD	0.717	2.831	1.774	1.112	2.200	1.656	1.715
ADHD	3.792	4.602	4.197	3.161	4.221	3.691	3.944
MEAN	2.255	3.717	2.986	2.137	3.211	2.674	

Table 3-2. Summary of Analysis of Variance for Significant Differences Between Typically Developing Participants and Participants with Attention Deficit Hyperactivity Disorder, Stuttered Disfluencies and Normal Disfluencies, and the Original Story Telling Task and the Story Telling Task with Pictures.

EFFECT	Wilks' Lambda	F	Hypothesis df	Error df	Significance
Group	0.489	6.270*	1	6	0.046**
Type	0.395	9.206*	1	6	0.023**
Story	0.873	0.875*	1	6	0.387
Group x Type	0.951	0.310*	1	6	0.598
Group x Story	0.938	0.397*	1	6	0.552
Type x Story	0.907	0.616*	1	6	0.462
Group x Story x Type	0.884	0.786*	1	6	0.410

* Exact statistic
** Statistically significant $p<0.05$.

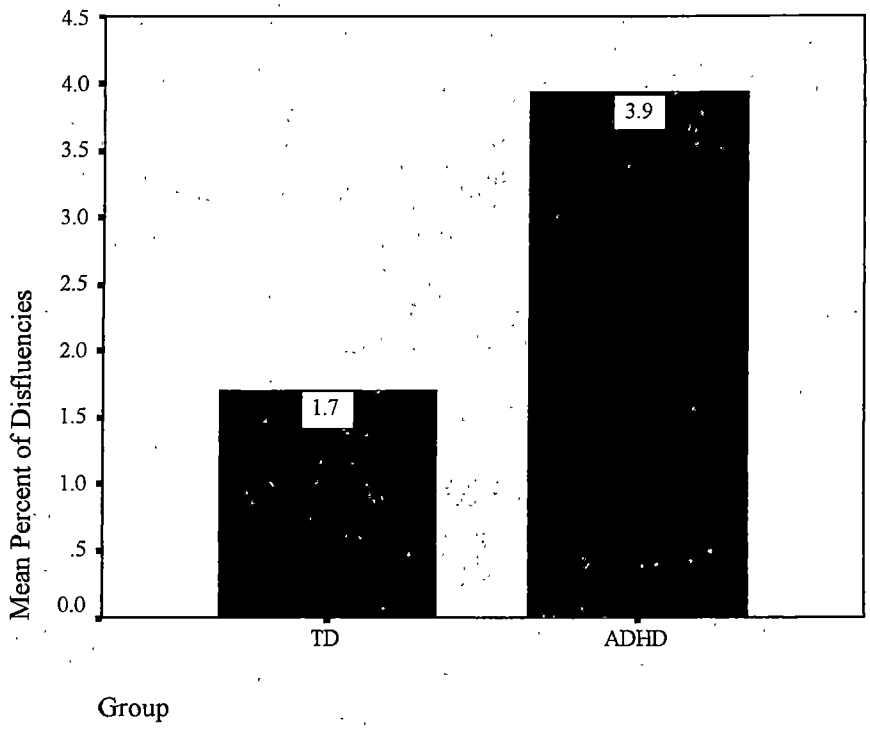

Figure 3-1. A Comparison of the Mean Percent of Total Disfluencies for the ADHD and TD Groups.

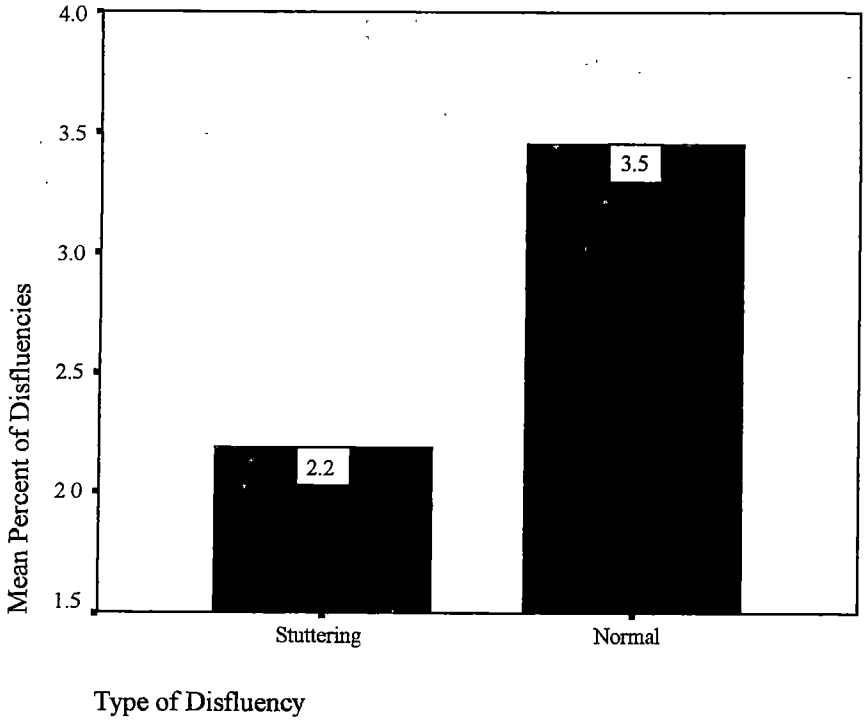

Figure 3-2. Comparison of the Mean Percent of the Types of Disfluencies Elicited by Both Groups, ADHD Participants and the TD Participants.

Table 3-3. A Comparison of the Mean Percent of Stuttered and Normal Disfluencies for the Typically Developing Participants (TD) and the Participants With Attention Deficit Hyperactivity Disorder (ADHD) During the Two Story Telling Tasks.

PARTICIPANT	Stuttered Disfluencies Mean	Normal Disfluencies Mean	Differences
TD	0.912	2.514	1.602
ADHD	3.478	4.409	0.931
MEAN	1.602	3.461	1.859

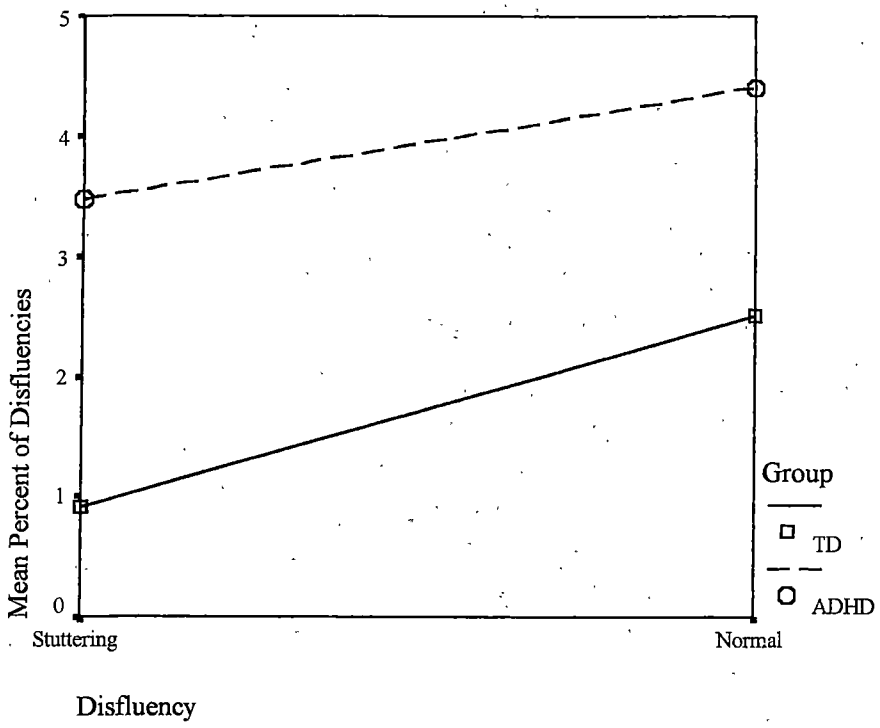

Figure 3-3. A Comparison of the Typically Developing Group (TD) and the Attention Deficit Hyperactivity Group (ADHD) of Participants Mean Percent of Stuttered Disfluencies and Normal Disfluencies.

Task Differences

Two story telling tasks were utilized to obtain speech samples for fluency analyses. The first task was a creation of an Original-Story (OST) when the examiner provids the participant with a sentence prompt. The second task, Story Telling from Pictures (ST-P), required the participants to create a story based on the pictures from David Wiesner's Tuesday, a wordless picture book. The analysis of variance summarized in Table 3-2 shows that there was not a significant difference (p=.387) between the occurrence of disfluencies produced on the OST (mean = 3.0) and the ST-P (mean = 2.7). This finding is illustrated in Figure 3-4.

Overall the ADHD participants were more disfluent than the TD participants, but the story telling task did not appear to affect the disfluencies for either group. Thus indicating that there was not a significant task effect for either group. The difference between the mean percent of disfluencies on the OST and the ST-P for the TD participants was 0.118% and for the participants with ADHD the mean difference was 0.506%. See Table 3-4. This difference was not significant.

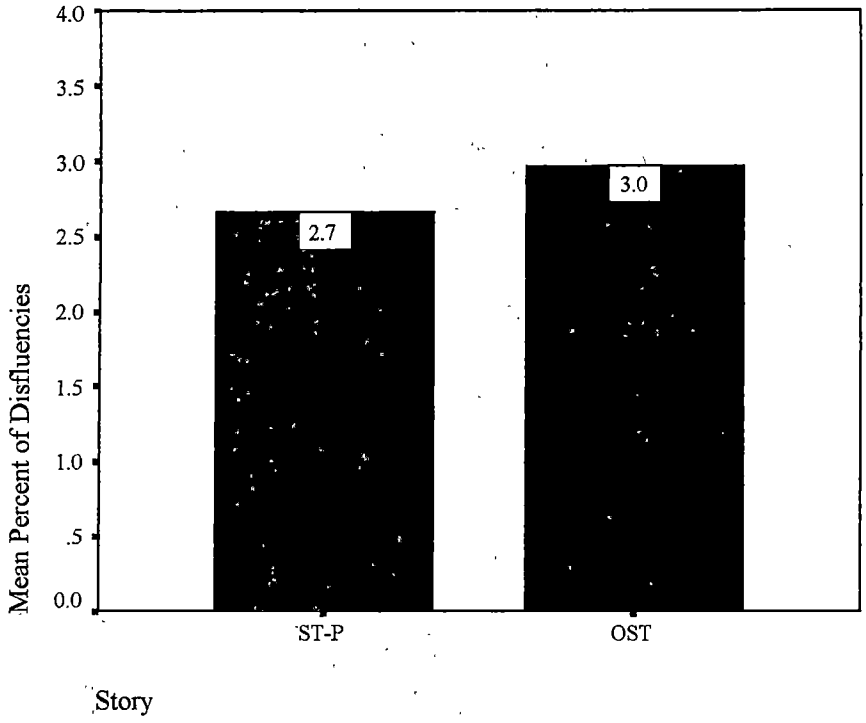

Figure 3-4. A Comparison of the Mean Percent of Disfluencies for the Story Telling Task with Pictures (ST-P) and the Original Story Telling Task (OST) for all Participants.

Table 3-4. A Comparison of the Mean Difference for the Typically Developing Participants (TD) and the Participants with Attention Deficit Hyperactivity Disorder (ADHD) During the Original Story Telling Task (OST) and the Story Telling Task with Pictures (ST-P).

PARTICIPANT	OST Total	ST-P Total	Overall Mean	Differences
TD	1.774	1.656	1.715	0.118
ADHD	4.197	3.691	3.944	0.506
MEAN	2.986	2.674		0.312

Chapter IV

Discussion

Research indicates that the development of the forward flow of information is a process and there are many factors, which can interrupt this process resulting in moments of disfluencies (Starkweather, 1987). A number of researchers have looked to various populations which exhibit an increased incidence of stuttering in order to further identify these factors and their contribution to disfluent speech (Bloodstein, 1995; Chapman & Cooper, 1973; Cooper, 1986; Devenny, Silverman, Balgley, Wall, & Sidtis, 1990; Hall, 1996; Nettelbladt & Hansson, 1997; Paul, 1998; Patterson & Reed, 1981; Preus, 1990; Roth, 1986; Willcox, 1988). Since disfluencies are present in the speech of other populations other than those who stutter, it is important to examine these populations and factors which influence them in order to better understand the disfluent speech of persons who stutter. In order to determine if attention deficits might contribute to the process of fluent speech production, the frequency and type of disfluencies of children with Attention Deficit Hyperactivity Disorder (ADHD) were compared to Typically Developing (TD) children. Disfluencies were identified and tabulated in two speaking tasks for both groups in order to determine if: children with ADHD are more disfluent that their TD peers; if the disfluencies elicited by children with ADHD were qualitatively different from those elicited by the TD children; and if the type and frequency of disfluencies produced on the Original Story Telling Task (OST) was different from those produced on the Story Telling Task with Pictures (ST-P).

Group Differences

Some research reports disfluencies in the speech of children with ADHD (Hamlett, Pellegrini, & Conners, 1987; Tannock, Purvis, & Schachar, 1993). Attention is defined as a conditional, multidimensional relationship between behavior and environment resulting in a correlation among events and reactions to them. For children with ADHD the disturbance in the relationship between behavior and environment manifests itself in several ways. Shelton and Barkley (1994) reported that a disturbance in one aspect of attention is likely to have an impact on other behavioral dimensions since there is an overlap between attention and function. Augustine and Damico (1995) suspected that the primary symptoms of ADHD, impulsivity/hyperactivity and inattention/disorganization, were a result of an "internal deficit or primary impairment within the child" (p. 248). They also stated that there are secondary symptoms like academic difficulty, problems with peer relationships, conduct and aggressive behavior, and language and speech difficulties. It was hypothesized that a high frequency of disfluencies could be one of these secondary speech difficulties.

The narratives created by the ADHD and TD participants on the OST and ST-P tasks were analyzed and compared for the percent of disfluencies elicited. In this study, it was proposed that the narratives produced by the ADHD children would contain more disfluencies than those of their Typically Developing age and gender matched peers. Children with ADHD are impulsive and have difficulty maintaining sustained attention. In turn impulsivity and inability to maintain sustained attention can create difficulties in other aspects of a child's behavior, like an increase percent of disfluencies. Data analysis supported these findings. There was a significant difference ($p = .046$) between the total

percent of disfluencies on both storytelling tasks produced by children with ADHD compared to TD children. The mean percent of disfluencies for children with ADHD (3.9%) was significantly greater than the mean percent of disfluencies for the TD children (1.9%). This supports the author's hypothesis that a significantly greater percent of disfluencies in the narratives of children with ADHD is a manifestation of the disturbance in the relationship between behavior and environment.

Other research has reported that children with Attention Deficit Hyperactivity disorder manifest a variety of behaviors like academic difficulty, language delays, or pragmatic difficulties (Austin & Csanyi, 1994; Giddan, 1991; Hamlett et. al., 1987; Shelton & Barkley, 1994; Tannock & Purvis, 1993; Westby & Culter, 1994). These difficulties are attributed not only to the inability to maintain attention, but also an internal deficit to monitor behavior, the ability to self-talk, language delays, or deficits in executive processing. Executive processes are those mechanisms which 'orchestrate cognition'... effortful applications of self-conscious, deliberate knowledge, as opposed to knowledge that is acquired automatically (Hamlett et al., 1987). The results of this study support an interpretation that the dimension of attention has a negative impact on speech fluency. The increased percent of disfluencies, of ADHD children as compared to their TD peers is viewed as a secondary symptom to the disrupted dimension of attention..

Hamlett, Pellegrini, and Conners (1987) found that during a memory and social communication task that children with ADHD were significantly more disfluent than their TD peers matched for sex, age, and socioeconomic status. They suggested that the high occurrence of disfluencies was due to the competing demands of speech and cognitive processing. They viewed the increased frequency of disfluent statements as

"additional confirmation of the problems such children have with developing and monitoring self-imposed structure" (p. 236). Tannock, Purvis, and Schachar (1993) compared ADHD and TD boys on the ability to retell stories. This information was analyzed for the amount of information recalled and the cohesiveness and organization of that information. Although there was not a significant difference in the ADHD and TD participant's ability to extract the main idea, the ADHD subjects had a higher frequency of misinterpretations and word substitutions (p. 113).

Shelton and Barkley (1994) found that children with ADHD are more likely to have difficulty with higher order or "executive language functioning" because of their inability to internalization of language for self-regulation. As proposed, this would reflect a connection between deficits in executive processing and attention and the observed frequency of disfluencies. Tannock et al. (1993) found a difference between the two groups in their ability to organize and create cohesive accounts of information. Hamlett et al. (1987) and Tannock et al (1993) suggested that an increased percent of disfluencies for the ADHD children could be attributed to deficits in executive processing abilities. Tannock et al. (1993) found a difference between the two groups in their ability to organize and create cohesive accounts of information. For the purpose of this study organization and cohesiveness of the stories was not measured, but the type of disfluencies was measured. The author wanted to determine if there was a difference in the types of disfluencies elicited by the ADHD participants along with a greater number. The second question of this study investigated a difference in the type of disfluencies produced by both groups.

Type Differences

Like attention, fluency is a multidimensional behavior influenced by a number of variables (Starkweather, 1987). Fluency and periods of disfluency are a result of normal developmental process experienced by young speakers as language skills change with age and maturation. Haynes and Hood (1977) investigated the frequency and type of disfluencies as related to language complexity and chronological age. They concluded that there was a trend toward a decrease in the frequency of disfluencies with chronological age and an alteration in the topography of disfluencies. Peters and Starkweather (1989) compared the normal and abnormal disfluencies for the normally nonfluent and their peers who stutter. They found there were a decline in number and a shift in the type of disfluencies for the typically developing children as they grew older.

Conture (1990) warns that the biggest problem in differentiating children who stutter from those who do not is the observed overlap in the number and nature of speech disfluencies exhibited. Research has described stuttering as an abnormally high frequency and long duration of sound, syllable and word repetitions and abnormally high frequency and long duration of sound prolongations and pauses with accompanying signs of tension and effort evident either acoustically or physically (Peters & Starkweather, 1989; Schwartz, Zebrowski, & Conture, 1990; Starkweather, 1987; Yairi & Lewis, 1984; Yairi & Ambrose, 1992; Zebrowski, 1995). Other research has established a relationship between chronological age and the frequency, duration, and type of stuttering and the number and variety of secondary characteristics in children who stutter (Conture, 1990; Guitar, 1988; Peters & Starkweather, 1989; Schwart, 1990; Starkweather, 1987; Zebrowski, 1995). Through a comparison of the frequency of disfluencies for TD and

ADHD participants, the experimenter sought to determine if attention is a contributing factor to the frequency of disfluencies. However, it has not been determined whether or not attention might also have an affect on the topography of disfluencies. In this study, it was not only important to establish that participants with ADHD were more disfluent than their TD peers, but also to describe the topography of the disfluencies elicited by both the ADHD and TD peers.

Conture's classification system was used to make the distinction between normal disfluencies and stuttered disfluencies. See Table 2-2. He classified eight commonly identified types of disfluencies as within word or between word disfluencies. Conture reports that "listeners are more apt to perceive speech disfluencies as stuttering when a speaker produces a word that contains any one or a combination of the following: (1) a sound syllable repetition, (2) a sound prolongation, (3) an unusual pause between the sounds or syllables of a word, and (4) a repetition of a monosyllabic whole word" (p. 14).

Results indicate that both TD and ADHD children exhibited a significantly ($p = .023$) greater number of normal disfluencies than stuttered disfluencies. See Table 3-2. Although the ADHD participants were more disfluent than the TD participants there was not a difference in the type of disfluencies. Both groups exhibited a significantly greater number of normal disfluencies as opposed to stuttered disfluencies. See Figure 3-2.

It can be concluded that attention is one contributing factor to the occurrence of disfluencies in the speech of ADHD children. It appears that there is a greater possibility for increased disfluencies due to the disruption and weakness in executive processing skills. Although ADHD children exhibit more disfluencies than their TD peers, approximately 90% were Normal Disfluencies (ND) which is not the type of disfluencies

of children who stutter. This is an important point, because even though the ADHD participants elicited a high frequency of disfluencies, these disfluencies are not descriptive of the same disfluencies elicited by persons who stutter. So it can be concluded that the executive processing deficits of ADHD children are not the same for children who stutterer.

Task Differences

Based on earlier research it was proposed that overall the narratives produced by the ADHD children would contain more disfluencies than those of their Typically Developing peers (Hamlett et. al., 1987 and Tannock et. al., 1993). Data analysis indicates there was a significant difference ($p=.046$) between the total percent of disfluencies on the OST and the ST-P produced by children with ADHD as opposed to the TD children. However, there was not a significant difference in the occurrence of disfluencies between the two story telling tasks (OST vs. ST-P). Other researchers have reported that task has an affect on the frequency of disfluencies for stuttering and nonstuttering children (Gordon, 1991; Gordon & Luper, 1989; Hill, 1995; Logan & Conture, 1995; Sillman & Leslie, 1983; Wall & Meyers, 1983; Weiss & Zebrowski, 1994). It was hypothesized that the ADHD and TD participants would produce more disfluencies on the OST as compared to the ST-P. It was expected that the pictures of the ST-P would require a lower demand for organization of content and language and executive processing. Wall and Myers (1982) described out a relationship between the cognitive process of sentence organization and fluency. Other researchers have reported task affect on disfluencies for ADHD children (Hamlett et al, 1987; Tannock et al, 1993, and Oram et al, 1999). The purpose of the Oram, Fine, Okamoto, and Tannock (1999)

study was to determine if an executive dysfunction interfered with the performance on certain tasks. They compared the performance of ADHD children, Typically Developing children, and ADHD children with accompanying language delays on individual subtest of the Clinical Evaluation of Language Fundamentals – Revised (CELF-R). They concluded that ADHD participants performed like those without ADHD on all tasks except for the Formulating Sentences subtest. For this particular subtest it was concluded that the difference could be due to aspects of executive dysfunction in ADHD, such as impulsivity and pragmatic deficits. In this study that dysfunction, if present, did not affect the children's fluency when performing the OST task.

In short, the lack of structure on the OST was hypothesized to result in more revisions and interjections and pauses due to the demand of organizing and planning of the narrative. Barkley (1990) pointed out that poor regulation and inhibition are the hallmarks of ADHD. Westby and Culter (1994) said that children with ADHD tend to be poorer in complex problem solving strategies and organizational skills and perform well where materials are meaningful and structured for them. Keeping this in mind, it was proposed that the Story Telling Task with Pictures would provide the necessary meaning and structure resulting in fewer disfluencies. Although ADHD participants were less disfluent on the ST-P, this difference was not statistically significant. For the TD participants they were slightly more disfluent on the ST-P; however this difference is not statistically significant. Therefore the presumed difference in the two tasks was either not present or required no significant difference on executive processing.

Demands and Capacities: Language and Executive Processing

The results were further examined within the context of the Demands and Capacities hypothesis. Although language and executive processing are not directly examined it appears a difference in language and executive processing had an affect on the percent and type of disfluencies exhibited by each group. For example ADHD participants exhibited a greater number of disfluencies than their TD peers; and both groups elicited a greater percent of normal disfluencies as opposed to stuttered disfluencies. It was proposed that the Story Telling Task with Pictures would provide the necessary structure thus lowering the demand for executive processing skills and resulting in fewer disfluencies on that task. This hypothesis was not statistically different. Hamlett et al. (1987) pointed out that the "deficits in the hyperactive child's attentional and inhibitory mechanisms may interfere with cognitive performance especially on complex problem-solving tasks that require organization and deliberate planning, or the application of 'executive processes' and 'operations'" (p. 228). The Story Telling Task with Pictures (ST-P) provided the ADHD participants with the necessary structure to aid in executive processing. Thus they were not required to use a high level of organization and deliberately planning. The pictures did the organization and planning for them. The only demand they had was to tell the story. This was not true for the story telling task without pictures. It can be presumed that the ADHD participants were more disfluent during this task because in addition to creating a story they had to simultaneously "organize and deliberately plan".

Demands and Capacities: A Neuro-Motor Connection

Austin and Csanyi (1994) report that persons with ADHD have a deficit in the neurotransmitters that control the attentional system. In addition deficits in the prefrontal cortex functioning have been hypothesized to contribute to ADHD symptoms of inattention, lack of inhibition, and overactivity which in turn could contribute to deficiencies in syntax and fluency (Augustine & Damico, 1995; Austin & Csanyi, 1994; Shelton & Barkley, 1994). As a result it has been suggested that problems with impulsivity or a deficiency in inhibition behavior could result in excessive and developmentally inappropriate levels of motor or vocal activity.

Based on the results of this study it can be hypothesized that an increased number of disfluencies could be an example of "excessive and developmentally inappropriate levels of motor or vocal activity." Peters and Starkweather (1989) established that children increase their motor control throughout the preschool years. Thus a coordination of speech in more consistently timed and better organized resulting in fewer disfluencies. Generally as motor and linguistic demands decrease so does the occurrence of disfluencies. It is when these demands exceed the capacities that disfluencies occur. For instance it has been established that linguistically precocious children can be highly disfluent because their language skills exceed the speech motor abilities. Also children who have language delays, although their motor abilities may be appropriate, the deficits in language negatively impact their ability to monitor and self regulate the forward flow of information.

In addition to connections between language skills and fluency, previous research has established a connection between motor abilities and fluency. Devenny, Silverman,

Balgley, Wall, and Siditis (1990) found that stuttering seemed to be associatesd with specific deficits within the speech motor system (p. 437). In addition it has been determined that neurological impairments influence motor production in people with Down Syndrome meaning that stuttering could be due to a motor-control impairment. A connection between neurological motor control for the purpose of fluent speech has been established. Due to the neurological nature of ADHD, many children, like these who participated in this study, take medication to help them control the impulsiveness and/or difficulty maintaining sustained attention. In this study the ADHD participants were significantly more disfluent than their age and gender matched peers. The increased percent of disfluencies for the participants with ADHD can be attributed to the neurological differences of ADHD, which make attention very difficult to control.

Summary

The purpose of this study was to compare the frequency and nature of disfluencies in children with Attention Deficit Hyperactivity Disorder (ADHD) to their Typically Developing (TD) peers. Results indicated that participants with ADHD were more disfluent than the TD participants. Also both groups produced significantly more normal disfluencies than stuttered disfluencies. Finally the difference in tasks did not significantly impact the frequency and nature of disfluencies.

Limitations and Future Research

As hypothesized the ADHD children were more disfluent than their TD peers however the design of this study did not directly measure some of the proposed affects on this increased occurrence of disfluencies. Future research could analyze the narratives of all participants and statistically measure and compare the organization and sophistication

of the narratives. This type of analysis could provide more concrete information between the differences in executive processing.

Another limitation is that the data was only recorded on an audio recorder. If narratives had also been video taped an analysis of secondary characteristics could have been completed. It is noted that the presence or absence of secondary characteristics aids in the differential diagnosis of persons who stutter. Accessory or secondary characteristics are the behaviors used in an attempt to postpone, interrupt, escape from, avoid, or disguise the core behaviors. Since there is an overlap in the development of stuttering and fluency these characteristics are often used to provided a differential diagnosis on the incipient and confirmed stutterer.

Finally, a third group of participants, particularly children who stutter, could have been analyzed in order to investigate a task affect. Or this study replicated with a different group of participants. Since there was not a group of participants who were confirmed stutterers speculations based on previous research was made on how they would have performed on these two tasks. If a third group was provided statistical analysis could have been completed and in turn identified if any and affect the tasks had on the participants and the occurrence and type of disfluencies.

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APPENDIX

Appendix A

Diagnostic Criteria for Attention-Deficit / Hyperactivity Disorder According to DSM-IV

A. Either: Six or more of the following symptoms of (1) inattention or (2) hyperactivity-impulsivity have persisted for at leas 6 month to a degree that is maladaptive and inconsistent with developmental level:

Inattention

a. often fails to give close attention to details or makes careless mistakes in schoolwork, work, or other activities
b. often has difficulty sustaining attention in tasks or play activities
c. often does not seem to listen when spoken to directly
d. often does not follow through on instructions and fails to finish schoolwork, chores, or duties in the workplace (not due to oppositional behavior or failure to understand instructions)
e. often has difficulty organizing tasks and activities
f. often avoids, dislikes or is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework)
g. often loses things necessary for tasks or activities (e.g. toys, school assignments, pencils, books, or tools)
h. is often easily distracted by extraneous stimuli
i. is often forgetful in daily activities

Hyperactivity

a. often fidgets with hands or feet or squirms in seat
b. often leaves seat in classroom or in other situations in which remaining seated is expected
c. often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness)
d. often had difficutly playing or engaging in leisure activities quietly
e. is often "on the go" or often acts as if "driven by a motor"
f. often talks excessively

Impulsivity

g. often blurts out answers before questions have been completed
h. often has difficulty awaiting turn
i. often interrupts or intrudes on others (e.g., butts into conversations or games)

B. Some hyperactive-impulsive or inattentive symptoms that caused impairment were present before age 7 years.C. Some impairment from the symptoms is present in two or more setting (e.g., at school [or work] and at home).

D. There must be clear evidence of clinically significant impairment in social, academic, or occupational functioning.

E. The symptoms do not occur during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and are not better accounted for by another mental disorder (e.g., Mood Disorder, Anxiety Disorder, Dissociative Disorder, or a Personality Disorder).

Appendix B

PARENT QUESTIONNAIRE

Please complete this questionnaire as accurately as possible. All of the information is confidential. No names will be used when this information is reported in the final research document. Thank you.

I. Adult identification

A. General

Mother's Name _____ Age_____

Father's Name _____ Age _____

Siblings Name _____ Age _____

Siblings Name _____ Age _____

Siblings Name _____ Age _____

B. Income

1. Combined Income (both parents):

Less than $10,000 $10,000-$20,000 $20,000-$30,000

$30,000-$40,000 $40,000-$60,000 $60,000-$80,000

more than $80,000

2. Mother's Income:

Less than $5,000 $5,000-$10,000 $10,000-$20,000

$20,000-$30,000 $30,000-$40,000 $40,000-$50,000

more than $50,000

3. Father's Income:

Less than $5,000 $5,000-$10,000 $10,000-$20,000

$20,000-$30,000 $30,000-$40,000 $40,000-$50,000

more than $50,000

C. Occupation:

Please list your occupation and specific job title.

Example: Occupation Banker; Job title Cashier

Mother: Occupation_____; Job Title_____

Father: Occupation_____; Job Title_____

D. Education

Please circle the last year of school completed

Mother: 1 2 3 4 5 6 7 8 9 10 11 12

Post Highschool: 1 2 3 4 5 6 7 8 9 10

Degree(s) _____

Father: 1 2 3 4 5 6 7 8 9 10 11 12

Post Highschool: 1 2 3 4 5 6 7 8 9 10

Degree(s) _____

II. Child Identification

A. General

Name_____ Date of Birth_____ Age____ Sex__

Address_____

School_____ Grade_____

B. Speech and Language History

What is the primary language spoken in your home? _____

Are there any other language spoken in your home (on a regular basis)?_____

If yes, please list. _____

Describe the quantity of speech that your child uses:

_____ Talks a lot _____ Average _____ Talks very little

Is your child's speech understandable to you? _____ To others? _____ If no, please describe his/her speech _____

Does your child hesitate and/or repeat sounds? _____

Does your child "get stuck" in attempting to say words? _____

Has your child's ever been identified as a stutterer? _____

If yes, by whom _____ Was this an accurate evaluation of your child's speech?_____ Was your child ever professionally treated for this problem? ____ By whom _____ When _____

Results of this therapy _____

Does your child have any known speech/language disorders?_____

If yes, has your child received services regarding this disorder in the past two years? If yes, please describe._____

Does any family member have a stuttering disorder? _____ Other speech or language disorders? _____ If yes, please describe _____

C. Health History

Has your child been diagnosed with Attention Deficit- Hyperactivity Disorder?_____

If yes, by whom?_____ When was the diagnosis made?_____

Is your child currently taking medication for ADHD?_____

If yes, what is the name, dosage amount, and dosage schedule. [For example, "XXXX 20mg 3 times a day – 7am, 12:30pm, and 4:30pm"]

_____

Does your child demonstrate any other attention and/or behavioral problems?_____

E. School Performance

Does your child have difficulty in school?_____

If yes, which subjects prove to be the most difficult?_____

Has the child ever repeated a grade?_____If yes, which grade?_____

Is the child performing at grade level at this time?_____

Average grades are: A B C D D F

F. Verification

For research purposes it is necessary to have physician verification of diagnosis of ADHD. I have enclosed an additional release of information form for you to sign and send to the physician who made the diagnosis of ADHD for your child. For your convenience I have also enclosed a stamped envelop to be mailed to this physician or professional and in return the physician will mail the form to me. Thank you for your time.

Appendix C

Physician/Professional Verification Form

Dr./Mr./Mrs./Ms _____,

My child, _____, is participating in a study at the University of Tennessee. Please verify his/her diagnosis of ADHD by filling in the appropriate information. Thank You.

Parent/Guardian _____

Name

_____ _____

Signature Date

Date of Diagnosis_____

Medication type_____

Dosage amount and frequency_____

_____

Print Name

_____

Signature Date

_____

Degree and Special Certification

Thank You for your time. Please return to UTK in the self-addressed stamped envelope.

Appendix D

Summary of ADHD and TD Medical History

Subject	Age	Medical Hx	Medication	Diagnosing Doctor
TD01	9;11	None	None	Not Appropriate
TD02	10;0	None	None	Not Appropriate
TD03	9;7	None	None	Not Appropriate
TD04	8;9	None	None	Not Appropriate
TD05	10;2	None	None	Not Appropriate
TD06	10;0	None	None	Not Appropriate
TD07	10;6	None	None	Not Appropriate
AD01	9;9	Yes – '95	Prozac 10mg	John Robertson, MD
AD02	10;0	Yes – '95	Dexedrine 15mg	Lori Baxter, MD
AD03	9;9	Yes – '96	Adderall 10mg	Christopher Miller, MD
AD04	8;6	Yes - 97	Ritalin 20mg	Lori Baxter, MD
AD05	10;0	Yes - '95	Adderall 10mg	Lori Baxter, MD
AD06	9;11	Yes – '96	Ritalin 30mg	Timothy Thurston, MD
AD07	10;3	Yes-'98	Ritalin 20mg	Robert Proffit, MD

Appendix E

Child Assent Form

Title of Project: Disfluency Characteristics of Nonstuttering children and children with Attention Defecit-Hyperactivity disorder.

Hello, my name is Melissa Hiller. Your mom says that you are willing to help me. I need to meet with you at The University of Tennessee. There are a couple of things we will do.. First, I need you to listen for tones through these head phones and when you hear a sound you raise your hand so I know that you heard it. The second thing I need you to do is look at some pictures, point to some shapes, tell me which words go together best, and finish my sentences for me. Last, I need for you to tell me some stories. The first type of story will be one that you make up. I will give you a sentence and I want you to tell me the best story you can from that sentence. After telling me three stories that you made up from the sentence I gave you, I will give you a few minutes to look through a book. After looking at the book you will be asked to tell me a story based on the pictures you saw.

I will tape record every story you tell me, then later I will write it all. This is important for me to do in order to get everything you say in your story 100% correct. After I write everything out I will compare your story to the stories that other children tell me and see how some of the ideas are the same and how some are different.

Are you willing to help with this project? I think you will find that these things are easy and fun to do. If you decide that you don't want to do this anymore, all you have to do is tell me. You can just say, "I don't want to play this anymore." I really appreciate your help!

_____

Name

_____ _____

Signature Date

Appendix F
Informed Consent

Title of Project: Disfluency Characteristics of Nonstuttering children and children with Attention Deficit-Hyperactivity disorder.

This project is a study to compare the frequency of speech disfluencies in children with Attention Deficit-Hyperactivity Disorder ADHD and typically developing children between 7 and 10 years old. As subjects in this project, your child will be asked to tell stories with and without the aid of pictures. The collection of this data will be conducted during one session at the Fluency Research Lab at the University of Tennessee. At this time all descriptive information, screening procedures, and one story telling task will be completed. Next, your child will be asked to tell three original stories. These narratives will be audio recorded for later examination and transcription.

There are no risks to your child greater than those encountered in everyday life. The results from this study may provide a better understanding of the affect of ADHD on the narrative abilities of children with this disorder. An incentive of participation in this study is all subjects involved will be administered a hearing screening and an evaluation of language abilities.

The total test time will be approximately 45 to 60 minutes and your child will only interact with the examiner. Your child will not be forced to participate in the project if he or she is unwilling and/or you may withdraw your child from the project at any time without penalty. Confidentiality will be maintained at all times. Data gathered may be published in the future, however, all subjects will be referred to by coding number only. Following the period required by the University, all data will be destroyed. Until such a time, the data obtained will be kept in a locked filing cabinet at a UTK location.

If you have any questions, please call:

Melissa A. Hiller, B.A.
Dept. of Audiology and Speech Pathology
University of Tennessee
547-1 South Stadium Hall
Knoxville, Tennessee 37916
Phone: 974- 1801

Pearl A. Gordon, Ph.D.
Dept. of Audiology and Speech Pathology
University of Tennessee
547-1 South Stadium Hall
Knoxville, Tennessee 37916
Phone: 974- 1802

I _____ give permission for my child _____
(print name of parent) (print name of child)
to be a subject for the subjects described above.

Parent/Guardian _____ Date _____
(Signature)

Please sign both consent forms. Return one copy in the enclosed stamped addressed envelope and keep the second for your files. Thank You.

Appendix G

Total Percent of Disfluencies for Typically Developing (TD) Group on the Original-Story Telling Task (OST) and the StoryTelling Task With Pictures (ST-P).

	OST		ST-P	
SUBJECT	Stuttered	Normal	Stuttered	Normal
TD01	0	5.03	.46	2.76
TD02	1.33	4.0	3.96	3.52
TD03	.96	.96	.31	1.88
TD04	.63	4.43	1.85	2.38
TDO5	.66	.66	0	1.70
TD06	.72	2.71	.56	2.52
TD07	.70	2.02	.63	.63

Note. Disfluencies are presented in percentages.

Appendix H

Total and Mean Percent of Number and Type of Disfluencies for Attention Deficit Hyperactivity Disorder (AD) Group on the Original-Story Telling Task (OST) and the StoryTelling Task With Pictures (ST-P).

	OST		ST-P	
SUBJECT	Stuttered	Normal	Stuttered	Normal
AD01	4.40	1.10	1.95	3.41
AD02	2.55	3.27	5.07	3.38
AD03	4.26	5.96	1.98	2.77
AD04	1.18	3.53	.75	4.448
AD05	.91	5.45	1.65	4.47
AD06	11.84	8.06	8.46	6.15
AD07	1.42	4.84	2.28	4.89

Note. Disfluencies are presented in percentages.

VITA

I, Melissa Anne Hiller Hannah , am the author of this document. I was born in Cincinnati, Ohio on August 12, 1975 but raised in Nashville, Tennessee. I was an accomplished student and athlete and received the Saint Cecilia Girl award. A partial scholarship for Cross Country and Track brought me to the University of Tennessee in the Fall of 1994. I received her undergraduate degree in December 1997. I was a two time co-captain on the UT Women's Cross Country team and received ALL-SEC academic honors. I began my graduate study in the Spring in 1998 and that summer worked as a counselor for the UTK Camp for Kids who Stutter. My interest in fluency research was ignited by this experience. As a friend and mentor the head of this camp, Dr. Pearl Payne guided and supported me through this entire research and life experience. Since the start of this thesis I have completed all the required course work for my Masters degree and began working for the public school systems as a Speech Language Pathologist. Although this decision to begin working as an SLP postponed the completion of this study, it has been an invaluable experience. In 1999, I moved to Chattanooga, Tennessee and was hired as a SLP for the Rhea County Department of Education. In 2000 I had moved to Murfreesboro, Tennessee where I am currently working as a SLP for the Bedford County Department of Education. Although this document is completed this project is far from finished. I look forward to exploring all the other avenues this project has to offer.